Science

Teacher Guide

Primary Grade 4

Standards Based

Papua New Guinea
Department of Education

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Teacher Guide

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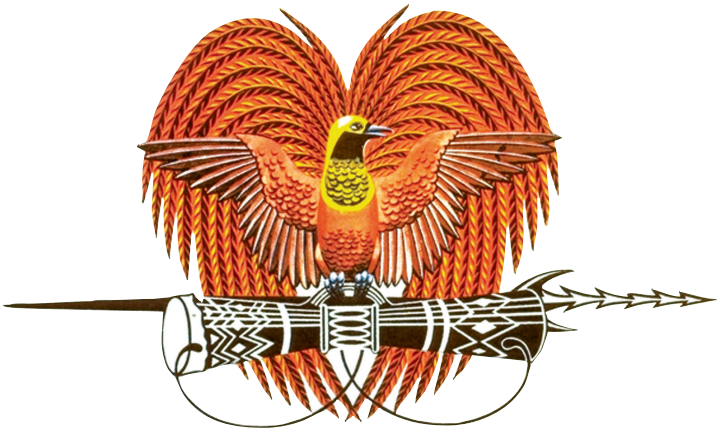
Standards Based



Papua New Guinea
Department of Education

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Contents

Secretary's Message

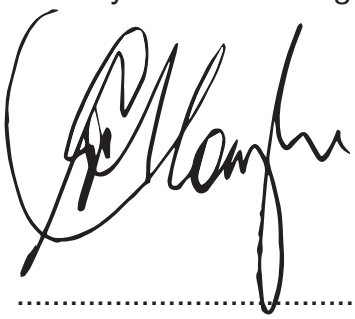
This Science Teacher Guide for Grade 4 was developed as a support document for the implementation of Science syllabus for grades 3, 4 & 5. The document provides guidelines for teachers on how to plan and program teaching and learning activities. It also contains sample guided lessons and assessments tasks with suggested teaching and learning strategies that teachers can use to work towards the achievement of content standards in the syllabus.

The Science subject is fundamental in life and a pillar for the ongoing and future development of this nation. Hence, it is critical to develop the learners' understanding of scientific concepts, skills and processes, and nurture the students' love for Science to enable them to be scientifically literate. This Teachers Guide will help teachers to expand the broad content from the syllabus into teachable programs. It has been designed with a view of making the students understand the basic scientific knowledge and skills in accordance with daily experience and prior knowledge about the environment.

The intention at this level is to set sound foundation for children to learn Science concepts and skills and to gradually develop the love for Science and expand the knowledge and understanding as the progress from one level to another.

Teachers are encouraged to read this teacher guide carefully to become familiar with the content so that they can be confident to try out new concepts and strategies and to teach the content well. They can also adjust to suit the needs of their students.

I commend and approve this Grade 4 Science Teacher Guide to be used in all Primary Schools throughout Papua New Guinea.



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DR. UKE W. KOMBRA, PhD
Secretary for Education

Introduction

This Teacher Guide must be used to help you to implement the Primary Grades 3, 4 & 5 Syllabus. The information and guidelines provided in this teacher guide will assist you to interpret and translate the content prescribed in the Grades 3, 4 & 5 Primary Syllabus into teachable activities. This book provides a guide for you to use the suggested teaching and learning ideas given are to assist you to plan quality science lessons and when, where and how to use benchmarks in relation to the attainment of standards.

The teacher guide also guides you on how to create and design an active and interactive teaching and learning environment. It contains samples of assessment tasks that will help you to create assessment tasks that can be measured against the intended content standard. The teacher guide will give you an opportunity to prepare learning activities that will motivate your students to think critically and communicate ideas freely with other students in the classes.

The content of this teacher guide features the following:

- key features of the subject,
- teaching and learning strategies,
- planning and programming,
- content overview,
- content background information,
- samples of guided lessons,
- assessment and reporting of the subject and
- resource materials.

How to use the Teacher Guide

You are encouraged to use this Teacher Guide as the main reference to plan and implement the grade four contents as prescribed in the Grades 3,4 &5 Primary Science syllabus. For effective implementation of science in Grade 4, teachers are encourage to do the following;

1. Read the teacher guide thoroughly and carefully.
2. Read the syllabus and become familiar with strands, units, conten standards and performance standards which are further expanded in the teacher guide.
3. Read each sections of the teacher guide and take note of new changes or inclusions that may appear to be new and unfamiliar to you.
4. Take note of the ideas, strategies, and processes that you feel comfortable with and those you find difficulty with.
5. Meet with other teachers, discuss and share ideas about how to:
   - use the teacher guide to do planning for the year's instructional programs
   - conduct in-services on sections of the teacher guide to assist other teachers
   - conduct awareness and share ideas with stake holders about the teacher guide.

Introduction

Key Features

The key features outlined in this section are identified as unique to Science and are important in the planning and teaching of Science. The key features of the Grade 3 to Grade 5 Science subject emphasises recommended knowledge, skills and processes and provide ideas on how to teach Science without a laboratory.

Using the senses

Most people don't know what a *scientist* really does. Many people think a scientists spends his day mixing up chemicals in a laboratory. But a scientist is really like a detective. The scientist wants to find out why things happen. He or she starts by looking for clues. The scientist observes things very carefully. He or she uses the five senses to collect information.

Scientists describe the things they observe and they write down descriptions. They do the experiments and often they measure things. They collect results and record them. If they are not satisfied with their results, they repeat the same experiment.

Scientific Processes and Skills

Scientific inquiry may be defined as the activities and processes which scientists and students engage in to study the natural and physical world around them. In its simplest form, scientific inquiry may be seen as consisting of two critical aspects: the what (content) and the how (process) of understanding the world we live in. Teaching science as inquiry must therefore go beyond merely presenting the facts and the outcomes of scientific investigations. Students need to be shown how the products of scientific investigations were derived by scientists and be provided opportunities to:

- ask questions about knowledge and issues that relate to their daily lives, society and the environment
- be actively engaged in the collection and use of evidence
- formulate and communicate explanations based on scientific knowledge.

Through inquiry learning, students will be able to acquire knowledge and understanding of their natural and physical world based on investigations, apply the skills and processes of inquiry and develop attitudes and values that are essential to the practice of science.

Introduction

The table below shows the degree of responsibility students have in posing and responding to questions, designing investigations, and evaluating and communicating their learning (student-directed inquiry) in an inquiry–based learning compared to the degree of involvement of the teacher (teacher-guided inquiry).

Essential features of Science as Inquiry	**More ⟷ Less Amount of Student Self-Direction / Amount of Guidance from Teacher Or Material**			**Less ⟷ More**
1. Question Students engage with an event, phenomenon or problem when they	pose a question	select among questions	sharpen or clarify questions provided	accept given questions
2. Evidence Students give priority to evidence when they	determine what constitutes evidence and collect it	are directed to collect certain data	are given data and told how to analyze	are given data and told how to analyze
3. Explanation Students construct explanations when they....	formulate their own explanation after summarizing evidence	are guided in process of formulating explanation from evidence	are given possible ways to use evidence to formulate explanation	are provided with evidence
4. Connection Students evaluate their explanations when they...	examine other resources and form links to explanations	are directed toward sources of knowledge	are given possible connections	are provided with connections
5. Communication Students communicate and justify their explanations when they.....	form reasona-ble and logical arguments to communicate explanations	are coached in development of communication	are provided guidelines for communication	are given steps and procedures for communication

Adapted from *Inquiry and the National Science Education Standards*, *National Research Council (2000)*

Science without a laboratory

Science processes and procedures can be taught and learned without a conventional Science laboratory. Science without a laboratory is a reality for Papua New Guinea primary schools. With this in mind, the Grades 3, 4 & 5 Science Syllabus together with the teachers guides have been specifically designed to assist you to plan and design worthwhile learning opportunities for all students irrespective of the school's location. Improvising of materials comes into play.

Students and teachers are encouraged to use the resources that are readily available to them in their own surroundings. Students' safety is of great importance and should be guaranteed before actually using the improvised material. Local knowledge and situations become very important in this approach.

Teaching and Learning Strategies

A primary purpose for inquiry – based instruction is for students to learn fundamental science concepts, principles, and theories as well as to develop science process skills and attitudes that are essential for scientific inquiry. Science teachers are already using a variety of teaching and learning strategies in their lessons. These strategies can be mixed and matched.

Concept Cartoon - in concept cartoons, minimal language is used. Visual images are utilised to present concepts or questions relating to one central idea or word.

Concept Mapping - this is a strategy to present meaningful relationships among concepts. Concept maps are useful in organising and linking concepts or ideas.

Cooperative Learning - activities are structured such that each student assumes certain responsibilities and contributes to the completion of tasks. In working with others, students are exposed to different points of views and solutions in accomplishing a common goal.

Demonstration - is commonly used to scaffold the learning process. This approach is recommended when the learning activity is not safe or too complex for students to set up on their own.

Field Trip - learning activity outside the school. It provides opportunities for students to explore, discover and experience science in everyday life.

Games - engage students in play or simulations for the learning of concepts or skills. This is useful in helping students to visualise or illustrate objects or processes in the real world.

Investigation - students engage in activities that mirror how scientists think and what they do in a decision making process, such as asking or posing questions and planning or designing investigations.

Problem Solving - engages students in finding solutions to problems by applying scientific knowledge and skills.

Projects - they are learning activities that require students to find out about an object, event, process or phenomenon over a few weeks.

Questioning - Questions are useful tools in the scientific inquiry process. Both teachers and students should engage in cycles of questions-answers-questions throughout the learning process.

Role Play, Drama, Dance and Movement - allow students to express their understanding of scientific concepts and processes in a creative way.

Stories - telling stories about everyday life where scientists can capture students interest and engage them in talking about science. Either the teacher or students can be the story creator or teller.

Strategies for Active and Independent Learning (SAIL)

The SAIL approach emphasises learning as a formative and developmental process in which instruction and assessment point the way for students to continuously learn and improve. Learning expectations and rubrics are used to describe what students should know and be able to do. This would help students know where they are in the learning process and how they can improve.

Information and Communication Technologies (ICT)

ICT supports the inquiry process and also facilitates student collaboration and self-directed learning. For example, online collaborative tools allow students to share and discuss their ideas or findings within the school, and also extend their learning through consulting field experts. Internet enabled devices could be used to facilitate data collection and analysis in situated learning. Students can also explore and visualise abstract concepts using simulations tools to manipulate the variables to deduce a relationship between the variables.

Teaching and Learning Strategies

What are some features of an inquiry classroom?

An inquiry classroom is visibly different from a traditional classroom in the following ways:

Inquiry Classroom	Traditional Classroom
Students often work in groups	Students tend to work alone
Emphasis on understanding of concepts	Emphasis on mastery of facts
Allows for pursuit of student questions	Follows a fixed curriculum closely
Activities rely on a variety of sources	Activities rely mainly on textbooks and workbook materials
Students are viewed as thinkers with their own theories about the world	Students are viewed as **"blank slates"**
Teachers facilitate an interactive learning environment	Teachers tend to disseminate information to students
Teachers seek to understand student learning	Teachers tend to seek correct answers
Assessment is interwoven with teaching	Assessment tends to be separate from teaching

Adapted from *In Search of Understanding: The Case for Constructivist Classrooms, Brooks & Brooks (1993).*

Although participation by students in hands-on activities is desirable, it is equally important that they are mentally engaged with scientific reasoning and methods. Research indicates that science process skills are best learnt when used to understand specific scientific content. Understanding content without process or vice versa is insufficient to nurture students as inquirers.

Safety for Primary Students

When teaching Science, teachers must ensure that students know how to follow safety guidelines and handle apparatus with care. Safety must be given the highest priority for the benefit of the children and the success of the Science lesson.

Correct and safe techniques, as well as a wise selection of experiments, resources, materials, and field experiences appropriate to age levels, must be carefully considered regarding the safety precautions for every instructional activity.

While no comprehensive list exists to cover all situations, the following should be reviewed to avoid potential risks and problems. Appropriate safety procedures should be used in the following situations:

- observing wildlife; handling living and preserved organisms; and coming in contact with natural hazards, such as poison ivy, ticks, mushrooms, insects, spiders, poisonous plants and snakes,
- engaging in field activities in, near, or over bodies of water,
- handling glass tubing and other glassware, sharp objects, or other breakable objects,
- using open flames or heat to conduct experiments,
- working in or with direct sunlight (sunburn and eye damage),
- observing and handling chemicals and other hazardous substances.

Students with special needs (Inclusive Learning)

Some students have special needs. This includes students who are gifted and those who are disadvantaged. Gifted students should be given opportunities to extend their learning. Students with physical or intellectual impairments and emotional or learning difficulties need special support in the classroom. Teachers have a responsibility to ensure that the learning needs of these students are met. All students are individuals and all have the right to quality education in order to reach their full potential.

Planning and Programming

Planning and Programming is organising the content from the syllabus into teachable plans for delivery in the classroom using approaches such as long, medium, short term plans. For example:

- yearly overview is a long term plan
- termly overview is medium term plan and
- weekly and daily plans are short term plans.

Yearly Plan

When planning an instructional program, we begin with the yearly plan. The yearly plan is organised by terms in a school year. The main or key information that forms the content of the plan are provided in both the syllabus and the teacher guide. These are the;

- strands,
- units and,
- content standards.

Weekly Plan

A weekly plan of the program of instruction is a plan of an instruction program for teaching and gives the teacher specific outline of the Units, Content Standards and Performance Standards for instruction (teaching) which the teacher follows in a term. This guides the teacher to organize the teaching program for the number of weeks in each term.
To compile a plan for a week's program teachers will need to organize the plan using the:

- units
- content standards
- performance standards
- lesson titles.

Teachers should use the term overview to see the order of units organised, and then use this order to plan the weekly program. The weekly plan is implemented through a timetable that is planned for the subjects in the Primary level.

Planning and Programming

Timetable

Sample Timetable

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 - 8:15	Assembly	Assembly	Assembly	Assembly	Assembly
8:15 - 8:30	Listening	Oral Expression	Listening	Oral Expression	Listening
8:30 - 9:00	Spelling	Spelling	Mathematics	Spelling	Social Science
9:00 - 9:30	Talking	Talking	Talking	Mathematics	Mathematics
9:30 - 10:00	Written Sentences	Written Sentences	Written Sentences	Written Sentences	Written Sentences
10:00 -10:30	RECESS				
10:30 - 11:00	Reading	Reading	Reading	Reading	Reading
11:00 - 11:30	Science	Mathematics	Science	Science	Written Expression
11:30 - 12:00	Social Science	Social Science	Social Science	Science	SocialScience
12:00-1:00	LUNCH				
1:00 - 1:30	Mathematics	Science	Mathematics	Mathematics	Mathematics
1:30 - 2:00	Health	Science	Health	Arts	Arts
2:00 - 2:30	Arts	Health	PE	PE	Sports
2:30 - 3:00	PE	Arts	Hand writing		

Sample Time break up

Subjects	Time analysis		Time variation	
	Min Per Less	Recom. Time	+	-
Listening	3 x 15	45		
Talking	4 x 15	60	15	
Oral expression	2 x 15	30		
Reading	5 x 30	150		
Written Sentences	5 x 30	150		
Hand writing	1 x 15	15	15	
Spelling	2 x 15	30	15	
Written Expression	1 x 30	30		
Mathematics	8 x 30	240		
Science	2 x 30 + 2 x 60	180	15	
S/Science	5 x 30	150		
Health	3 x 30	90		30
Arts	3 x 30 + 1 x 45	135		
Physical Education	2 x 30 + 1 x 60	120		
Sports	1 x 60	60		
R/Education	1 x 60	60		
Assembly	5 x 15	75		
Block Time	3 x15	45		30
		1650	**60**	**60**

Content Overview

This section presents the overview of the Science content for grade four. The content is organised into the broad learning concepts.

- Life
- Physical Science and
- Earth and Space.

These broad learning areas are known as strands. From these strands units are developed and drawn from the units are topics. The overview below will help you understand the process in identifying the scope of the content of learning – strand, units and topics are translated into content standards.

Here is the scope of learning for grade four (4) in Primary Schools.

Content Scope of Learning for Grade 4

Strand	Unit	Grade 3	Grade 4	Grade 5
		Topic	Topic	Topic
Life	Plants	• Plant parts and their functions	• Life cycle of plants	• Plant growth
	Animals	• Animal parts and their functions	• Life cycle of animals	• Reproduction and heredity of animals
	Human Being		• Skeletal and Muscular system	
	Interaction and Relationship in the environment	• Observing our Environment	• Living things in the environment	• Habitat and adaptation • Energy in Food
Physical Science	Energy	• Energy • Light • Magnet	• Sound • Electricity 1	• Heat • Electricity 2
	Force and motion	• Moving objects	• Forces, motion and machines	• Motion and machines
	Matter	• Properties of matter • Substances and mixtures	• Air • Matter changes	• Three states of matter • New matter
Earth and Space	Our Earth	• The Earth • Rocks • Soil	• Importance of soil for human being	• Rocks, minerals and fossils
	Weather and climate		• Observing weather	• Weather and seasons
	Space	• Observing the sun	• Observing the moon	

Content Overview

Yearly Overview

The yearly overview is a plan designed to organise the learning content for grade four students into terms and weeks.

<table>
<tr><th>Week</th><th>Term 1</th><th>Term 2</th><th>Term 3</th><th>Term 4</th></tr>
<tr><td>1</td><td>Orientation
Revision Work</td><td>Revision Work</td><td>Revision Work</td><td>Revision Work</td></tr>
<tr><td>2</td><td rowspan="3">Life

Living things in the Environment</td><td>Life

Life Cycle of Plants</td><td rowspan="4">Physical Science

Air and Matter Change</td><td rowspan="2">Life

Skeletal and Muscular System</td></tr>
<tr><td>3</td><td>Earth & Space

Importance of Soil for human beings</td></tr>
<tr><td>4</td><td rowspan="4">Life

Life Cycle of Animals</td><td rowspan="2">Physical Science

Force Motion and Machine</td></tr>
<tr><td>5</td><td>Earth & Space

Observing Weather</td></tr>
<tr><td>6</td><td rowspan="2">Earth & Space

Water in Natural</td><td>Life

Life Cycle of Plants</td></tr>
<tr><td>7</td><td rowspan="3">Physical Science

Properties of Matter</td><td rowspan="2">Physical Science

Electricity 1</td></tr>
<tr><td>8</td><td>Earth and Space

Observing the Moon</td><td>Physical Science

Sound</td></tr>
<tr><td>9</td><td>Report Writing</td></tr>
<tr><td>10</td><td colspan="3">Testing and Compiling of Assessment</td><td>Speech Day Preparation</td></tr>
</table>

Content Overview

Termly Overview

The term overview is a plan of an instructional program for teaching. It provides the teacher with the specific units, topics and lesson titles suggested to be planned and delivered within a term. The term overview is organised by:

- Strands
- Units
- Topics.

Term 1 Overview

Week	Strand	Unit	Topic	Lesson title	Periods/s (30mins)
1	**Orientation and Revision Work**				
2	**Life**	Interaction and Relationship in the Environment	Living things in the Environment	Animals depend on plants for food and shelter	2
				Animals depend on animals for food	2
3				People and Living things	2
4				Review	1
5	**Earth and Space**	Weather & climate	Observing Weather	Instruments to measure weather	2
				Changes in the sky	2
				Measuring Weather	2
6				Factors affecting weather	2
				Effects of weather on human activities	2
				Review	1
7	**Physical Science**	Matter	Air	Air around us.	1
8				Properties of Air - Air Takes up Space (i)	2
9				Properties of Air - Air Takes up Space (ii)	2
				Properties of Air - Air has mass	2
				Properties of Air - Compressing Air	2
10	**Testing and Compiling of Marks**				

Content Overview

Term 2 Overview

Week	Strand	Unit	Topic	Lesson title	Periods (30mins)
1	**Revision Work**				
2	**Life**	Plants	Life cycle of plants	Looking at Seeds	2
3	**Earth and Space**	Our Earth	Importance of Soil for Humans	Uses of soil for human beings	2
				What is soil pollution?	1
				Effects of soil pollution	1
				Review	1
				Protecting and conserving soil	2
				Unit Review	1
4	**Life**	Animals	Life cycle of animals	Growing and Changing (What is a life cycle)	2
5				Life cycle of a butterfly	1
				Life cycle of frogs	1
				Life cycle of a chicken	1
6				Life cycle of a fish	2
				Life cycle of a dogs	1
				Unit Review	1
7		Plants	Life cycle of plants	Germination of Seeds	2
8	**Earth and Space**	Space	Moon	Discovering Moon	2
				Movement of Moon	1
				The Changing Moon	1
9				Unit Review - Moon	1
10	**Testing and compiling of Marks**				

Content Overview

Term 3 Overview

Week	Strand	Unit	Topic	Lesson title	Periods (30 mins)
1	**Revision Work**				
2	**Physical Science**	Matter	Matter change	Properties of physical change	1
				Properties of chemical change	1
				Comparing physical and chemical change	1
3				Reversible and irreversible changes in the environment	1
				Review- physical and Chemical change	1
				Bubbles in Boiling Water	1
				Measuring the temperature of boiling Water	2
4				Graphing and Analysing Data- Boiling water	1
				Closer look at bubbles	1
				Steam and water vapour	1
				Measuring temperature of cooling water	2
5				Graphing and Analysing data- Cooling water	1
				Changes in states of water- Ice to water	1
				Measuring Melting point of ice	2
				Review – Changing states of water	1
				Unit Review	1
6	**Earth and Space**	Weather and Climate	Water in natural world	Sources of water on earth	1
				Where did the water go to?	1
				Collecting invisible water	1
				Making clouds	2
				Water Cycle	2
				Importance of Water in daily Activities	1
				Water Pollution	
7				Conservation of Water	1
				Review- Water in Natural World	1
	Life	Plants	Life cycle of plants	Observing Plant Growth-Flowering	1
8	**Physical Science**	Energy	Sound	What is sound?	1
				Making sounds	2
				How does sound travel?	2
				Bouncing sound (echo)	2
9				High and Low sounds (Pitch	1
				Soft and Loud sound (Volume)	2
				Review- Sound	
10	**Testing and compiling of Marks**				

Content Overview

Term 4 Overview

Week	Strand	Unit	Topic	Lesson title	Periods (30 mins)
1	**Revision Work**				
2	**Life**	Human Body	Skeletal and muscular system	Revision Work	
				Bones of human beings	2
				Joints of the human body	2
				Muscles of the human body	2
3				Mechanisms of movement of the arm	2
				Review- Bones	1
4	**Physical Science**	Force and Motion	Force, Motion and Machines	What is force and motion	1
				Describing motion based on speed, direction and distance	1
				Measuring motion of an object	2
				Review- Force and motion	1
5				Simple Machine - Levers	1
				Simple Machine - Pulleys	1
				Simple Machines - Inclined planes	1
				Simple Machine - Screws	1
				Simple Machine - Wheel & axle	1
				Simple Machine - Wedges	1
				Review – Simple machines	1
				Unit Review	1
6	**Life**	Plants	Life Cycle of Plants	Observing Plant Growth - Fruit	1
				Life cycle of Plants	2
				Review	1
7	**Physical Science**	Energy	Electricity 1	What is electricity?	1
				Sources and uses of electricity	1
				Connection in different ways to light a bulb	2
				Connecting without a socket	2
				Let's make a simple circuit	1
				Conductive and non-conductive materials	2
8				Switch	1
				Making a traffic light	1
				Unit Review	1
9	Assessment and Report Writing				
10	Speech day Preparation				

Content Overview

Yearly Lesson Overview

The yearly lesson overview has the lesson titles which are organised from term 1-4 for the year. There are 97 lessons altogether including the revision lesson/follow-up lessons. These lesson titles are expected to be taught by grade 4 teachers throughout the country.

Strand	Unit	Lesson #	Suggested lesson title
Life	Interaction and relationship in the environment	1	Animals depend on plants for food and shelter
		2	Animals depend on animals for food
		3	People and Living things
		4	Review
Earth and space	Weather and climate	5	Instruments to measure weather
		6	Changes in the sky
		7	Measuring Weather
		8	Factors affecting weather
		9	Effects of weather on human activities
		10	Review
Physical science	Matter	11	Air around us.
		12	Properties of Air - Air Takes up Space (i)
		13	Properties of Air - Air Takes up Space (ii)
		14	Properties of Air - Air has mass
		15	Properties of Air - Compressing Air
		16	Review
Life	Plants	17	Looking at Seeds
Earth and Space	Our Earth	18	Uses of soil for human beings
		19	What is soil pollution?
		20	Effects of soil pollution
		21	Review
		22	Protecting and conserving soil
			Unit Review
Life	Animals	24	Growing and Changing (What is a life cycle)
		25	Life cycle of a butterfly
		26	Life cycle of frogs
		27	Life cycle of a chicken
		28	Life cycle of a fish
		29	Life cycle of a dogs
			Unit Review
Life	Plants	31	Germination of Seeds
Earth and Space	Space	32	Discovering Moon
		33	Movement of Moon
		34	The Changing Moon
		35	Unit Review

Content Overview

Strand	Unit	Lesson #	Suggested lesson title
Physical Science	Matter	36	Properties of physical change
		37	Properties of chemical change
		38	Comparing physical and chemical change
		39	Reversible and irreversible changes in the environment
		40	Review - physical and Chemical change
		41	Bubbles in Boiling Water
		42	Measuring the temperature of boiling Water
		43	Graphing and Analysing Data- Boiling water
		44	Closer look at bubbles
		45	Steam and water vapour
		46	Measuring temperature of cooling water (liquid-solid)
		47	Graphing and Analysing data - Cooling water
		48	Changes in states of water - Ice to water
		49	Measuring Melting point of ice
		50	Review – Changing states of water
		51	Unit Review
		52	Sources of water on earth
Earth and Space	Weather and Climate	53	Where did the water go to?
		54	Collecting invisible water
		55	Making clouds
		56	Water Cycle
		57	Importance of Water in daily Activities
		58	Water Pollution
		59	Conservation of Water
		60	Review- Water in Natural World
		61	Observing Plant Growth-Flowering
Life	Plants	62	What is sound?
Physical Science	Energy	63	Making sounds
		64	How does sound travel?
		65	Bouncing sound (echo)
		66	High and Low sounds (Pitch
		67	Soft and Loud sound (Volume)
		68	Review- Sound
		69	Bones of human beings
LIFE	Human Body	70	Joints of the human body
		71	Muscles of the human body
		72	Mechanisms of the arm and hands
		73	Review- Bones
		74	What is force and motion?

Content Overview

Strand	Unit	Lesson #	Suggested lesson title
Physical Science	Force and Motion	75	Describing motion based on speed, direction and distance
		76	Measuring motion of an object
		77	Review- Force and motion
		78	Simple Machine - Levers
		79	Simple Machine - Pulleys
		80	Simple Machines - Inclined planes
		81	Simple Machine - Screws
		82	Simple Machine - Wheel & axle
		83	Simple Machine - Wedges
		84	Review – Simple machines
		85	Unit Review
		86	Observing Plant Growth - Fruit
Life	Plants	87	Life cycle of Plants
		88	Review
		89	What is electricity?
Physical Science	Energy	90	Sources and uses of electricity
		91	Connection in different ways to light a bulb
		92	Connecting without a socket
		93	Let's make a simple circuit
		94	Conductive and non-conductive materials
		95	Switch
		96	Making a traffic light
		97	Unit Review

Background Information

The background information will assist teachers who are not familiar with the content of a particular unit or topic to enhance his or her planning and to teach with confidence in the classroom. As most primary teachers are generalist and not specialist in subject matter, it is important that for each unit in the syllabus, there is background content information for the teachers to use. Secondly, most Primary Schools in Papua New Guinea are situated in the remotest parts do not have other resource books, most teachers will depend on the Science Teacher Guide to develop daily teaching plan mainly in terms of content delivery to the students in the classroom.

Strand 1: Life

Unit 1: Plants

Topic: Life Cycle of Plant

Life Cycle of Plants

- The plant starts life as a seed, which **germinates** and grows into a plant. The mature plant produces flowers which are fertilized and produce seeds in fruit or seedpod. The plant eventually dies, leaving seeds which **germinate** to produce new plants.
- The seed will sprout and produce a tiny, immature plant called a **seedling.** The seedling will grow to adulthood and form a mature plant. The mature plant will reproduce by forming new seeds which will begin the next life cycle. As described above this life cycle is generally used by the **flowering** plants.
- The majority of plants on earth are flowering plants (this includes trees, grasses, cacti and other small plants, as well as the more obvious examples).
- All flowering plants have a similar reproductive cycle.
- The reproductive cycle is an important adaptation, and the formation and dispersal mechanisms for seeds (contained in fruit, pods or nuts) are varied.
- Fruits are the outcome of a fertilized flower and contain seeds.
- Conifers do not have flowers but produce seeds in cones.
- Seeds:
  – need water to germinate
  – need the right temperature to germinate
  – vary in their rate of germination

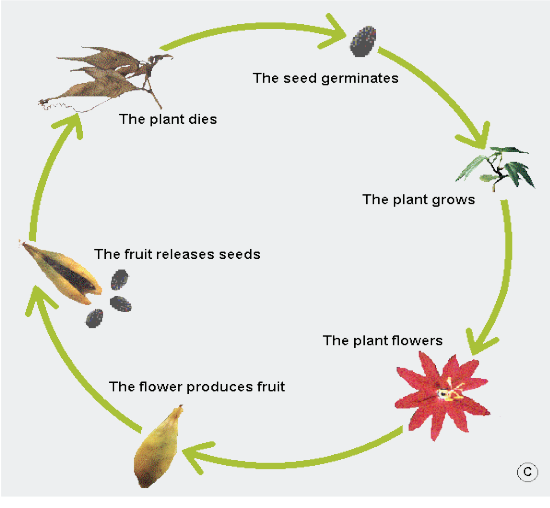


Figure 2: Life cycle of flowering

Figure 1: A Seedling

Background Information

Strand 1: Life

Unit 2: Animals

Topic: Life cycle of animals

Stages of life cycle of animals

- Animals are born in different ways depending on the group each animal belong to mammals give birth to young, where birds, fish and reptiles lay eggs which their young hatch out of. In some egg laying animals such sharks, the eggs are laid and incubated inside the body of the mother shark, which therefore gives birth to live young.

Life cycle of a butterfly

- The insects have four stages in their life cycle:

Egg: unborn stage. Larva: young stage – this is when the most of the feeding is done. Pupa: inactive (no feeding) stage between larva and adult stages.

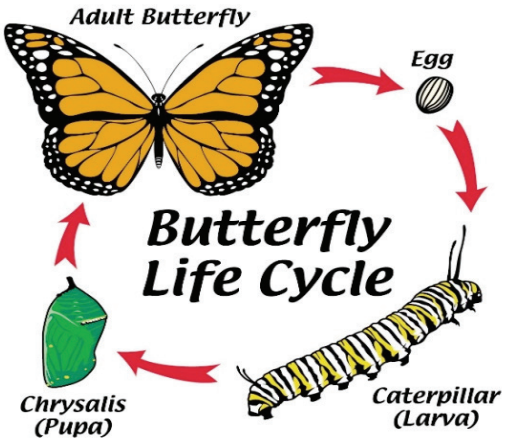


Figure 1: Life cycle of a butterfly

Life cycle of a frog

- Frogs go through four stages in their life;
  The life cycled of a frog begins with egg, tadpole, young frog (metamorph), and adult frog.
- Frogs lay many eggs. The eggs will hatch. The tadpole consists of gills, a mouth and a tail. By 12 weeks, the tadpole looks like a miniature version of the adult frog. By between 12 to 16 weeks, the frog has completed the full growth life cycle.

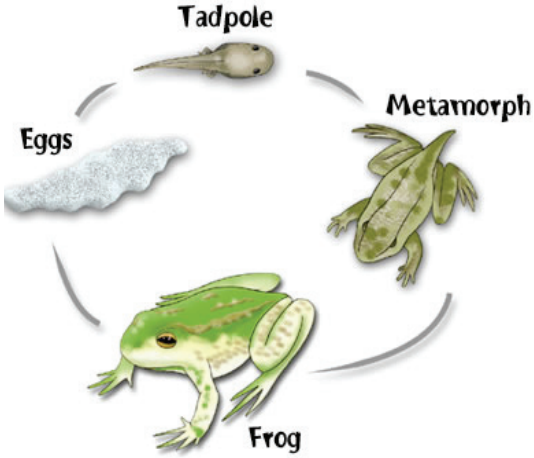


Figure 2: Life cycle of a frog

Background Information

Life cycle of a chicken

- Each chicken started its life by hatching from an egg. Chicks grow and change overtime, becoming chickens and having babies of their own. A chicken's life cycle begin even before it hatches. If hatching naturally, the mother hen will sit on the eggs to maintain the optimum temperature so they can develop until it is almost hatching time. When an egg is laid, a baby chicken starts growing and forming inside. A hen lays an average of 300 eggs per year and takes 21 days to hatch.

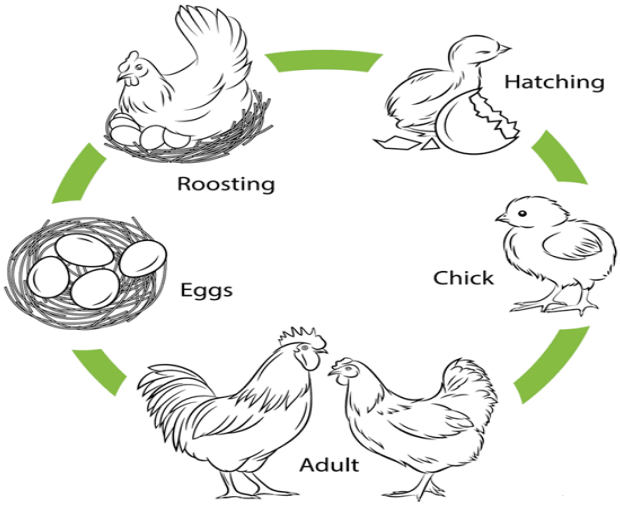


Figure 3: Life cycle of a chicken

Life cycle of a dog

- A dog's lifecycle begins at puppyhood and spans an average of 12 years. Dogs go through four stages of the life cycle; puppy, adolescent, adult and senior. The adult age of a fully matured dog occurs when it is around 2 years old. Its senior years start when it is around 7 years old. During these stages, the dog has become fully matured, independent and responsible.

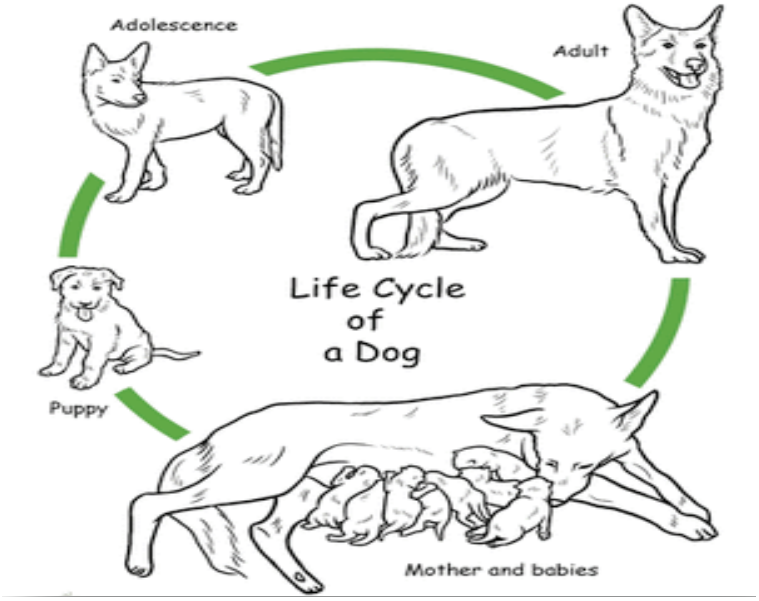


***Figure 4*:** Life cycle of a dog

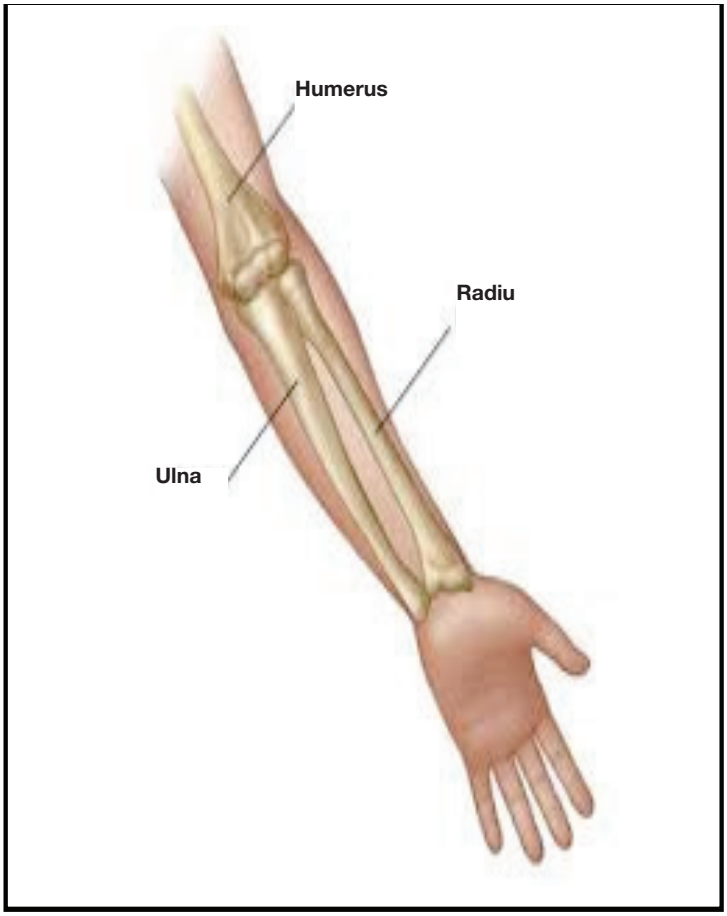
Background Information

Unit 3 : Human beings

Topic: Skeletal and Muscular System

Bones and Muscles

- The skeleton system is the structure of the body, consisting of bones and other connective tissues, which protects and supports the body tissues and internal organs.
- The skeleton system includes all of the bones and joints in the body and also provides attachment points to allow movements at the joints.
- At birth the human skeleton is made up of around 300 bones. By adulthood, some bones have combined together to end up with 206 bones.
- The human skeleton system has six major functions including the production of blood cells, for support, for movement and for protection, for storage of ions and endocrine regulations.
- The skeleton system in adult is made up of 206 individual bones. These bones are arranged into two major divisions: the axial skeleton and the appendicular skeleton.
- The longest bone in the human body is the thigh bone called the **femur.**
- The smallest bone found in the human body is located in the middle ear. The **staples** (or stirrup) bone is only 2.8 millimeters long.
- The area of our body with the most bones is the hand, fingers and wrist where there are 54 bones.



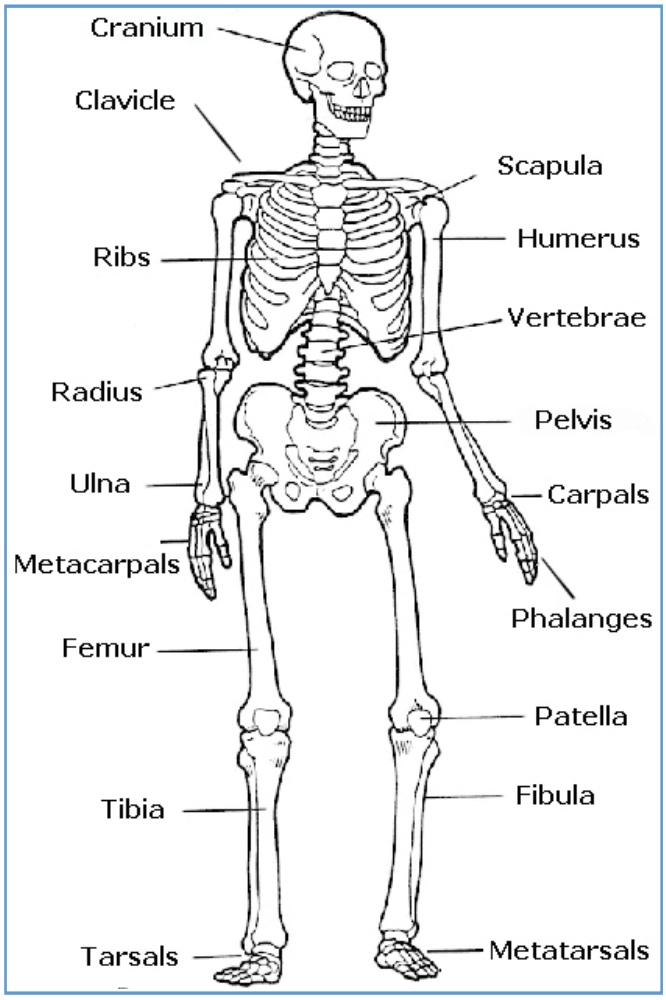


Figure 1: Skeleton system

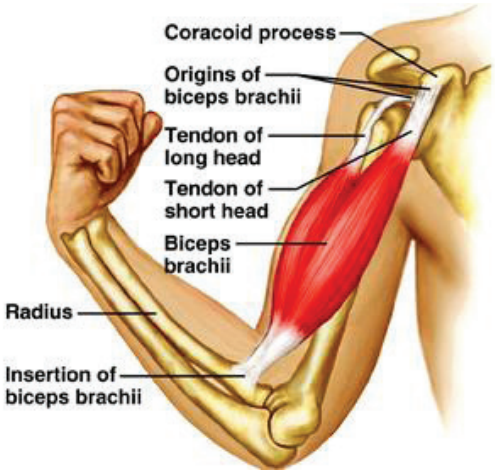
Background Information

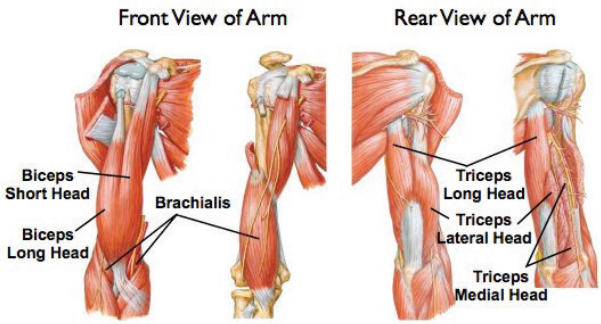
- The muscular system is responsible for the movement of the body. Attached to the bones of the skeletal system has more than 600 muscles that make up roughly half of a person's body weight.
- The muscular system is an organ system consisting of skeletal, smooth and cardiac muscles. It allows for the movement of the human body, maintains posture, and circulates blood throughout the body.
- If bones give your body support, muscles give it power. Some of these muscle control big movements, like the muscles in your arms and legs. Other muscles control very tiny movements, like blinking.
- Most of our muscles are attached to bones with tendons. Tendons are like strong rubber bands or ropes. Inside the muscles are blood vessels and nerve endings that get message from our brain.
- There are various types of muscles

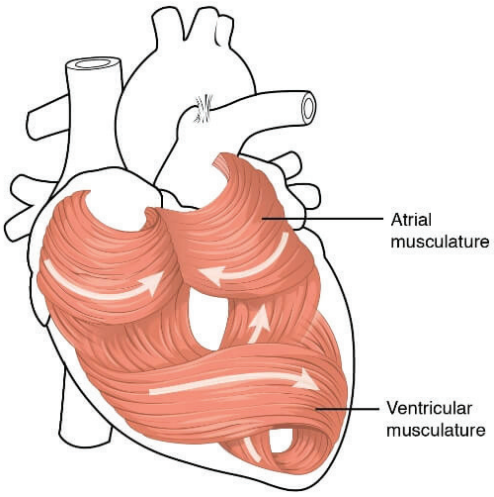
Skeletal muscles – These are the muscles used to move around. They cover our skeleton and move around. They cover our skeleton and move our bones. These muscles are voluntary because we control them directly with signals from our brains.

Smooth muscles – These are special muscles that do not connect to bones, but control organs within our body. These muscles work without us having to think about them.

Cardiac Muscles – This is a special muscle that pumps our heart and blood through our body.







Background Information

Unit 4 : Interaction and relationships in the environment

Topic: Living things in the environment

Interaction among living things

- Plants depend on animals for nutrients, pollination and seed dispersal.
- Plants are also useful for animals home because many animals live around plants. Plants give animals the food and shelter they need. Herbivores, which are plant eating animals, rely on plants to provide for them with a regular source of food.
- Plants provide shelter for animals and the make oxygen for the animals to live. When animals die they decompose and become natural fertilizer to the plants.
- Herbivores like cow, deer, feed on plants. Carnivores, like lions and wolves, eat meat. Omnivores, which include pigs, bears and humans, eat both plants and animals.
- Animals depend on each other for food and survival.
- People depend on plants for food, clean air, water, fuel, clothing, and shelter.
- Human beings depend on Earth's environment for the following the resources.

Food:

Without food, life would not exist. The environment provides food since plants grow from the soil. Plants growing from the soil are also eaten by certain animals, sheep and cattle which are all considered as food for human beings.

Water:

This is the element of life without which all things would die. The environment provides this element through various ways including rain, rivers, lakes and oceans. Human beings use water for drinking, washing, irrigation and power generation.

Shelter:

Some of the materials used in the construction include sand, stones and trees. The environment has an abundance of these raw materials and that is why human beings are able to build decent shelters.

Clothing:

Without clothing, human beings would find it difficult to cope with the harsh elements of the climate. The environment provides raw materials, such as silk and cotton, which are all used in manufacture of clothing and products.

Figure 1: Plants and animals need each other to survive

Background Information

Strand 2: Physical Science

Unit 1: Energy

Topic: Sound

Sound energy is a form of energy that is associated with vibrations of matter. It is a type of mechanical wave which means it requires an object to travel through. This objects include air and water. Sound originates from the vibrations that result after an object applies force to another object.

- We are able to hear different sounds because as the sounds (vibrations) enter our ears, the ear also vibrates.
- Dogs' ears are more sensitive than human ears which allow them to hear sounds that humans cannot hear.
- There is no sound in space because there is no object for sound to travel through
- Sounds travels through a solid much faster than through air. The speed of sound is 767miles per hour. Sound travels faster through a liquid such as water faster than it travels through air.
- Flies cannot hear at all. Whales can communicate with each other under water up to 800km in the ocean

Properties of Sound

- Sound can be modified for example pitch and loudness.
- The frequency of sound is the number of vibrations in a given unit of time.
- Pitch is determined by the frequency of a vibrating object. Objects vibrating faster have a higher pitch than objects vibrating slower.
- Musical instruments vibrate to produce sound.
- Echo is a reflection of sound, arriving at the listener sometime after the direct sound.
- An echo is what happens when sound bounces of a surface as they travel and play back again a second time. An echo is more likely to happen when the sound has a lot of surfaces to bounce off. For example, caves and alley ways are usually full of echoes.

Electricity

Sources of electricity are everywhere in the world. Worldwide, there is a range of energy resources available to generate electricity. These energy resources fall into two main categories, often called **renewable** and **non-renewable** energy resources. Each of these resources can be used as a source to generate electricity, which is a very useful way of transferring energy from one place to another such as to the home or to industry.

- Electricity is the flow of electrical power or charge or it is the formed of energy that is carried through wires and is used to operate machines, lights etc.
- A **battery** can act as a source of electricity in circuits.
- **Water power** (hydropower) can produce electrical energy. Dams are used to contain flowing river water, forming lakes and reservoirs. As water flows downhill it is channeled to a turbine or water wheel. The force of the flowing water turns the turbine or wheel, which turns a generator to make electricity.
- **Sun power** (solar energy) use sunlight to produce electricity that can be used directly or stored in battery for later use.

Background Information

Simple circuit

An electric circuit is like a pathway made of wires that electrons can flow through. A battery or other power source gives the force (voltage) that makes the electrons move.

The word “circuit” rhymes well with “circles” and a circuit needs to be a circular to work. The wires have to go from the power source to the device and back again, so electrons can go out and come back.

Many circuits have a switch so that they can be turned on and off. When the switch is off, it makes a gap in the circuit and the electrons are unable to flow around. When the switch is turned on, it closes the gap and the electricity is able to move and make the device work.

An electrical conductor is a substance in which electrical charge carriers, usually electrons, move easily from one point

- Electrical energy moves through materials that are conductors (metals). Insulators (rubber, plastic, wood) do not conduct electricity well.
- Types of conductors and insulators

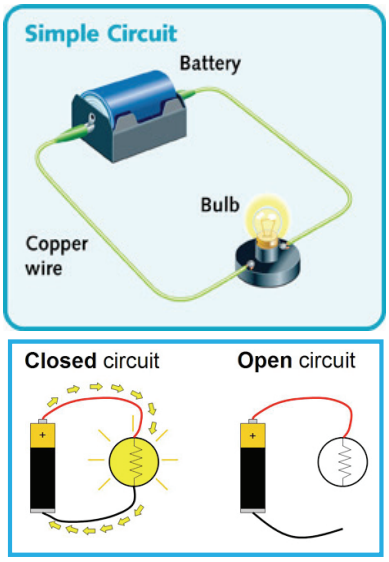


Figure 1: Simple circuit and closed and open circuit.

An **electrical conductor** is a substance in which **electrical** charge carriers, usually electrons, move easily from atom to atom with the application of voltage. **Conductivity,** in general, is the capacity to transmit something, such as **electricity** or heat. Copper, steel, gold, aluminium, and brass are good conductors of electricity.

Background Information

Unit 2 : Force and Motion

Topic: Force, motion and machines

Interaction among living things

Describing and measuring motion

- Forces cause changes in motion and do not associate with motion itself.
- Forces are our way of describing the way effects such as pushes, pulls or gravity can influence the motion of things.
- A change in motion (speeding up, slowing down, and swerving) is caused by an external effect and not by the object itself or something inside it.
- The position of an object can be described by locating it relative to another object or to the background.
- Tracing and measuring an object's position over time can describe its motion.
- Speed describes how fast an object is moving.
- Speed is the measure of motion. You can find it by dividing the **distance** covered by the **time** it takes to travel that distance.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Machines around us

- **Simple machines** are tools that make work easier. Examples of tasks made easier include lifting a heavy weight, moving a heavy object over a distance, pushing things apart, changing the direction of a force, or holding an object together.
- The **six** simple machines are the lever, inclined plane, wedge, wheel and axle, screw, and pulley.
- The lever is a stiff bar that moves about a fixed point (fulcrum). It is a simple machine that is used to push, pull, or lift things. Examples include a seesaw, crowbar, and shovel.
- The inclined plane is a flat surface that is raised so one end is higher than the other. The inclined plane helps move heavy objects up or down. An example is a ramp.
- The wedge is wide at one end and pointed at the other to help cut or split other objects. Examples include a knife or axe.
- The wheel and axle consists of a rod attached to a wheel. A wheel and axle makes it easier to move or turn things. Examples include bicycle wheels, roller skates, and a door knob.
- The screw is an inclined plane wrapped around a cylinder or cone. A common use of the screw is to hold objects together. Examples include a jar lid and wood screw.
- The pulley is a wheel that has a rope wrapped around it. Pulleys can be used to lift heavy objects by changing the direction or amount of the force. Examples include a flagpole.

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Background Information

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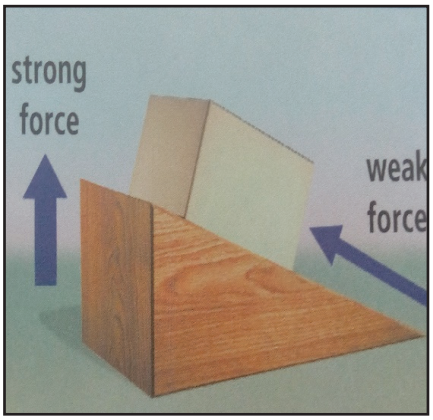
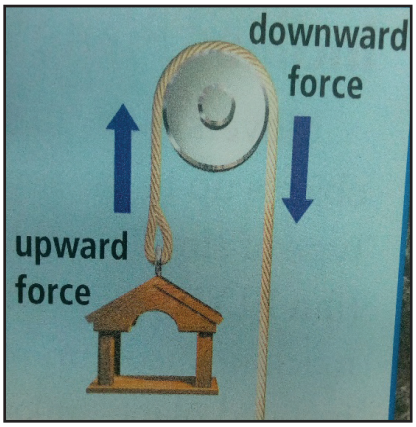
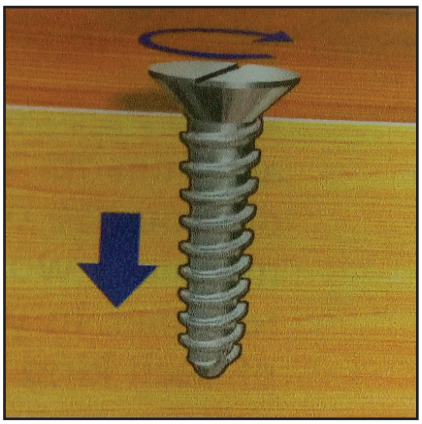


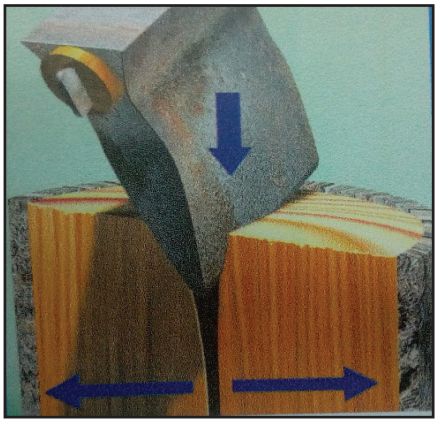
An inclined plane changes both the strength and the direction of the force



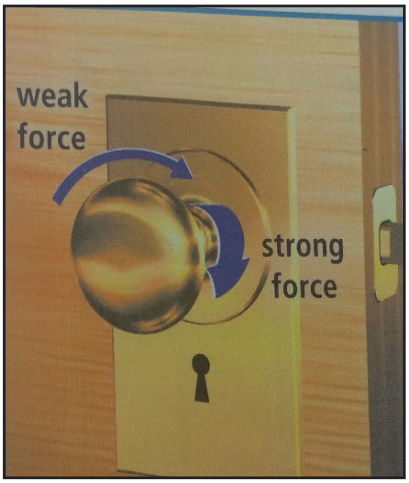
A pulley changes the direction of a force but not its strength



A screw changes a weak circular force to strong downward force or upward force



A wedge changes a downward force to an outward force



A wheel and axle changes the strength of a force but not its direction

Background Information

Unit 3: Matter

Topic: Air

Characteristics of Air

- The three properties of air are that, it has **weight**, can be compressed and takes up space.
- The characteristics of air are as follows;

1. Air is invisible
You cannot see air but you will feel air when it is moving. Wind is moving air.

2. Air is odorless
Pure air has no smell or odor.

3. Living things breathe air
All living things such as humans, animals and plants need air to survive.

Figure 1: Air occupies space inside a balloon

4. Air takes up space
When we drink a can of juice or pop air fills up space in the can. An empty glass is full of air, even when it is upside down.

5. Air has weight or mass
The weight of air is called **air pressure.** The air pressure is the same inside and outside your body. The pressure of air in tires

Topic: Matter Changes

Physical and chemical changes in matter

- There are two basic types of properties that we can associate with matter. These properties are called **Physical properties** and **Chemical properties.**
- Physical properties are properties that we can observe using our senses without changing the matter.
- A chemical property is a property of matter that can only be observed when matter is changed into another new kind of matter. For example, **flammability,** you cannot determine if an object is flammable unless you try to burn it.
- There are many types of physical properties. Commonly used examples include **density, color, odor, hardness** and **volume.**
- **Boiling** and **melting** points are physical properties of matter. Different materials have different melting and boiling points.

Physical Change

- A physical change is a change in the size, shape, or state of matter. A new type of matter is **NOT** being formed. Examples include cutting, tearing, crushing, dissolving, etc.
- Changing states

Description of Changes of States			Term for Changes of States
• Solid • Liquid • Solid • Liquid	→	• Liquid • Solid • Gas • Gas	→ • Melting • Freezing • Sublimating/solidifying • Evaporating/vaporasing

Background Information

Chemical Change

- A chemical change is a change in which a new kind of matter is being made. Energy is always involved.
- Chemical changes occur when a substance combines with another to form a new substance.
- There are several differences between a physical and chemical change. A physical change in a substance does not change what the substance is. In a chemical change where there is chemical reaction, a new substance is formed and energy is given off or absorbed.

Figure 2: This vehicle rusting is an example of chemical change

Changes in states of water

- All matter exist as solid, liquid, or gas. These are called the **states of matter**. Matter can change from one state to another if heat is added (heated) or heat is removed (cooled). If ice (solid) is heated it changes to water (a liquid). This change is called **melting**.
  If water is heated, it changes to steam (a gas). This change is called **boiling**.
- These changes of state always occur with a change of heat. Heat which is energy either comes into the material during the change of phase or heat comes out of the material during this change.

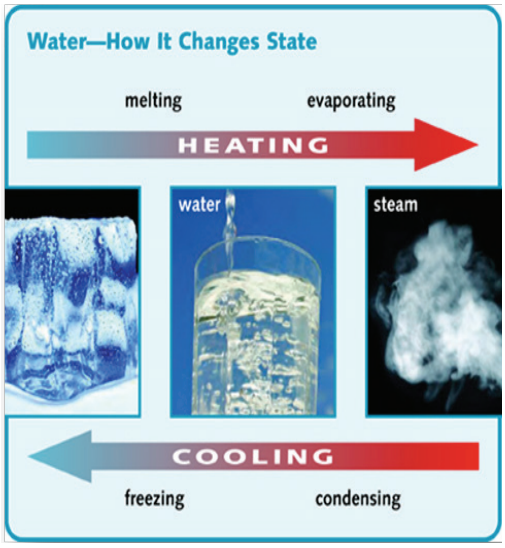


Figure 3: How water changes states

Melting point – if you watch the temperature of ice as it melts, you see that the temperature remains steady at 0o C until all ice has melted. During changes of state (phase changes), the temperature remains constant even though the liquid contains more energy than the ice (because the particles in liquids move faster than the particles in solids). The solid begins to change from a solid state to liquid state – a process called melting. The temperature at which melting occurs is the melting point of the substance. The melting point for ice is **0° Celsius.**

• **Boiling Point of Water** – If you heat a pot of water, the temperature of the water rises and the particles move faster and faster as they absorb the heat. The temperature rises until the water reaches the next change of sate – boiling. As the particles move faster and faster, they begin to break the attractive forces between each other and move freely as steam – a gas. The process by which a substance moves from the liquid state to the gaseous state is called *boiling.* The temperature at which a liquid begins to boil is called the boiling point. The temperature of the **boiling water will remain constant at 100°C** until the water has been changed to steam.

• **Freezing Point of a Substance** – If you cool a gaseous substance, you can watch the phase changes that occur. The phases are:

- **Condensatio**n – going from gas to a liquid
- **Freezing** – going from a liquid to a solid.

Background Information

Strand 3 : Earth and Space

Unit 1: Our earth

Topic: Importance of Soil for Human

Uses of Soil

- Soil is important because many plants grow in soil and it provides support and nutrients for plants.
- Soils provide habitat for animals that live in the soil (such as ground frogs and mice) to organisms (such as bacteria and fungi), that account for the most of the living things on Earth.
- Soils absorb, hold, release and change and purify most of the water in terrestrial systems.
- Soil provides minerals and water to plants. Soil is used to make plants grow and healthy.

Soil Pollution

- Soil pollution as part of land degradation is caused by the presence of human-made chemicals or other alteration in the natural soil environment. It typically caused by industrial activity, agricultural chemicals, or improper disposal of waste.
- When humans introduce harmful objects, chemicals or substances, directly or indirectly into the soil in a way that causes harm to other living things or destroys soil.
- Soil pollution occurs when the presence of toxic chemicals, pollutants or contaminants in the soil is in high concentrations to be of risk to plants, wildlife, humans and of course, the soil itself.
- The ever-increasing use of chemicals such as pesticides, herbicides, insecticides and fertilizers is one of the main factors causing soil pollution by affecting the microorganisms present in the soil, causing the soil to lose its fertility and resulting in the loss of minerals present in the soil.
- Some of the main soil pollution effects are as follows;

1. Effect on health of humans.
2. Effect on growth of plants.
3. Decreased soil fertility.

Soil Protection

- Soil conservation is the preventing of soil loss from erosion or reduced fertility caused by over usage and other chemical soil contamination.
- Dig drainage channels to guide rainwater runoff.
  If you live on a hillside or in a valley where water might collect, create channels around the edges of your property to redirect runoff water. Reducing runoff keeps surges of water from carrying off soil or killing plants due to overwatering.

- Till and contour your garden.
  Protect the soil in your garden by tilling it and shaping it to catch rainwater. Tilling turns the soil to allow nutrients to spread through it evenly, while contouring (planting flowers and crops in long, linear depressions with mounds between each row) will ensure that water soaks into your crops instead of washing over the top and taking topsoil with it.

- Build a terrace

Terracing involves constructing a series of short steps-like platforms on which to grow plants and is a useful alternative to planting on sloped ground. Rather than simply running down the slope, water will soak into the flat soil of each platform, hydrating plants and keep soil from being swept away.

Background Information

Unit 2 : Weather and climate

Topic: Observing weather

Weather description and changes

- Changes in weather are characterized by daily differences in wind, temperature and precipitation.
- Weather is the day to day conditions of the atmosphere (or air) in a particular place
- There are many different types of weather conditions, from rain to sun to cloudy and windy.

Different types of weather conditions

- Weather is mainly affected by the Sun and the rotation of the earth. The rotation of the Earth on its axis causes different parts of Earth face the sun at different time. This makes morning and evening cooler than mid-day.
- The other factors include wind, clouds and rain and nearness to the sea (land breeze and sea breeze).
- **Winds, clouds and rain;**
  Hot winds make the weather hot while cold winds make the weather hot while cold winds make the weather cool.

On cloudy days, the days are mostly cool while the nights become warm.
In rainy season, the weather remains cool during the days and nights.

- **Nearness to the sea;**

During the day, the land near the sea heats up faster.
Land and sea are different temperatures during the day, due to which a cool breeze blows from the sea toward the land. This is called sea breeze.
At night, the land cools faster than the sea. The cool air from the land moves towards the sea, and is known as land breeze.

Rain:
When clouds pass through cooler air, the water drops become bigger and heavier and fall down as rain.

Fog:
On cold morning, water vapor condenses on the dust particles forming a kind of cloud just near the ground. This is called a **fog**.

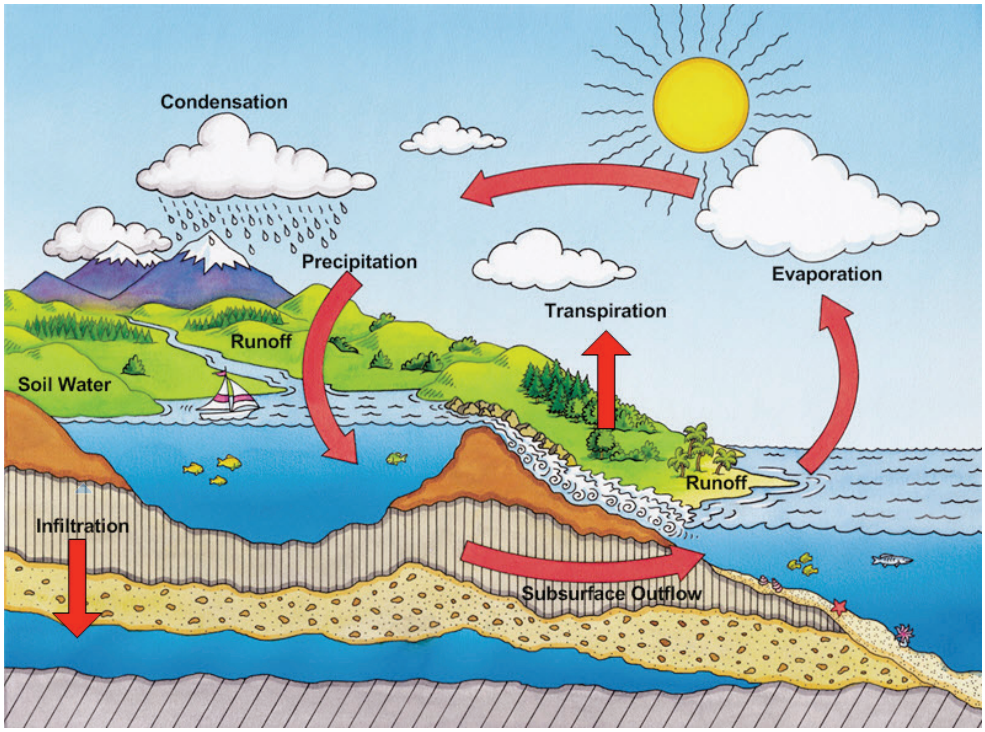
Effects on weather
Hot humid weather makes us sweat, clothes dry slowly on rainy days, hail or frost damage crops and plants.

Background Information

Water in Natural World

- The **water cycle** is the movement of water from the ground to the air and back to the ground by evaporation, condensation, and precipitation. The energy that drives this cycle comes from the sun.
- During the water cycle, liquid water is heated and changed to a gas **(evaporation).** The gas is cooled and changed back to a liquid **(condensation).** A liquid or a solid falls to the ground as **precipitation.**
- Heat from the Sun causes water on Earth (in oceans) to evaporate (turn from liquid into gas) and rise into the sky. This water vapor collects in the sky in the form of clouds. As water vapor in the clouds cools down and it becomes water again, this process is called condensation. Water falls from the sky in the form of rain, snow, hail, this process is called precipitation.

Water Cycle



Importance of water

- Water is the most important resources and everyone including children to be aware of the important role water plays in our lives.
- Everything that is living on earth needs water to survive. If water ceased to exist, animals, plants, people and everything else would eventually perish.
- The human body is made up of about 75% water. Water helps our blood flow into the blood vessels and supplies vital nutrients to our bodies.

Using water wisely- Conserving water

- Our water supply on Earth is limited. Pollution reduces the amount of usable water; therefore, the supply should be conserved carefully.
- Water conservation is an important practice at every age, and it is important for children to understand why conserving water helps the environment. For example, less than 2 percent of Earth's water is fresh water with less than 1 percent of water being available to drink. Since a person cannot go for more than one week without water, it is critical to conserve water at home.

Background Information

Unit 3 : Space

Topic: Observing the Moon

Weather Description and changes

Properties of the Moon

- A natural satellite
- One of more than 96 moons in our solar system
- The only moon of the planet earth

Movement of the Moon

- The moon orbits the Earth every 271/3 days.
- The moon rises in the east and sets in the west.
- The moon rises and sets 50 minutes later each day.
- The Moon turns on its axis every 27 days.
- Same side of the Moon always faces Earth.

Phases of the Moon

- The cycle of phases of the moon occurs as the moon makes one revolution around the Earth. The shapes we see follow a pattern.
- The phases of the moon are caused by its position relative to the Earth and the sun. The phases of the moon include;
  - *new moon,*
  - *waxing crescent,*
  - *first quarter,*
  - *waxing gibbous,*
  - *full moon,*
  - *waning gibbous,*
  - *last quarter, and*
  - *waning crescent*

A. Guided lesson - Sample 1

Lesson **No.87**

Strand 1: Life

Unit 1: Plants

Lesson title: Life cycle of plants

Content standard: 4.1.1 Identify and explain the different stages in the life cycle of plants.

Objective: By the end of the lesson students can be able to identify and describe the life cycle of plants.

Key concepts:
- Plants go through changes as they grow.
- Plants grow and reproduce.
- Most plants grow from seeds or cuttings.

Knowledge, Skills, Attitudes and Values (KSAV)

Skills	Attitudes	Values
• Flowering plants go through a life cycle from seeds, to new plant, to flowers, to new fruit and then to seed again. • The life cycle of each flowering plant varies from each other.	• Identifying different flowering plants around their community. • Describe and give descriptions of the process involved in the life cycle of each plant. • Draw or sketch the life cycle of a common flowering plant.	• Appreciate that plants go through a changes as they grow. • Develop an attitude of love and respect for plants.

Materials: Science syllabus/Teachers guide pictures of plants, pot plants, colures pens/pencils, crayons

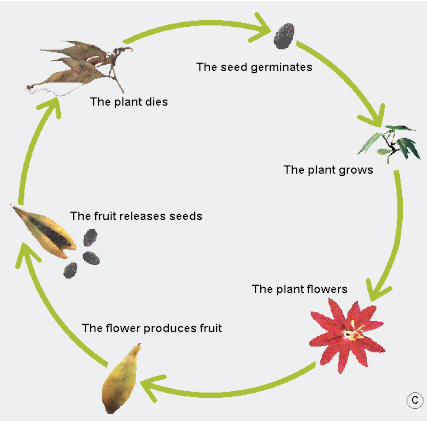
⚠ • Do not touch or play with dangerous plants.

Teachers Notes:

1. This lesson requires you to prepare pictures of plants or real plants for the students to understand the plant cycle. Ensure that the real plants are not dangerous and students do not spoil or play with the pot plants. Guide students to inquiry learning approach in science.
2. It is advisable to have your students work in groups as they will be discussing and deciding on their responses to the guided questions.
3. Ask students to bring seeds or cuttings to be planted during the lesson.

Teaching and Learning Activities

1. Using the notes given draw a life cycle of a common flowering plant found in the local area.
2. Get the students to suitable places in the school to plant their seeds or cuttings.



Life cycle of a flowering plant

A. Guided lesson - Sample 1

Summary

- Most plants start growing from seeds or cuttings.
- Flowering plants go through a life cycle from seeds, to new plant, to flowers, to new fruit and then to seed again.

Blackboard Plan

Title: Life Cycle of Plants

Key Question: How do plants make new plants?

Activity: Draw a life cycle of a common plant

Discussion

1. Why does the sun move across the sky during the day?
2. What would happen if the earth and the sun were spinning? Provide suggestions.

Summary

- Most plants start growing from seeds or cuttings.
- Flowering plants go through a life cycle from seeds, to new plant, to flowers, to new fruit and then to seed again.

A. Guided lesson – Sample

Introduction:

- Recap with the students by brainstorming on what they know of plant growth and development.
- Introduce the topic of the lessons and the materials needed for the lesson.

Body:

Teacher activities

- Display pictures of plants and pot plants. Caution students not to touch or play with the pot plants.
- Guide and supervisor students during the course of the activity.
- Emphasize on safety rules.
- For home work, students are tasked to plant a seed or cutting at home, observe and record the plant's development stages.

Student activities

- Participate and follow instructions to complete given activities.
- Ensure that safety rules are followed.
- Choose a common plant in groups.
- Identify, discuss and draw in groups the different stages of growth in the plant for young to matured plant to reproducing and the different changes they go through in the process of development.
- Work cooperatively, appreciate and have respect for others.
- Present their findings and compare their findings with others to find the similarities and differences among different plants.

Conclusion:

- Teacher do corrections where necessary.
- Teacher summarize the lesson by asking questions to students or what the students have learnt in the lesson.
- Teacher display students work.

Evaluation:

Have I provided a good set of guided questions? Were my instructions clear? Have the students identified the different stages in the life cycle?

A. Guided lesson – Sample 2

Lesson **No.11**

Strand 2: Physical Science

Unit 3 : Matter

Lesson title: What happens if there is no air?

Content standard: 4.2.4 Investigate and explain the properties of air and the change in volume and pressure when compressed.

Objective: By the end of the lesson students can be able to find the presence of air and describe the importance of air around us.

Key concepts:

- Air is necessary for all living things.
- Air is a mixture of other gases.

Knowledge, Skills, Attitudes and Values (KSAV)

Skills	Attitudes	Values
• Air is all around us and can be felt or seen from things moving.	• Identifying the different ways in which the presence of air can be found.	• Appreciate the importance of air. • Develop attitude of caring for the air.

Materials: plastic bag, pictures,

- Do not put your head into the plastics bags.

Teachers Notes:

This lesson is about air. Students will be given the opportunity to find out the presence of air. We cannot see air around us because it is invisible. From the time we are born we are surrounded by air. Although we cannot see it, we can feel it. We feel it when it moves. When air moves it is called wind.

We can also feel air when we move into it. The air pushes against things when they move in it. For example, quickly swing your hand through the air. Can you feel the air pushing against your hand? You can also feel the air pushing against you when you run or when you ride on a car or PMV.

Although we cannot see air itself, we can see the effects it has on things. The waves on the water and the movement of the leaves on trees remind us that air is all around us.

Teaching and Learning Activities

Activity 1

1. Open the plastic bag
2. Catch air with the plastic bag.
3. Toss, hit, push and move the plastic bag.
4. Describe what you have observe.

Activity 2

1. Pour a good amount of water into a dish.
2. Place the plastic bottle under the water. Ensure that the cap is tight before placing it.
3. Open the bottle cap and observe.

A. Guided lesson – Sample 2

Summary

- Most plants start growing from seeds or cuttings.
- Flowering plants go through a life cycle from seeds, to new plant, to flowers, to new fruit and then to seed again.

Blackboard Plan

Title: Air Around us

Key Question: How can you prove that air is around us?

Activity 1: Finding the presence of air using a shopping plastic.

Activity 2 : Finding the presence of air in

Discussion

1. Why is air important to us?
2. Imagine if there was no air around. How will you live?

Summary

- Air is colourless. We cannot see air but we can feel it.
- Examples of the presence of air around us include, the movement of leaves on trees, the waves on the water and the bubbles in the water.

A. Guided lesson – Sample

Introduction:

- Recap with students by asking the students to breathe in and out air.
- Introduce the topic of the lessons and the materials needed for the lesson.

Body:

Teacher activities

- Go through the safety rules with the students because they will be handling plastics to collect air and this will be an outdoor activity.
- Asks students to discuss how they can collect air to fill the plastic bag.
- Asks students to stop and carefully hold onto the collected air in the plastic and sit in their groups.
- Guide and supervisor students during the course of the activity.
- Emphasize safety rules.

Student activities

- Participate and follow instructions to complete given activities.
- Ensure that safety rules are followed.
- Hold the plastics squeezed together and discuss in groups if air is found in the plastic.
- Carry out the short experiment to collect air by blowing into the plastic or opening the plastic towards the wind direction to collect air.
- Discuss and brainstorm the question on what if there is no air.
- Work cooperatively, appreciate and have respect for others.
- Present their findings and teacher complement students for their effort into their activity and collect their plastic bags.

Conclusion:

- Teacher do corrections where necessary.
- Teacher summarize the lesson by asking questions to students or what the students have learnt in the lesson.
- Teacher display students work.

Evaluation:

Have the children enjoyed the lesson? Were my instructions clear? Have the students identified the different ways to find the presence of air?

A. Guided lesson – Sample 3

Lesson **No.93**

Strand 2 : Physical Science

Unit 1: Energy

Lesson title: Let's make a simple circuit

Content standard: 4.2.2 Investigate the flow of electric currents using simple circuits.

Objective: By the end of the lesson the students can be able to:
- describe the components of an electric circuit
- construct a simple circuit.

Key concepts:
- Circuit is a path way in which electricity can flow through easily.

Skills, Attitudes and Values (SAV)

Skills	Attitudes	Values
• Simple circuit consists of energy source (battery) and other circuit components (wire, lamp (bulb), and switch).	• Observe and identify the different components of a circuit. • Construct a simple circuit using the materials provided.	• Develop an attitude to conserve and use electricity wisely. • Value individual effort and team work by respecting thie friends opinions.

Materials/references:
connecting wires, bulbs, batteries, switches, sand paper, bulb holders, torch, flash cards

- Do not play with batteries and wires.
- Do not connect wires to the wrong terminals.

Teachers Notes:

This lesson requires you to prepare the materials listed above prior the lesson. The students will be making a simple circuit to light up the lamp/bulb using wires, switch and batteries. If you are using a new copper wire ensure to use the sandpaper to rub the ends of the wire to remove the coat on the copper wire. Students should be following instructions and making sure to handle the materials carefully.

(Draw or paste the picture of the complete circuit to guide the teacher)

A. Guided lesson

Introduction:

- Teacher ask students to explain how a torch work works.
- Students in pairs discuss and explain how a torch works. 'It works because there is battery in the torch, when the switch is on the torch lights up and when the switch is off the torch does not light up.'
- Teacher commend students of their effort in explaining how a torch works.
- Teacher introduces the topic if the lesson, 'Let's make a simple circuit by lighting up the lamp/bulb.

Body:

Teacher activities

- Explains the activity of the lesson, introduces materials for the lesson and emphasize safety rules.
- Pose the problem; 'How can we light up the lamp/bulb?' Let's make a simple circuit.
- Writes down their hypotheses and ask them to confirm by carrying out the experiment.
- Distributes materials to all the groups to make a simple circuit.
- Emphasize on safety rules.
- Guide and supervisor students during the course of the activity.
- Teacher correct and commends students of their effort.

Student activities

- Participate and follow instructions to complete given activities.
- Ensure that safety rules are followed.
- Discuss in groups and identify ways to make a simple circuit.
- Students in groups set up their simple circuits and to confirm their hypotheses.
- Work cooperatively, appreciate and have respect for others.
- Record their findings and write their conclusions, then report or present their findings.

Conclusion

- Teacher summarize the lesson by asking questions to students or what the students have learnt in the lesson.
- Students and teacher display circuits and tidy up.

Evaluation:

Have the students grasped the idea of circuits? Have the identified the different things that make up a circuit? Were there enough materials for the activity?

A. Guided lesson – Sample 4

Lesson **No.9**

Strand 3 : Earth and space

Unit 2: Weather and climate

Lesson title: Weather and climate

Content standard: 4.3.2 Investigate and explain the factors that affect weather changes and the basic concept of water cycle.

Objective: By the end of the lesson the students can be able to identify and describe the effects of weather on human activities.

Key concepts:

- Weather affect human activities.

Knowledge Skills, Attitudes and Values (KSAV)

Skills	Attitudes	Values
• Bad weather causes floods and landslips or erosion. • Bad weather causes natural disasters. • Bad weather cause bush fire.	• Observe and identify the effects of bad weather on people. • Demonstrate evacuation drills.	• Respect their classmate's opinions.

Materials: pictures, short videos of natural disasters, flash cards,

- Do not play during bad weather.

Teachers Notes:

This lesson requires you to prepare necessary materials prior the lesson. The students should identify the effects of the weather on human activities using their own experiences or by reading, seeing or hearing from other sources. You can use other teaching and learning strategies suitable to your context to deliver this lesson. For example, using short educational videos or clips to show natural disasters that affect human activities.

(Paste one or two pictures on the effects of weather on human activities)

A. Guided lesson

Introduction:

- Teacher ask students to recall using their experiences or what they have learnt about the weather.
- Students' response by giving answers such as weather is about rain, sun, hot or cold, clouds or sky.
- Teacher introduce the topic to students and define human activities.

Body:

Teacher activities

- Teacher ask students to list the effects of weather on human activities
- Teacher guide students as they discuss and draw their flow charts
- Guide and supervisor students during the course of the activity
- Teacher correct students activity and commend them

Student activities

- Participate and follow instructions to complete given activities
- Students discuss in groups by drawing a flow chart to identify the effects of weather on human activities
- Work cooperatively, appreciate and have respect for others
- Students present their completed activity

Conclusion:

- Teacher summarize the lesson by asking questions to students or what the students have learnt in the lesson
- Students and teacher display flow charts

Evaluation:

_____

_____

_____

_____

Guided lesson

Lesson **No.1**

Strand 1: Life

Unit 4: Interaction and relationship in the environment

Lesson title: Animals depend on plants for food and shelter

Content standard: 4.1.4 Investigate the interdependence of living things within specific habitats.

Objective: By end of the lesson students can be able to explain the importance of plants to animals.

Key concepts:
- Living things depend on the environment for survival.
- Plants are the main source of food for living things.

Knowledge, Skills, Attitudes & Values (KSAV)

Knowledge	Skills	Attitudes
• Animals depend on plants for food, shelter and oxygen. • Animals that eat plants are called herbivores.	• Explain how living things depend on each other in the environment in terms of food and shelter.	• Appreciate the plants and how they are useful to animals. • Value the importance of plants for living things.

Materials: Chart, picture of plants

Teachers Notes:

All living things need food for energy. Plants make their own food but animals cannot. Animals get their energy from food they eat. This is the most obvious reason, herbivores and omnivores rely on many different plants for their leaves, berries, roots etc for food.

Herbivores are animals that eat green plants. Examples of herbivores are rabbits, deer, and giraffes. Omnivores are animals that eat both plants and animals. Examples of omnivores include pigs, dogs and humans.

Some animals, such as birds depend on the trees for their shelter. Plants provide shelter from predators and harsh factors of the environment like the hot sun, or the rain.

All animals, herbivore, carnivore or omnivore would die without oxygen. Oxygen is produced by plant as a result of it absorbing carbon dioxide in the process of photosynthesis.

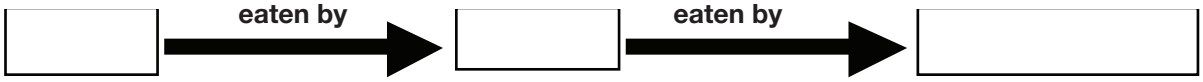
A. Guided lesson

Teaching and Learning Activities

Activity 1: Complete the sentences below

1. Animals need energy. They depend on plants for _____.
2. In the process of photosynthesis , the plants take in carbon dioxide and give off _____
3. Animals that eat plants only are called _____

Activity 2: Simple food chain
Draw a simple food chain. Indicate which is the plant, omnivore and herbivore.



_____ _____ _____

Summary

- All living things need food for energy. Animals get their energy from the food they eat.
- Herbivores are animals that eat green plants. Examples of herbivores are rabbits, deer, and giraffes. Omnivores are animals that eat both plants and animals. Examples of omnivores include pigs, dogs and humans.
- Plants provide shelter and oxygen for all animals.

A. Guided lesson

Lesson **No.2**

Strand 1: life

Unit 4: Interaction and Relationship in the Environment

Lesson title: Animals depend on animals for food

Content standard: 4.1.4 Investigate the interdependence of living things within specific habitats.

Objective: By the end of the lesson students can be able to:
- describe and understand that animals depend on other animals for food
- draw a simple food chain.

Key concepts:
- Living things depend on the environment for survival.
- Plants are the main source of food for living things.

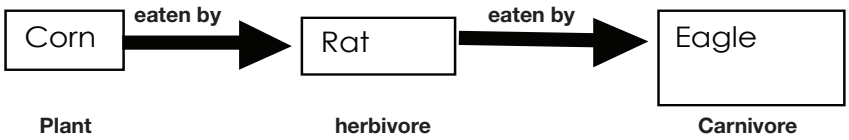
Knowledge	Skills	Attitudes
• Animals in a habitat depend on other animals for food. • Different types of animals interact by eating on consuming the other species.	• Indicate the flow of energy by drawing a simple food chain.	• Admire and appreciate the natural animal habitat.

Materials: Chart, picture of animals, sample of food chain

Teachers Notes:

Living things, mostly animals depend on plants for food. Plants make their own food using the energy from the sun. These plants are eaten by animals for food. This animals are called *herbivores.* These plant eating animals are then eaten by another animal for food. Animals that eat animals for food are called *carnivores*. For examples. a rat is eaten by another animal, an eagle.

Teaching and Learning Activities



a) Which animal depend on the grass for food?

b) Which animal depend on the other animal for food?

c) What will happen if all the plants and grass in the habitat is disturbed or destroyed?

d) What can we do to maintain this plants and animals interaction?

Summary

- Animals depend on plants for food. Other animals depend on other animals for food.
- Animals that are eaten by other animals are called carnivores.
- Examples of carnivores are tigers, eagle, shark.

A. Guided lesson

Lesson **No. 5**

Strand 3 : Earth and Space

Unit 2: Weather and Climate

Lesson title: Weather Instruments

Content standard: 4.3.2 Investigate and describe the factors that affect weather changes and the processes involved in the water cycle.

Objective: By the end of the lesson the students can be able to know the different instruments that are used to measure weather conditions.

Key concepts:

- Scientist use weather instruments to observe, record and measure weather.
- A weather station is a place where several weather instruments are grouped together.

Knowledge	Skills	Attitudes
• A weather instrument is used to observe, record and measure weather. • Name examples of weather instruments.	• Identify the different weather instruments and state the weather condition they measure.	• Show curiosity lo learn about the different weather instruments used to measure weather.

Materials: chart with pictures of different weather instruments

Teachers Notes:

A *thermometer* measures the air temperature. Most thermometers are closed glass tubes containing liquids such as alcohol or mercury. When air around the tube heats the liquid, the liquid expands and moves up the tube. A scale then shows what the actual temperature.

A *barometer* measures air pressure. It tells you whether or not the pressure is rising or falling. A rising barometer means sunny and dry conditions, while a falling barometer means stormy and wet conditions. An Italian scientist named Torricelli built the first barometer in 1643.

A *rain gauge* measures the amount of rain that has fallen over a specific time period.

A *wind vane* is an instrument that determines the direction from which the wind is blowing.

An *anemometer* measures wind speed. The cups catch the wind, turning a dial attached to the instrument. The dial shows the wind speed.

Weather maps indicate atmospheric conditions above a large portion of the Earth's surface. Meteorologists use weather maps to forecast the weather.

A *hygrometer* measures the water vapour content of air or the humidity.
A *weather balloon* measures weather conditions higher up in the atmosphere.

A *compass* is a navigational instrument for finding directions.

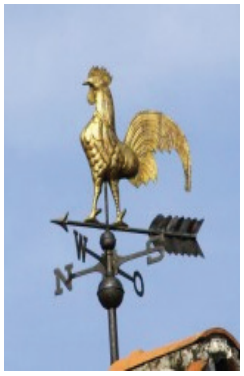
Weather satellites are used to photograph and track large-scale air movements. Then meteorologists compile and analyse the data with the help of computers.

Your eyes are one of the best ways to help detect the weather. Always keep an eye at the sky and you'll usually be on top of weather conditions.

A. Guided lesson

Thermometer


Rain Gauge


Wind Vane


Anemometer

Teaching and Learning Activities:

Activity 1: Refer to Worksheet on Measuring Weather"

Summary

- A thermometer is an instrument used for measuring temperature.
- A barometer is an instrument that is used to measure air pressure.
- An anemometer is an instrument used to measure the speed of wind.
- A hygrometer is used to measure the amount of water vapour in the air.

A. Guided lesson

Lesson **No.12**

Strand 2: Physical Science

Unit 3: Matter

Lesson title: Properties of Air - Air takes up space (i)

Content standard: **4.2.4** Investigate and explain the properties of air and the change in volume and pressure when compressed.

Objective: By the end of lesson the students can be able to demonstrate through experiments that air takes up space.

Key concepts:

- Air occupies space.

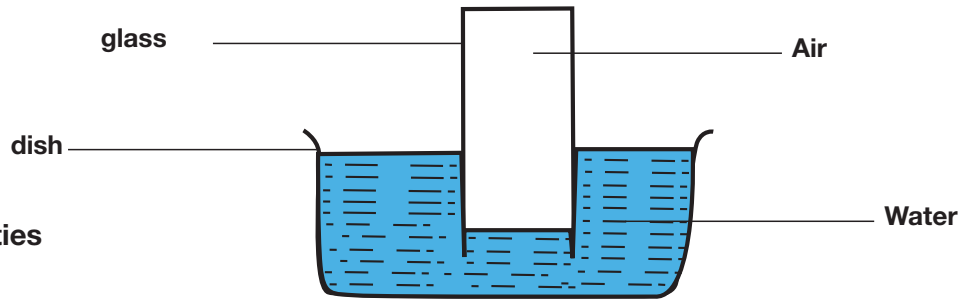
Knowledge, Skills, Attitudes &Values (KSAV)

Knowledge	Skills	Attitudes
• Air is a colourless gas that occupies space. • Air and water cannot occupy the same space at the same time.	• Demonstrate through experiments that air occupies space.	• Appreciate that all living things need air to stay alive.

Materials: Water filled clear container, clear glass, and water

Teachers Notes:

Despite the fact that air is invisible, it has weight and occupies space. A cup with no water in it looks empty to us. But it is not really empty. It contains air. We can prove this by turning it upside down and holding it under the water in a large dish. The water does not move in and completely fill the jar. It cannot because the space inside is occupied by air.



Teaching and Learning Activities

Activity 1: Experiment

1. Fill the clear container with water.
2. Turn the clear glass upside down.
3. Put the clear glass upside down into the clear water container that has water.
4. Watch carefully. What happens.
5. Now remove the cup and dry it with a dry cloth.
6. Put the piece of paper in the glass and repeat steps 2-4.

Discussion Questions

1. Did the paper get wet?
2. Why or why not?

Summary

- Air takes up the space in the glass.
- Air and water cannot occupy the same space at the same time.

A. Guided lesson

Lesson **No. 13**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Properties of air - Air takes up space (ii)

Content standard: **4.2.4** Investigate and explain the properties of air and the change in volume and pressure when compressed.

Objective: By the end of the lesson the students can be able to explain that air can take the place of water.

Key concepts:

- Two different states of matter cannot occupy the same space

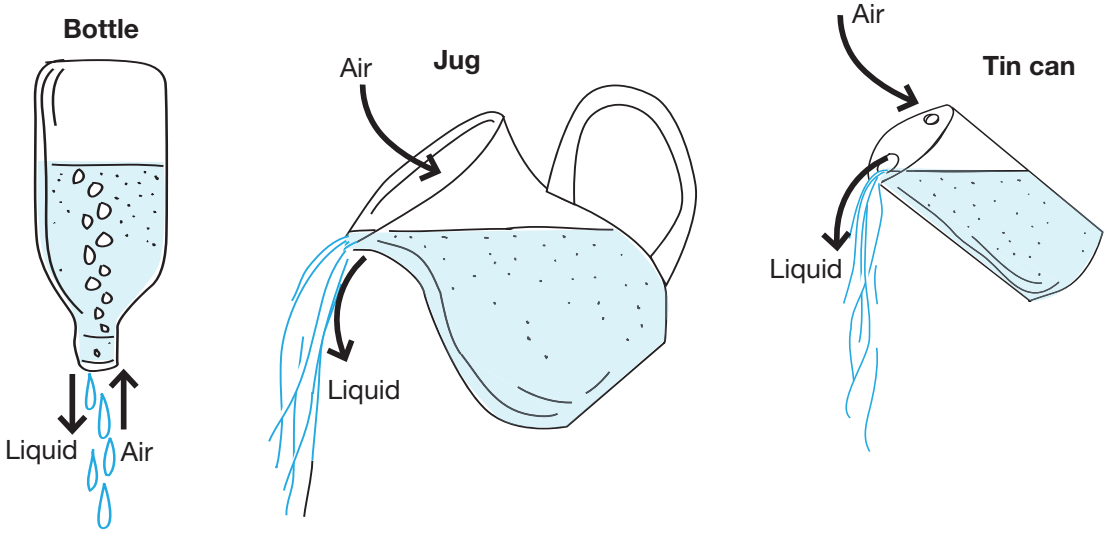
Knowledge, Skills, Attitudes &Values (KSAV)

Knowledge	Skills	Attitudes
• Air is a colourless gas that occupies space. • Air and water cannot occupy the same space at the same time.	• Demonstrate through experiments that air occupies space.	• Appreciate that all living things need air to stay alive.

Materials: Hanger, a beam balance

Teacher's Notes:

Air can take the place of liquids. If you fill a bottle with water and turn it upside down quickly you will see that, as the water comes out of the mouth of the bottle, large bubbles of air, rush in to take the place of water. This happens with all liquids. Whenever a liquid is poured out of a container air moves in to take its place. A container with a wide mouth or one with two openings is easier to pour liquid s from because the air can get in more easily.



A. Guided lesson

Teaching and Learning Activities

Activity 1: Air takes the place of water

1: Fill water into a pet bottle and close the lid.
2: Turn the pet bottle upside down.
3: Open the bottle lid and observe closely as the water comes out of the bottle.
4: Use another pet bottle and make a hole at the base of the bottle. Repeat steps 1-3.
5: Record your observation.

Discussion Question

What is the main difference between the rate of water coming out of the first bottle and the second bottle?

Summary

- Air and water cannot occupy the same space at the same time.
- When the lid of the pet bottle was opened, bubbles started forming in the bottle.

A. Guided lesson

Lesson **No.14**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Air takes the place of water

Content standard: **4.2.4** Investigate and explain the properties of air and the change in volume and pressure when compressed.

Objective: By the end of the lesson the student can be able to understand and explain that air has mass.

Key concepts:
- Air is a colorless gas and has mass

Knowledge, Skills, Attitudes & Values (KSAV)

Knowledge	Skills	Attitudes
• Air is a colourless gas that has mass and occupies space.	• Demonstrate through experiments that air has mass.	• Appreciate that all living things need air to stay alve.

Materials: Hanger, a beam balance, balloons

Teacher's Notes:

Air can take the place of liquids. If you fill a bottle with water and turn it upside down quickly you will see that, as the water comes out of the mouth of the bottle, large bubbles of air, rush in to take the place of water. This happens with all liquids. Whenever a liquid is poured out of a container air moves in to take its place. A container with a wide mouth or one with two openings is easier to pour liquid s from because the air can get in more easily.

Teaching and Learning Activities

Activity 1: Air takes the place of water

Step 1: Fill water into a pet bottle and close the lid.
Step 2: Turn the pet bottle upside down.
Step 3: Open the bottle lid and observe closely as the water comes out of the bottle.
Step 4: Use another pet bottle and make a hole at the base of the bottle. Repeat steps 1-3.
Step 5: Record your findings.

Discussion Question
What is the main difference between the rate of water coming out of the first bottle and the second bottle?

Summary

- The blown balloon is heavier than the balloon which was not blown. This indicates that air occupies space and has mass.

A. Guided lesson

Lesson **No. 17**

Strand 1: Life

Unit 1: Plants

Lesson title: Looking at seeds

Content standard: **4.1.1** Identify and explain the different stages in the life cycle of plants.

Objective: By the end of the lesson the students can be able to:
- know and understand that all seeds contain new plants
- describe and explain what seeds need in order to grow.

Materials: Bean or peanut seeds which have been soaked overnight, bean or peanut seeds for planting , clear glass jars, strips of paper to fit inside the jars, tape measure, corn plants which have been growing for four (4) weeks.

Key concept:
- Seeds are covered by a seed coat that protects the sleeping plant.
- Seeds contain stored food which helps the new plant to grow.

Knowledge, Skills, Attitudes & Values (KSAV)

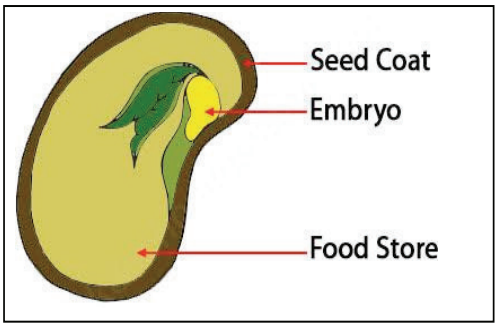
Knowledge	Skills	Attitudes
• Every seed contains a sleeping plant. • Seeds have a coat that protects the plant. • Name the parts of a seed	• Identify and state the parts of a seed.	• Appreciate and care for plants.

Materials: seeds (soaked and dry), knives

- take extra care when using sharp objects (knives, razor).
- Wash hands after touching soil.
- Handle glass jar with care.

Teacher's Notes:

This is the first lesson of the strand Life in this grade. Having in mind that children already know that seeds grow into plants, this lesson will mostly be based on seeds. Teachers must stress more that every seed contains a "sleeping plant". Other than just verbally mentioning it, children should be given the opportunity to find the sleeping plant in the soaked seeds.



Seeds are of different shapes and sizes. Each seed is covered by a seed coat. Inside the seed coat we find the parts which will grow into a new plant, *e.g.* the young shoot and young root. The seeds also contains stored food which helps the new plant to grow.

For the Activity, a good number of seeds for each group should be soaked overnight before the lesson. This will the seed to open up very easily.

A. Guided lesson

Teaching and Learning Activities

Key Question: What does a seed contain?

Activity 1

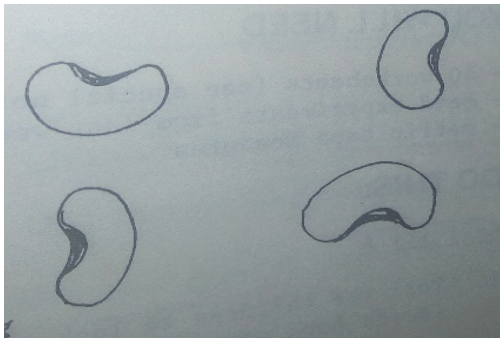
1. Give each group 1 soaked seed, 4 dry seeds, strip of paper and a glass jar.
2. Carefully open the soaked seed with their fingers nails (or razor blades, knives) by cutting through the seed coat and removing it.
3. Carefully cut around the edge of the seed and open up into the class (Demonstrate this to the class)
4. Remind the children that the seed contains a "sleeping plant" and tell each group to find it inside the soaked seed.

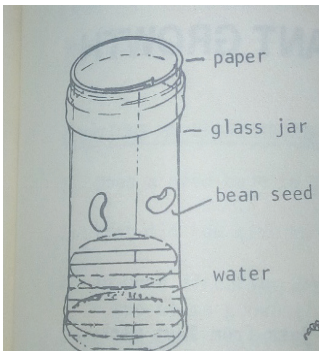
Activity 2

1. Tell the children to:

- Put the paper around the inside of the glass jar.
- Put 4 dry seeds between the paper and the wall in 4 different positions.
- Put water in the bottom of the jar (about 1/3 full).

4 ways to plant the seeds





2. Show the children by doing the experiment yourself ***without adding water .***
3. Ask the children if the plants will grow upside down or not.
4. Tell the children they will find out the answer when the seeds germinate.
5. Collect jars containing seeds and keep in a dark place until next week.

Summary

- Seeds come in different sizes .Each seed contains a sleeping plant.
- The seed has a seed coat, embryo (sleeping plant) and the food store.

A. Guided lesson

Lesson **No. 25**

Strand 1 : life

Unit 2 : Animals

Lesson title : Life cycle of a butterfly

Content standard: **4.1.2.** Identify and explain the different stages in the life cycle of animals.

Objective: By the end of the lesson the students can be able to explain that there are four stages of the butterfly cycle.

Key concepts:

- A butterfly goes through four stages of growth from egg to adult hood, the process is known as Metamorphosis.

Knowledge	Skills	Attitudes
• Butterfly goes through a process called Metamorphosis.	• Identify the four stages in the life cycle of the butterfly.	• Develop a positive attitude to preserve and care for butterflies. • Value the process of its stages.

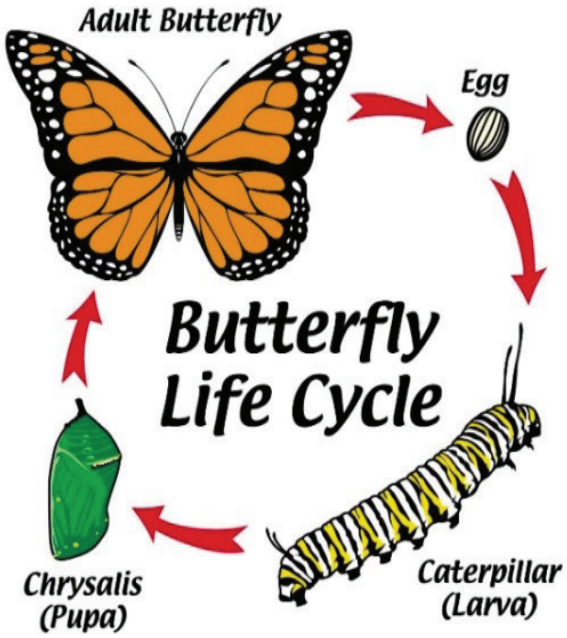
Materials: Chart, A4 papers, Scissors and glue

- Handle scissors with care.
- Be careful not to spill glue.

Teacher's Notes :

A butterfly goes through four stages of growth from egg to adult hood, the process is known as Metamorphosis. Which are:

1. **Egg:** The female butterfly lays an egg on leaf. The egg grows into a larva or caterpillar.
2. **Caterpillar:** As the caterpillar grows bigger it sheds its skin.
3. **Pupa or cocoon**: The Chrysalis cannot move and stays in one place. Inside, the caterpillar changes into a butterfly.
4. **Butterfly:** When the butterfly is ready to appear the chrysalis shell cracks and the head and thorax come out. It pushes its legs out and pulls the rest of its body free.



A. Guided lesson

Teaching and Learning Activities:

Activity: Life cycle of a butterfly

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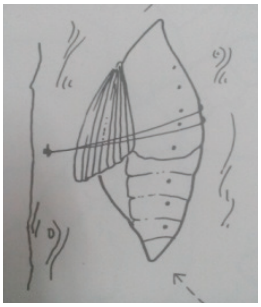
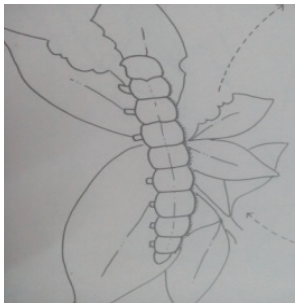
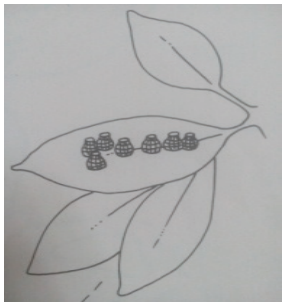
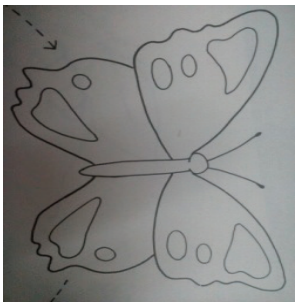





Summary

- A butterfly is an insect.
- A butterfly goes through four stages of growth from egg to adulthood, the process is known as metamorphosis.

A. Guided lesson

Lesson **No. 26**

Strand 1 : Life

Unit 2 : Animals

Lesson title : Life cycle of a frog

Content standard: **4.1.2** Identify and explain the different stages in the life cycle of animals

Objective: By the end of the lesson the students can be able to discover that frogs gather in groups to find mates

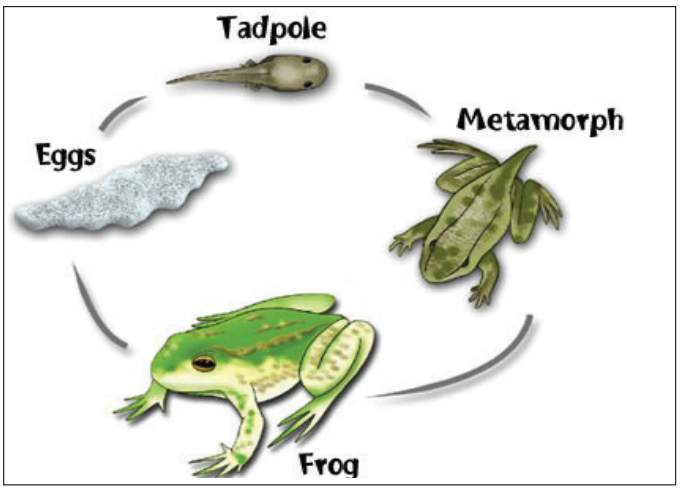
Key concepts:
- A frog is an animal that lives on the land and in the water.
- Female frogs lay eggs in the water.

Knowledge	Skills	Attitudes
• A frog's cycle starts at egg, to tadpole to metamorph and then adult frog. • Male frogs make sound to attract female frogs.	• Draw the life cycle of frogs. • Explain why frogs live in both land and water.	Show curiosity to learn about life cycle of frogs

Materials: A4 papers, glue, chart

Teacher's Notes

How do frogs reproduce?
Frogs and toads gather in groups to find mates. They always gather near some kind of water. Frogs like to mate in rainy weather.
Male frogs croak. They make these sounds to attract females. Female frogs and toads lay eggs.. Other frogs lay eggs in wet places on land.
Some frogs guard their eggs. The female marsupial frog carries her eggs in a pouch on her back. In one Australian frog species, the female swallows the eggs and the young develop in her stomach. Most frogs and toads don't care for their young. The young can grow up on their own.



A. Guided lesson

Teaching and learning Activity
Activity: Life Cycle of a frog

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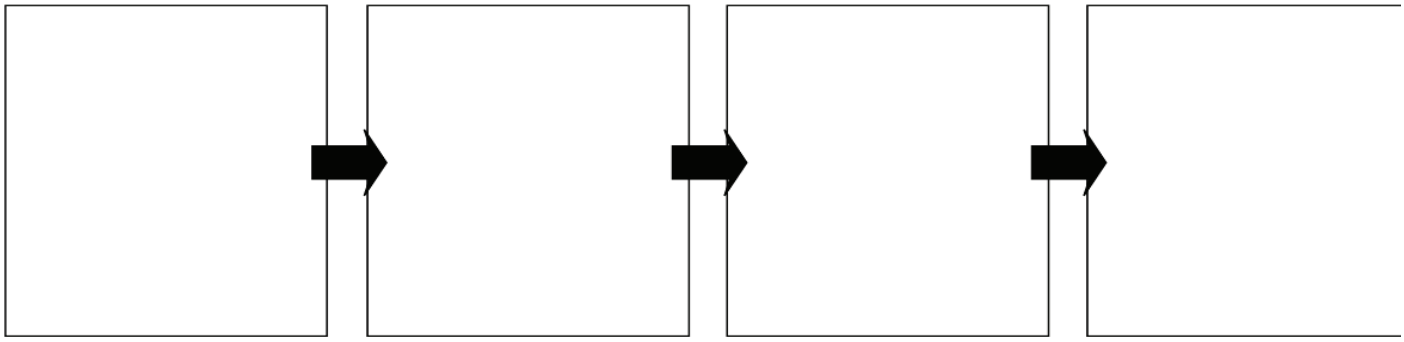
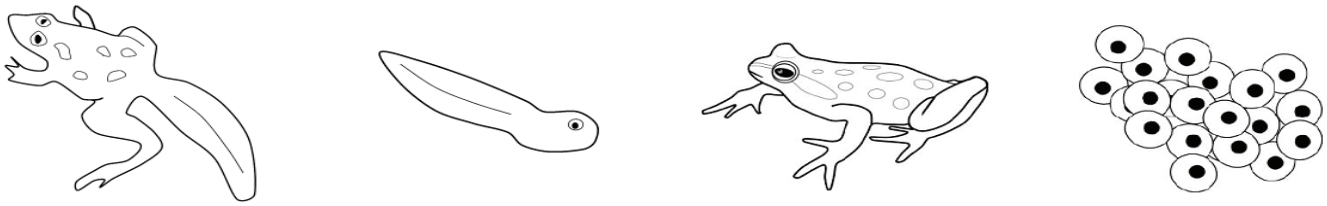




Summary

- A frog is an amphibian.
- Frogs lay eggs in the water. The eggs change into a tadpole which has a tail. The tadpole grows and changes into a small frog.

A. Guided lesson

Lesson **No. 32**

Strand 1 : Life

Unit 2 : Animals

Lesson title : Life cycle of a chicken

Content standard: **4.1.2** Identify and explain the different stages in the life cycle of animals.

Objective: By the end of the lesson the students can be able to describe the life cycle of a chicken.

Key concepts:
- It takes 21 days for the chicks to hatch out from the egg

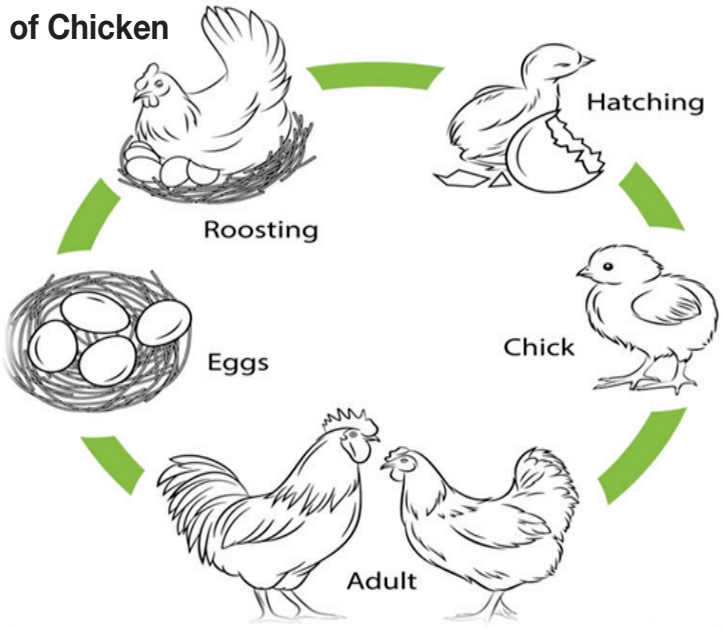
Knowledge	Skills	Attitudes
• The life cycle of chickens starts before hatching.	• Describe and explain the life cycle of a chicken.	• Respect the opinions of class mates.

Materials: Life cycle of chicken chart.

Teacher's Notes:

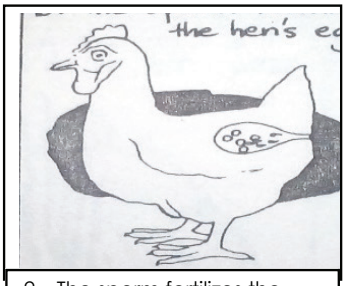
Each chicken started its life by hatching from an egg. Chicks grow and change overtime, becoming chickens and having babies of their own. A chicken's life cycle begin even before it hatches. If hatching naturally, the mother hen will sit on the eggs to maintain the optimum temperature so they can develop until it is almost hatching time. When an egg is laid, a baby chicken starts growing and forming inside. A hen lays an average of 300 eggs per year and takes 21 days to hatch.

Life cycle of Chicken

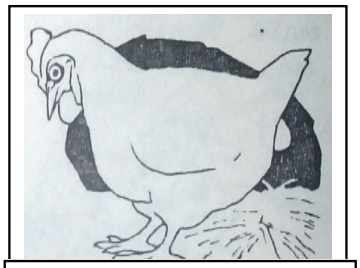


A. Guided lesson

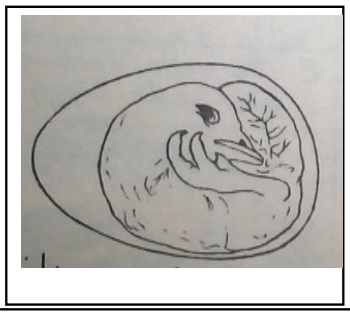
1. The male mates with the female and puts sperm in her



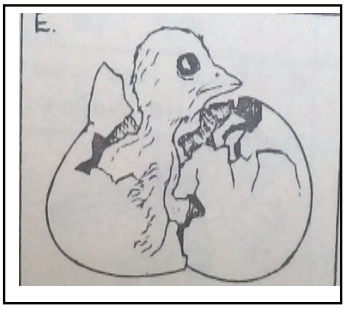
2. The sperm fertilizes the hen's eggs



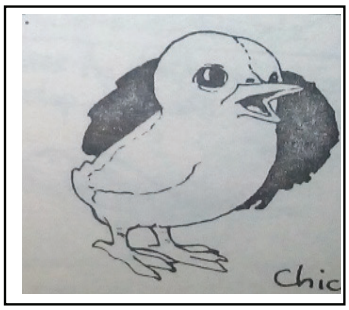
3. The hen lays a fertilized egg



4. A chick grows inside the shell of the egg.



5. After 21 days the chick hatches out.



6. The new born chick

- Draw this diagram on a chart
- Before pasting it for the children to see do the activity first.

Teaching and learning:
Activity:

1. From the pictures above unjumble the diagram sentences (use the letters A-F).
2. Tell the students to write them in their correct order.

SUMMARY

- The male chicken mates with a female chicken and deposits sperm in her body.
- The fertilization takes place inside the body of the female. The sperm swim towards the egg cells and fertilizations then occurs when a sperm joins with an egg cell.

A. Guided lesson

Lesson **No. 29**

Strand 1 : Life

Unit 2: Animals

Lesson title : Life cycle of a dog

Content standard: **4.1.2** Identify and explain the different stages in the life cycle of animals.

Objective: By the end of the lesson the students can be able to identify and describe the four stages in the life cycle of a dog.

Key concepts:

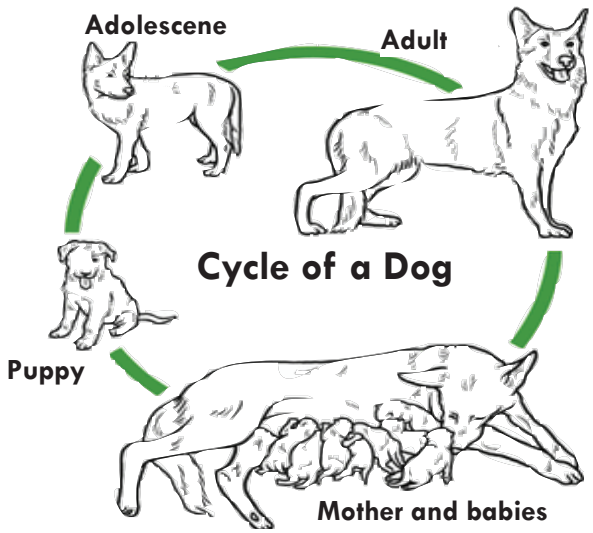
• Dogs go through four stages of their life cycle.

Knowledge	Skills	Attitudes
• Dogs go through four stages in their life cycle. • Dogs are good for human to pet them.	• Discover how the dogs go through their four stages of life.	• Respect the dogs. • Love dogs, as they a good pets.

Materials: picture or poster of the life cycle of dogs

Teacher's Notes :

A dog's lifecycle begins at puppyhood and spans an average of 12 years. Dogs go through four stages of the life cycle; puppy, adolescent, adult and senior. The adult age of a fully matured dog occurs when it is around 2 years old. Its senior years start when it is around 7 years old. During these stages, the dog has become fully matured, independent and responsible.



Summary

- A dog is a mammal and goes through four stages.
- After male and female dog mate, puppies are born. This puppies are similar to their parents. Then the puppies go through the adolescent stage and finally reach the adult stage.

A. Guided lesson

Lesson **No.31**

Strand 1: Life

Unit 1: Plants

Lesson title: Germination of seeds

Content standard: **4.1.1** Identify and explain the different stages in the life cycle of plants.

Objective: By the end of the lesson the students can be able to:

- know and understand that soil is not necessary for seeds to germinate
- know that when a seed germinates the young stem always grows upwards and young root downwards.

Key concepts

- Seed needs water to germinate.
- Seeds contain stored food which helps the new plant to grow.

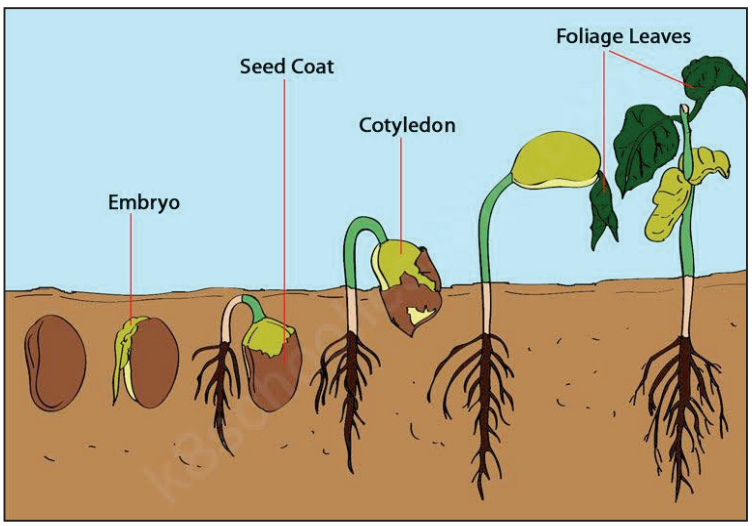
Knowledge	Skills	Attitudes
• Water is needed in order to germinate seeds. • The seed need the right amount of water, sunlight and air in order to grow.	• Identify the factors needed for seed germination.	• Show curiosity to learn about seed germination.

Materials: pictures of the stages of seed germination

⚠ • Be careful when handling glass jars

Teacher's Notes:

Water is necessary for seeds to grow because moisture swells the seed coats, allowing the seedlings to push through them and begin growing. Water also carries nutrients that are required for growth. Seeds need air because the oxygen in air enables a seed to burn its stored food, giving it energy to grow.



A. Guided lesson

Teaching and Learning Activity

1. Does a seed have to be in soil to germinate (grow)? _____ (No)
2. What did you give to the seeds so that they could germinate? _____ (water)
3. In what direction are the
   - Stems growing? _____ (upwards)
   - The roots growing? _____ (downwards)
4. How many centimeters did your plant grow in a week?
5. How far apart now are the marks you made last week?
6. Which part of the stem grow to make a plant taller?

Activity 1

1. Tell the children to look at their glass jars from last week. (seeds have germinated).
2. Ask them to compare their experiments with yours (seeds have not germinated).
3. Tell the children to answer questions 1 to 3.

Activity 2

1. Tell each group to go outside and measure the same plant that they measured last week.
2. Tell the children to answer questions 4,5 and 6 on their worksheet.

Summary

- Seeds do not need soil to germinate. Water and oxygen is needed to germinate seeds.
- The seeds use the food stored in the seed to germinate.

A. Guided lesson

Lesson **No. 33**

Strand 3: Earth and Space

Unit 3: Space

Lesson title: The changing Moon

Content standard: **4.3.3** Observe and describe the properties and the movement of the moon.

Objective: By the end of the lesson the students can be able to understand why the moon changes its shape everyday.

Key concepts:

- Moon does not changes shape

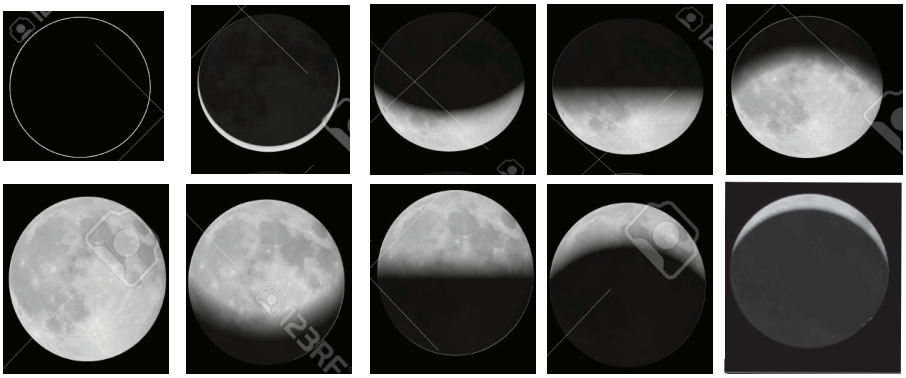
Knowledge	Skills	Attitudes
• The changes in the shape of the moon occurs due to the position of the moon with the earth and sun. • The moon is full once every 28 days.	• Correctly draw the shape of the phases of the moon as seen in Papua New Guinea. • Create a "phase of the moon" calendar.	

Materials: picture of the phases of the moon, paper, 20 toea coin, scissors, pencil, color pencil, butcher paper, glue

Teacher's Notes:

The lesson on the phases of the moon is very interesting due to the fact that is happens after every 29 days. However, over the years there has been some misconception on the way we view the moon and presenting them on diagram form. PNG is located close to the equator, and the way we view the phases of the moon is totally different from the way it is viewed from the Northern or Southern Hemisphere. For example, the new moon viewed from a country in the northern hemisphere would be seen as a "C shape", whereas in PNG the new moon is seen as "u" shaped (see diagrams below).

The moon is full only once every 29 days. The rest of the time the shape of the moon is in the process of waxing(growing) or waning (disappearing) or the moon cannot be seen at all (new moon). The changes in the shape of the moon are due to several factors. Only half of the moon is lighted by the sun at any one time. A 'full moon' occurs when the moon is in one side of the earth and the sun is on the other. However, because the moon is slowly circling the earth, the fully lighted disk shape cannot be seen all the time. As the moon continues its orbit, the lighted part slips away from the view.



A. Guided lesson

Teaching and Learning Activities

Activity 1: Moon Calendar

1. Draw the calendar on the butcher paper.
2. Look for the moon. Draw its shape on a circle. (to keep all the circles the same size, you could trace around a 20 toea coin).
3. Color the circle according to the shape of the moon.
4. Cut out the shape.
5. Find today's date on the calendar. Paste your moon in that square.
6. Do this every night and morning for one month. Watch what happens.

Summary

- The moon changes its shape every night due to the amount of light it gets from the sun.
- The changing shape of the moon that we see every night is called the phases of the moon.
- There are different phases of the moon. The phases repeat after every 29 days.

A. Guided lesson

Lesson **No.36**

Strand 2: Physical Science

Unit 3 : Matter

Lesson title: Properties of physical change

Content standard: **4.2.5** Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to explore the properties of physical change by doing simple experiments.

Key concepts:
In a physical change, the state, shape or size of the object change.

Knowledge	Skills	Attitudes
• In a physical change, the appearance of the object changes. • Physical change is reversible.	• Describe physical changes that occur daily.	• Appreciate properties of physical change in our daily lives.

Materials: scissors, A4 papers, ice cubes and small bowls.

Teacher's Notes

In a physical change, **the state, shape or size** of the object is changed. Pressure, temperature or motion can bring about a physical change.

Change in state

An ice cube, a solid, becomes a liquid when it melts. You can take the liquid and turn it back into a solid by freezing it. This change is reversible. It is a different state, but it is still water. This is called physical change. The state has changed, but it is still the same thing –water. Another example is, when candle wax is heated, the solid wax melts and becomes a liquid. If you cool the molten wax, it becomes a solid again.

Change in shape

Take a sheet of paper and crush it in your hands. Notice how the shape of the changed from the sheet into a small ball in your hands. This physical change resulted from the pressure you applied to it.

Change in size

If you change something physically, it may look different, but it is still the same thing. The molecules have not changed. For example if you tear a paper it looks different, but it is still a piece of paper. The size has changed but it is still paper.

A. Guided lesson

Teaching and Learning Activities

Key Question "What are some common property of physical change?"

Activity 1: Common properties of physical change.

1. Put the ice cube inside a bowl and leave it for 5 minutes and observe carefully.
2. Draw what you observe.
3. Describe what happened.

Activity 2:
What to do:
1. Use the scissor to cut the paper into pieces.
2. Describe what you can observe.

Summary

- In a physical change, no new objects are formed. The appearance of the object only changes.
- In a physical change the process is reversible.

A. Guided lesson

Lesson **No.37**

Strand 1 : Physical Science

Unit 3 : Matter

Lesson title: Properties of chemical change

Content standard: **4.2.5** Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to explore the properties of chemical change by doing simple experiment.

Key concepts:

- In a chemical change, a new product is formed. The product is totally different from the original.

Knowledge	Skills	Attitudes
• A chemical change occurs when a new product is formed. • A chemical change is irreversible.	• Identify chemical changes that happen daily.	• Appreciate reversible and irreversible changes in the environment.

Materials: Charts with examples of reversible and irreversible changes in the environment

- Make sure strike the match away from your body.
- Do not play with the match.

Teacher's Notes :

Every day we experience chemical changes in many things around us. A rotten fruit, fried egg or rusted nail. All these things involved an object going through a process that can never be reversed. A chemical process has caused that kind of change.

A chemical change is not reversible. Changes that cannot be reversed are called non-reversible change. There are usually one or more new substances formed or created from that change. A good example is the change that occurs when you fry an egg. When you fry an egg, notice how the liquid egg-white part becomes solid and changes to pure white colour. The fried egg's properties are different from that of the uncooked egg.

Another example is a dry wood in a fire place. When we light the wood up, it burns gently and after a while, it burns into ashes. As it burns, it produces heat, light and smoke which escapes through the chimney. The heat, light, fire and smoke are all good characteristics of a chemical reaction, which result in a completely new matter- ashes.

Other examples of Chemical changes are;

- Baking cakes
- Rusting nails or metals or aluminum
- Ripening and rotting fruits
- Digesting food in the tummy
- Cooking food- grilling, smoking.

A. Guided lesson

Teaching and learning activities

Key Question "What are some common properties of chemical change"

Activities: Properties of chemical change

What to do:

1. Light the match stick with care. Make sure strike the match away from your body.
2. Observe the match stick lighting.
3. Record your observation by drawing and describing what had happened.

Summary

- In a chemical change a new product is made. The product is something completely different from the original. For example, a raw (uncooked) to a fried or cooked egg.
- A chemical change is irreversible; that means it cannot change back to the original state or material.

A. Guided lesson

Lesson **No.38**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Comparing physical and chemical changes

Content standard: **4.2.5** Investigate physical and chemical changes of matter including the changes in states of water.

Objective: By the end of the lesson the students can be able to explore the properties of chemical change by doing simple experiment.

Key concepts:

- In a physical change, no new products are made, however, in a chemical change a new product is formed.

Knowledge	Skills	Attitudes
• Understand the difference between physical and chemical changes.	• Differentiate between chemical and physical properties. • Make a list of chemical and physical changes in the environment.	• Appreciate properties of physical and chemical properties.

Materials:

Teacher's Notes :

There are several differences between a physical and chemical change. In a physical change, no new kinds of particles are produced even though the particles can move closer together or far apart, or they may mix together with particles of other substances. In a chemical change where there is chemical reaction, a new substance is formed and energy is given off or absorbed.

There are two basic types of properties that we can associate with matter. These properties are called Physical properties and Chemical properties.

Physical properties are properties that we can observe using our senses without changing the matter. A chemical property is a property of matter that can only be observed when matter is changed into another new kind of matter. For example, flammability, you cannot determine if an object is flammable unless you try to burn it.

Teaching and Learning Activities

Key Question "What are some examples of physical and chemical change that occur naturally?"

Activities:

Identify the different physical and chemical change that occur in the environment

Physical Change	Chemical change

Summary

- Physical changes in matter may inly cause matter to look different but does not change it into a new kind of matter.
- In a chemical change , the original matter and the new matter have different properties.

A. Guided lesson

Lesson **No.39**

Strand 2 : Physical Science

Unit 3 : Matter

Lesson title: Reversible and irreversible changes in the environment

Content standard: **4.2.5** Investigate physical and chemical changes in matter including the changes in states of water.

Objective: By the end of the lesson the students can be able to identify and classify reversible and irreversible changes in the environment.

Key concepts:

- In a physical change, no new products are made, however, in a chemical change a new product is formed.

Knowledge	Skills	Attitudes
• Reversible changes in the environment is a change that can be reversed. • Irreversible changes in the environment is a permanent change that cannot be reversed.	• Classify changes in the environment into reversible and irreversible.	• Appreciate reversible and irreversible changes in the environment.

Materials: Charts with examples of reversible and irreversible changes in the environment

Teacher's Notes :

Changes in the environment are divided into two;

- Natural changes *e.g.* rotting, germination, growth, seasons
- People made changes.

A reversible change is a change that can be undone or reversed. Another name for reversible change is physical change. We call them physical changes because a reversible change might change how a substance looks or feels (changing the physical appearance), and it is easy to turn it back again. It does not produce a new substance. Some examples of reversible (physical) changes include;

- Smashing a tin
- Dissolving sugar into water
- Freezing/solidification
- Changing states of water.

An irreversible change is a permanent change that cannot be undone. Another name for irreversible changes is chemical changes. We call them chemical changes because an irreversible change starts with one material and end up with one or more new ones. In an irreversible change, new materials are always formed. The new material is completely different from the original material. Sometimes these new materials are useful to us.

There are changes that happen on their own and we have no control over them. Some examples of irreversible (chemical) changes include;

- Burning wood to ashes
- Rusting
- weathering
- rotting
- respiration
- decomposition
- Blooming of flower
- ripening of fruits.

A. Guided lesson

Teaching and Learning

Key Question "What are some examples of reversible and irreversible changes in the environment?"

Activities: Reversible and irreversible changes

1. Make a table like this one shown below.

Changes in the environment	
Reversible (physical) changes	Reversible (physical) changes

2. Identify the changes in the environment and classify them into reversible and irreversible changes in the table.
3. Share your ideas with your classmates.

Summary

- A reversible change is a change that can be undone or reversed. Another name for reversible change is physical change.
- Examples of reversible changes are:
  - Smashing a tin
  - Dissolving sugar into water
  - Freezing/solidification
  - Changing states of water

- An irreversible change is a permanent change that cannot be undone. Another name for irreversible changes is chemical changes.
- Examples of irreversible changes are:
  - Burning wood to ashes
  - Rusting
  - weathering
  - rotting
  - ripening of fruits

A. Guided lesson

Lesson **No. 41**

Strand 2: Physical Science

Unit 3: Matter

Lesson title: Bubbles in boiling water

Content standard: **4.2.5** Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to perform an experiment and observe boiling water.

Key concepts:

- Bubbles appear as a result of continuous heating of water.

Knowledge	Skills	Attitudes
• Water boils at a certain temperature.	• Observe the changes that occur before, during and after the boiling of water.	• Accept the results.

Materials: Beaker (300 mL), 100 mL of water, burner, metal mash, tripod stand, match, dry cloth

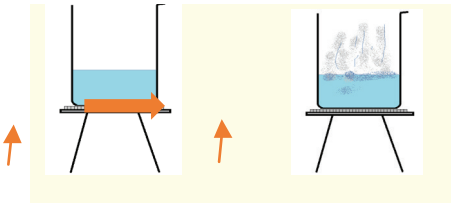
Teacher's Notes:

Most of us are used to seeing water being boiled in our homes. Water can be boiled to make tea, cook food and to kill germs before we use it.

When water boils, bubbles and steam can be seen. But what are bubbles? Bubbles that form in the boiling water is actually water vapour. Water changes from liquid to water vapour (gas), therefore bubbles are formed.

Teaching and learning activities

1. Predict what happens when the water boils.
2. Share and discuss your ideas with the class.
3. Fill the beaker with some water.
4. Heat the water.
5. Observe and record what you see happening.
6. Share your observations with your friends.



Discussion

What causes the bubbles to form? What happens to the volume of the water?

Summary

- Bubbles become larger as water is heated up. At the same time, the amount of steam increases. As a result the water level dropped has dropped.

A. Guided lesson

Lesson **No.42**

Strand 2: Physical Science

Unit 3 : Matter

Lesson title: Measuring the temperature of boiling water

Content standard: **4.2.5** Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to observe and record the temperature of boiling water.

Key concepts:

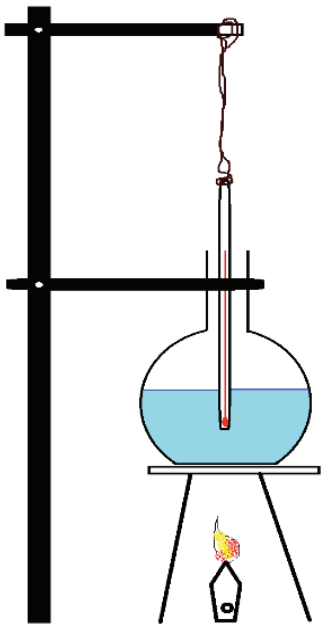
- A thermometer is an instrument used to measure how hot or cold something is.
- Water boils at 100^0 C.

Knowledge	Skills	Attitudes
• The temperature of water will increase as heat is added. • The boiling point of water at sea level is 100° C.	• Record the result of boiling water. • Observe the behavior of bubbles when heat is added.	• Respect other class mates opinions.

Materials: (300mL), 100mL of water, burner, metal mesh, match, dry cloth, flat bottom flask, timer, string, thermometer, boiling stones, tripod and retort stand.

Teacher's Notes:

To find out on the boiling point of water, have the water put into the pot and boil using oven or fire. As water temperature rises, evaporation speeds up because the molecules move more rapidly. If the rise in temperature is great enough, deep molecules beneath the surface will break loose from their neighbours and form bubbles of vapour. These bubbles then rise to the surface and fly away as steam. The temperature that is high enough to cause this activity is called the boiling point. The boiling point of water at sea level is 100° C. So when water inside the pot starts to babble, it shows that your water has reached the 100'c point.



Teaching and Learning Activities

Activities:

1. Predict how the temperature of water changes when it is continuously heated and share your idea with your classmates.
2. Set up the experiment as shown.
3. Fill the flat bottom flask with 100mL water and mark the level. Remember to put in boiling stones.
4. Start heating the water and measure temperature every 2 minutes, observe what is happening and record in a table.
5. After a while turn off the flame, observe what will happen and check the water level.

A. Guided lesson

Result

Record your observations, then discuss and share your ideas with your friends of the findings

Time	Temperature	Describe the condition of water
00 mins		
02 mins		
04 mins		
06 mins		
08 mins		
10 mins		
12 mins		
14 mins		
16 mins		
18 mins		
20 mins		
22 mins		
24 mins		
26 mins		
28 mins		
30 mins		

SUMMARY

- When water temperature increases, the bubbles form in the liquid lively
- The temperature of the water stays at about 100 degrees (°C) while boiling even when heat is constantly added.

A. Guided lesson

Lesson **No. 43**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Graphing and analysing data - Boiling water

Content standard: **4.2.5.** Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson students can be able to draw a line graph using the data collected in the last lesson (lesson 42).

Key concepts:

- A graph can be used to represent data collected.
- A graph has a title and a scale.

Knowledge	Skills	Attitudes
• The temperature of the water increases gradually as heat is constantly added. • A graph has a vertical and horizontal axis.	• represent data collected in a graph form. • identify the horizontal and vertical axis of a graph. • realize that the horizontal line in the graph represents the boiling point of water.	• Appreciate the results.

Materials: Table of results (lesson 42), grid paper, pencil

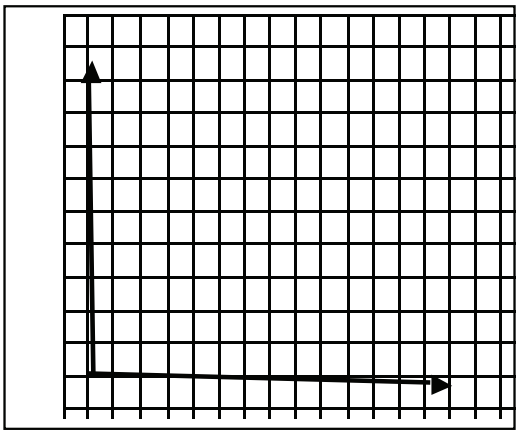
Teacher's Notes:

This lesson will require students to draw a line graph to see the relationship between time and the increase in temperature over time. Ensure that students have the table of result from the previous lesson (lesson 42) at hand before the lesson.

Since this will be a new skill for the students, explain the vertical and horizontal thoroughly before the actual activity. The vertical axis should have the temperature in (°C) and the time (in minutes) should be on the horizontal axis. Remind the students to write the title of the graph.

Teaching and Learning Activities

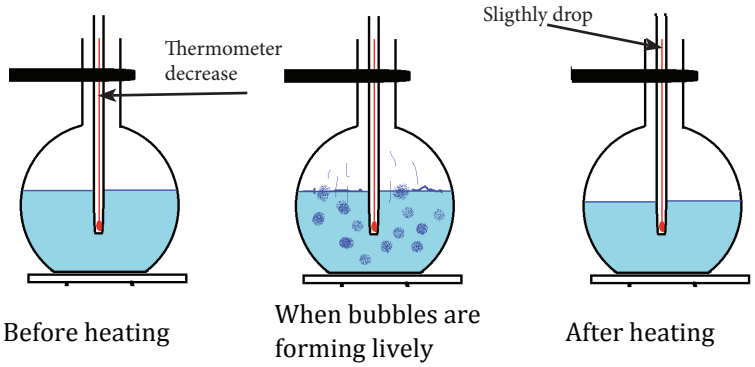
1. Use the grid paper to draw the graph.
2. Write down the title of the graph.
3. Write time on the horizontal axis and temperature on the vertical axis.
4. Use the table of results to plot in the points. Place a dot where the two lines meet horizontally (time) and vertically (temperature) for each data point.
5. Draw a line by connecting all the plotted dots.



A. Guided lesson

Result (sample)

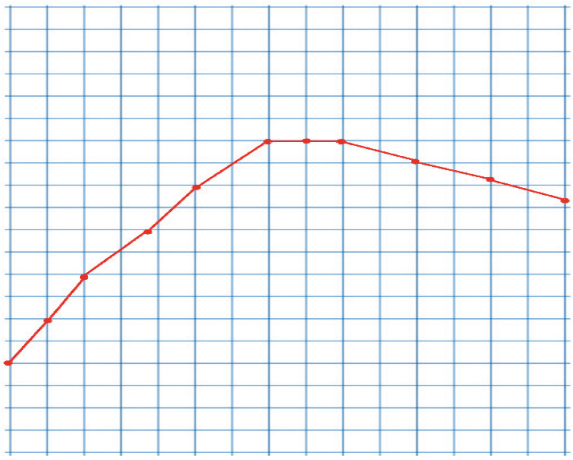
Discuss and share your ideas with your friends.



Before heating

When bubbles are forming lively

After heating



- Is there any change in water temperature while bubbles are forming?
- Is there any change in water volume after heating?

Summary

- The temperature of the water increases as the heat is continuously added.
- The horizontal line in the graph indicates the boiling point of water.

A. Guided lesson

Lesson **No. 44**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Closer look at bubbles

Content standard: **4.2.5** Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to identify and describe the causes of bubbles forming in boiling water.

Key concepts:

- Water vapour is invisible.
- The volume of the water will decrease as a result of water evaporating.
- Evaporation is the process where water changes into water vapour.

Knowledge	Skills	Attitudes
• When heat is continuously added, water changes form into water vapour which forms the bubbles. • The level of water in the boiling beaker will reduce after the boiling.	• Observe and identify the change of water to water vapour. • Observe the behavior of bubbles as heat is added.	• Accept the fact that bubbles are a result of water changing into water vapour.

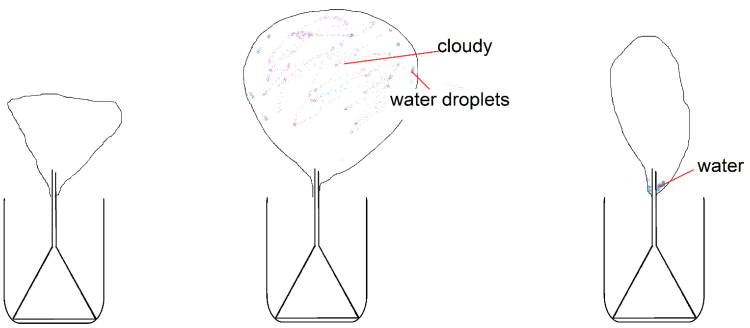
Materials: beaker (300 mL),funnel, rubber bands, plastic bag, boiling stones, Bunsen burner, metal mesh, tripod stand,

- Be careful not to touch heated equipment.
- Do not look directly into boiling beaker.
- Be careful not to burn the plastic bag.

Teacher's Notes :

Water can be able to change its form. For example when liquid water is heated continuously, bubbles and steam are visible during this process and the volume of the water decreases. What makes up these bubbles and the decrease of water level is never really understood.

This experiment is intended to investigate the bubbles in boiling water. The activity will require you to prepare necessary and enough materials for each group. If the materials listed are not available, you are encouraged to improvise. In the cause of the activity, continuously remind students to be cautious of hot objects.



A. Guided lesson

Discussion

- If the bag is inflated by air, should it shrink dramatically when it is cooled?
- If the bag is inflated by air, why water appears inside the bag when it is cooled?
- Why did the water level of the beaker decrease?
- What does this tell us about bubbles?

Summary

- When water boils, it turns into a form that is invisible and creates bubbles. We call these invisible form of water as water vapour.
- A process where water changes into vapour is called evaporation. The reason why water level decreased after boiling water is because water evaporates and moved away as water vapour.
- Water vapour turns back into water when it is cooled. This is why water appear inside the plastic bag.

A. Guided lesson

Lesson **No.48**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Changes in states of water – Ice to water

Content standard: **4.2.5**. Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to explain that water can change from solid ice to liquid form (water).

Key concepts:

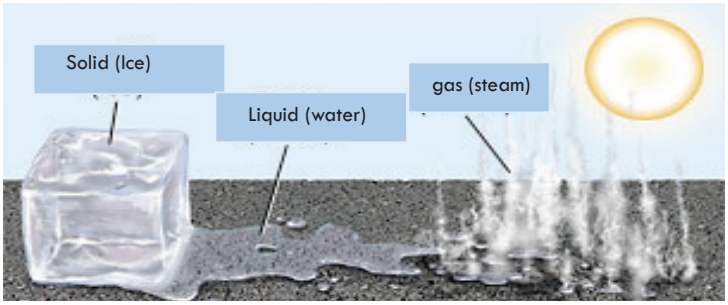
- When heat is added to ice, it starts to melt.
- The process in which ice turns to water is called melting.
- Ice melts at 0° C.

Knowledge	Skills	Attitudes
• Water exist in three interchangeable forms. • When heat is removed from water, it changes into solid form. When heat is added into a solid ice, it melts.	• Observing and record the behavior of water.	• Appreciate the importance of water.

Materials: ice cubes, thermometer

Teacher's Notes (Background information)

It is easy to understand that temperature change states of matter and it can be done by using water. Water is normally a liquid. But water can be a solid or a gas. You can change water's state of matter by changing its temperature or pressure to hot and cold. You can change water to a solid when you make ice block. When the water gets cold enough, the particles slow down enough to freeze into solid ice. This change happens at 32° Fahrenheit (0° Celsius). This temperature is called the **freezing point** of water. Above 32° Fahrenheit (0° Celsius), ice starts to melt and turn back into a liquid. So this temperature is called the **melting point** of ice. The temperature of the ice gets higher causing the ice to melt back to liquid.



Summary

- Water can exist in three different forms, solid (ice), gas (vapour) and liquid.
- When heat is added to a solid water (ice) it melts.

A. Guided lesson

Lesson **No.49**

Strand 2 : Physical Science

Unit 3: Matter

Lesson title: Measuring melting point for water

Content standard: **4.2.5**. Investigate physical and chemical changes in matter including the changes of states of water.

Objective: By the end of the lesson the students can be able to observe and measure the melting point of water.

Key concepts:

- Water changes its state when heat is removed.

Knowledge	Skills	Attitudes
• Water exists in three different forms • Water melts at 0 degrees.	• Describe the existence in three forms. • Measure the melting point of ice.	• Value that water exits in three forms.

Materials: thermometer, ice cubes, jar/ beaker

Teacher's Notes:

If the piece of ice is taken into a warm kitchen, it gradually grows warmer until it reaches a temperature of 32° F (0° C). It remains at that temperature during the time that it changes to its liquid form, a process called melting. Then its temperature rises until it equals that of the kitchen. If the pail of water is taken outdoors again, it cools back to 32° F and remains at that temperature until it has changed back to the solid state, a process called freezing. Then its temperature sinks to the outdoor level. Both melting and freezing occur at the same tempera.

Teaching and Learning

Activities: Identify and observe the melting point of water (ice) (ice block) while it is placed in the sunlight

1. Predict what would happen to the ice was placed outside for a while.
2. Share opinions with classmates.
3. Put some ice into a jar.
4. Record the initial temperature on the thermometer before placing it into the ice.

A. Guided lesson

Time	Temperature reading (°C)	Condition of the ice
0		
2		
4		
6		
8		
10		
12		
14		
16		

Summary

- When heat is added to water, it changes its change.
- Water melts at 0°C.

A. Guided lesson

Lesson **No. 52**

Strand 3: Earth and Space

Unit 2: Weather and Climate

Lesson title: Sources of water

Content standard: **4.3.2** Investigate and describe the factors that affect weather changes and the processes involved in the water cycle.

Objective: By the end of the lesson the students can be able to identify places where water is found.

Key concepts:

- Water is essential in life.
- There are natural source and man-made source of water.

Knowledge	Skills	Attitudes
• Natural sources of water are the sources of water that are naturally made. • Man-made source of water are the sources of water that have been made by man.	• Identify natural and man-made sources of water. • Locate natural and man-made in the environment.	• Accept and appreciate that water is essential for life.

Materials: Chart of natural and man-made sources of water.

Teacher's Notes:

Water is needed for survival. People use water to cook, drink, wash and for agricultural activities. The places from where water comes from is called the source of water. The sources of water can be classified into two groups, **natural** sources and **man-made** source.

Natural Sources of water

Rain, oceans, rivers lakes, streams, ponds and springs are natural sources of water. Salt water can be found in oceans and seas. Rivers, lakes, streams, ponds and springs have fresh water. Fresh water is also found underground.

Man-made sources of water.
Dams, wells, water taps

A. Guided lesson

Teaching and Learning Activities

1. Make a list of water sources around your community

Sources of Water	
Natural Source	Man-made

Summary

- Natural sources of water are the sources of water that are naturally made. Examples of natural source of water are lakes, rivers, ocean, ponds, streams, etc.
- Man-made source of water are the sources of water that have been made by man. Examples of man-made sources of water are the dams, wells, piped water.

A. Guided lesson

Lesson **No. 53**

Strand 3: Earth and Space

Unit 2 : Weather and climate

Lesson title: Where did the water go?

Content standard: **4.3.2.** Investigate and describe the factors that affect weather changes and the processes involved in the water cycle.

Objective: By the end of the lesson the students can be able to:
- observe from the experiment that water level changes
- describe the process of water disappearing.

Key concepts:

- Water changes from one form to another when heated is added or removed.

Knowledge	Skills	Attitudes
• The process of water changing from liquid to gas is called evaporation. • Heat is added for the water to evaporate.	• Demonstrate the change of water to gas in an experiment. • Identify examples of evaporation in daily life.	• Show curiosity to learn about water changing its form. • Appreciate the process of evaporation in daily life.

Materials: 4 beakers, water, rubber band, plastic wrap, 2 plastic trays, sticky tape, marker

- Be careful when handling glass jars.

Teacher's Notes

This lesson is a practical lesson and will require students to have the materials ready before the lesson. Steps 1-3 can be done well before the actual science lesson. This experiment should be conducted on a sunny day. To achieve the expected result, the glass should be left outside for 5- 6 hours.

After it rains the place is often wet and there are always puddles of water everywhere. Some rain water gather in a puddle on the ground and others accumulate into pots and dishes. After some time these water disappear. Why?

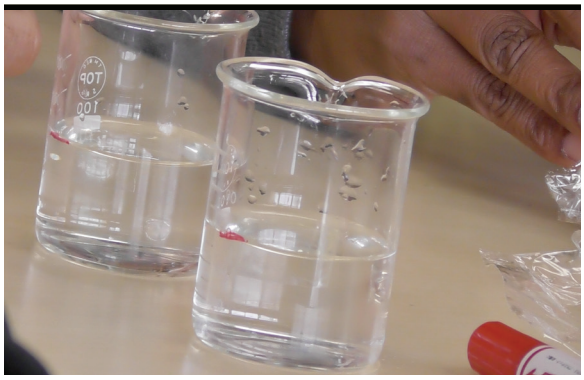
Water changes into water vapour when heat is added to water. The water vapour leaves the surface of water and goes up in the air. We cannot see the water vapour. The process of changing water from liquid state to water vapour (gas state) is called ***evaporation.***

A. Guided lesson

Teaching and learning activities

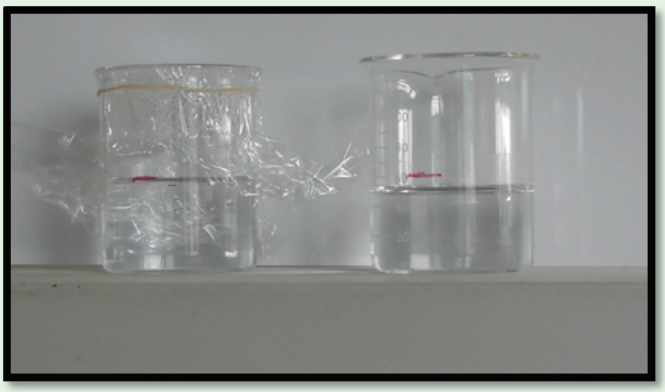
Let's investigate what happens to the water

1. Put same amount of water in all beakers and mark the water levels.
2. Cover two beakers with plastic wrap and close it with rubber band.
3. Place one set (open and closed beakers) in sunlight, the other set in shadow.
4. Predict what would happen to the water in all beakers.
5. Share prediction with friends and explain your reasons.
6. Perform the experiment (wait till next day).



Question

What happened to inside of plastic?
wraps covering beakers?
What happened to the water level?



Summary

- The process of water changing from liquid to gas is called evaporation.
- The water level in the open beaker decreased due to it evaporating.
- The water level in the closed beaker remain the same.

A. Guided lesson

Lesson **No. 54**

Strand 3 : Earth and Space

Unit 2: Weather and climate

Lesson title: Collecting invisible water

Content standard: **4.3.2** Investigate and describe the factors that affect weather changes and the processes involved in the water cycle.

Objective: By the end of the lesson the students can be able to observe from the experiment that water vapour is present everywhere.

Key concepts:

- Water vapour is invisible water.

Knowledge	Skills	Attitudes
• Water vapour is around us invisible. • The process in which gas changes into liquid form is called *condensation.*	• Demonstrate how to trap water vapour.	• Appreciate that water changes its state.

Materials: Water, ice cubes, 2 beakers, containers with lid, dry towel

- Be careful when handling glass or beakers.
- Follow teachers instruction.

Teacher's Notes:

This lesson is a practical lesson. The main idea behind this experiment is to trap the water vapour using the ice. If ice is not available, something cold could be used.

Droplets on the surface of the glass come from water in the air. When this air comes in contact with the cold surface (in this case the jar), the air cools down and water vapour in the air presents it in the form of droplets on the cold surface. Water vapour changes into water by cooling. The process of water changing from gas to liquid is called condensation.

Teaching and Learning Activities

Water vapour around us

1. Predict what would happen to the beaker if ice water is poured inside.
2. Share your predictions and reasons with classmates.
3. Wipe the two glasses with a dry towel
4. Fill the beaker 1 with ice cubes and water and beaker 2 with water only.
5. Observe what happens to outside of the beakers.

Summary

- We are surrounded with invisible water.
- The process in which water changes from gas to liquid is called condensation.

A. Guided lesson

Lesson **No.55**

Strand 3: Earth and Space

Unit 2: Weather and climate

Lesson title: Making clouds

Content standard: **4.3.2** Investigate and describe the factors that affect weather changes and the processes involved in the water cycle.

Objective: By the end of the lesson the students can be able to observe how clouds are formed.

Key concepts:
- Water vapour is invisible water.
- Water vapour changes to water droplets which forms the clouds.

Knowledge	Skills	Attitudes
• Clouds are formed as a result of the process called condensation.	• Demonstrate the formation of clouds in an experiment.	• Appreciate the formation of clouds.

Materials: Beaker, Ice, Match sticks (smoke), water (hot and cold)

- Be careful when handling glass beakers
- Take extra care when using matchsticks and hot water

Teacher's Notes:

When water changes from liquid form to vapour it is invisible and moves up into the air. As it moves up, the temperature gets cooler and vapour changes into water droplets which forms the clouds.

Teaching and learning activities

Let's make Clouds

1. In groups discuss the question "How are Clouds formed"
2. Share opinions and reasons with the class.
3. Prepare a beaker with warm water and ice cold water.
4. Light the match stick and blow it out above the warm water beaker (make sure some smoke goes into the beaker)
5. Put the beaker with ice water (cold water) above the other beaker.
6. Observe and describe the results based on the experiment.

Discussion Activity

1. Why do we see jet plane clouds?

Summary

- Water vapour changes to water droplets which forms the clouds.

A. Guided lesson

Lesson **No.61**

Strand 1 : Life

Unit 1: Plants

Lesson title: Observing plant growth - Flowering

Content standard: **4.1.1** Identify and explain the different stages in the life cycle of plants.

Objective: By the end of the lesson the students can be able to:
- describe and explain the male and female parts of a flower
- explain that some flowers have male and female parts in the same flower while other flowers have in different trees.

Key concepts:
- Flowers consist of petals, the male parts and the female parts.

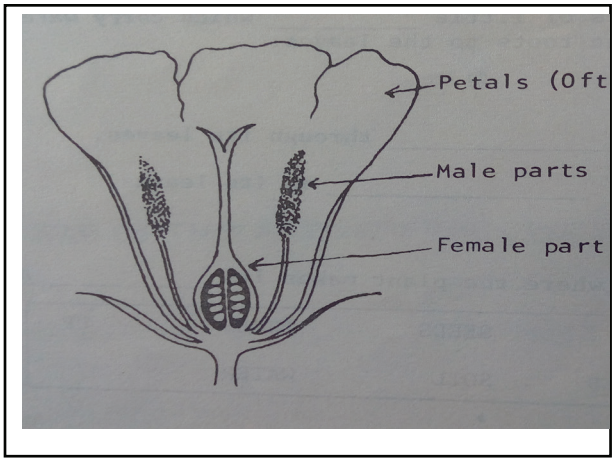
Knowledge	Skills	Attitudes
• The male parts of the flower produce pollen, while the female parts produce eggs.	• Draw and identify the parts of a flower.	• Value the importance of having flowers.

Materials : Flower samples

Teacher's Notes (Background information)

The teacher should collect flowers from the list. It is best if all the children can first look at flowers which have both male and female parts, e.g. sweet potato, bean, tomato, ginger, capsicum, convolvulus, cowpea, lily, cocoa, red pepper. DO NOT USE HIBISCUS. If there is time they could also then look at flowers which male and female parts in separate flowers e.g. Pawpaw, pumpkin, cucumber, water melon, coconut, tapioca.

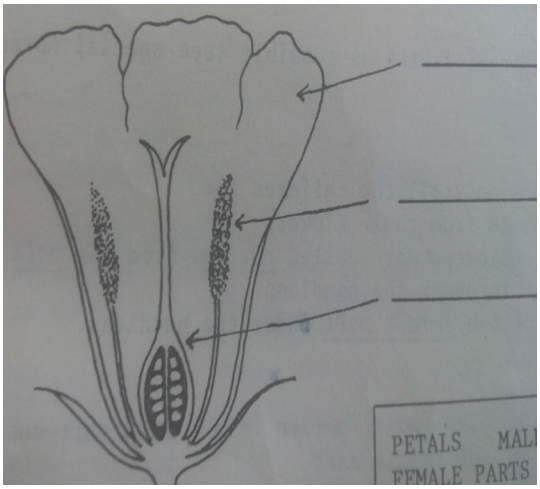
Flowers have different shapes, sizes and colors. Each flower is attached to the stem by a flower stalk. In some plants, the flowers grow one by one while in others they grow together in a bunch.
Most flowers have four parts- petals, sepals, male parts and female parts. The petals are usually large and brightly colored. They attract birds and insects. The sepals are on the outside of the flower. They look small like leaves and protect the flower bud. The male parts make a yellow powder in their tips called pollen. The female parts are in the center of the flower and contain eggs in the swollen base. Flowers are the sexual parts of a plant. They help the plant to reproduce (make new plants) by forming seeds.



A. Guided lesson

TEACHING and LEARNING

Activity: Parts of a flower
Name the parts of this flower. Choose from the words below.



Summary

- Flowers have different shapes, sizes and colors. Each flower is attached to the stem by a flower stalk. In some plants, the flowers grow one by one while in others they grow together in a bunch.
- Most flowers have four parts- petals, sepals, male parts and female parts. The petals are usually large and brightly colored. The sepals are on the outside of the flower. They look small like leaves and protect the flower bud. The male parts make a yellow powder in their tips called pollen. The female parts are in the center of the flower and contain eggs in the swollen base.

A. Guided lesson

Strand 2 : Physical Science

Lesson **No. 62**

Unit 1: Energy

Lesson title: What is sound?

Content standard: **4.2.1** Investigate the properties and characteristics of sound.

Objective: By the end of the lesson the students can be able to understand that sound is a form of energy that is produced through vibration.

Key concepts:
- Sounds are caused by vibrating objects which in turn vibrate the air all the way to our ears.

Knowledge	Skills	Attitudes
• Sound is a form of energy. • Sounds are formed as a result of vibration.	• Create different types of sound using their body parts.	• Accept that sounds are a result of vibration.

Materials: Ruler, rubber band

Teacher's Notes:

The world is filled with many interesting sounds. Every day we hear sounds around us. Quite often many sounds occur at the same time so we don't notice some of them. If you carefully listen, you will be amazed by the many different sounds around you. All sounds are different. Some may be soft, others too loud. Some sounds are high while other are low. Sounds can be sad, happy or peaceful. They can tell us that something dreadful has happened or can warn us of danger.

We make sounds by making things move. This movement is called **vibration**. When something moves up and down or forward and backwards it vibrates. These movements cause the air to move. When something vibrates (e.g. a guitar string) it causes the air around it to vibrate as well. This causes sound waves. Sound travels through the air to our ears. The ear drum moves and causes the small bones inside the ear with it. The vibration in the inner ear is then changed to nerve messages which the brain recognizes as "sounds" that when we hear the sound.

The activities that follow are all practical or aural activities. Teachers are encouraged to make this activities interesting while at the same time stressing the importance of how sounds are made.

Teaching and Learning Activities

Activity 1 (aural activity)

Using a ruler to create sound.

1. Using your left hand, place the ruler on the edge of desk about 5 -10 cm long.
2. Using the other hand, apply some pressure on the end of the ruler.
3. Observe what happens.

A. Guided lesson

Activity 2

Use body parts to create different sounds.

Activity 3

Ask one child at a time to imitate the sounds of these animals: dog, cat, roster, pig, cow and bird.

Summary

- Sound is a form of energy that is produced in many ways.
- Vibration is a quick motion back and forth that forces the air around it to produce sounds
- All instruments even without string make sound by vibrating one of its parts.

A. Guided lesson

Lesson **No. 64**

Strand 2: Physical Science

Unit 1: Energy

Lesson title: How does sound travel?

Content standard: **4.2.1** Investigate the properties and characteristics of sound.

Objective: By the end of the lesson the students can be able to:
- understand how sounds travels from one point to another
- explain what causes the sound to travel.

Key concepts:
- Sound requires a medium to travel

Knowledge	Skills	Attitudes
• Sound travels through different mediums- solid, liquid and gas. • Sound travels faster in water than in air.	• Identify the different mediums in which sound travels through. • Make a comparison between the different mediums in terms of the speed of sound.	• Accept and appreciate the importance of sounds in our lives.

Materials: ruler, kundu, guitar

- Do not listen to high volume music.

Teacher's Notes:
When something moves or vibrates it causes the air around it to move or vibrate also. These movements or vibrations then spread out from the source in all directions. These waves or vibrations cause sounds. Sound travels in straight lines like light. When the sound waves or vibrations strike an object they can bounce off and cause the object to vibrate. The sounds travel through the object or are absorbed or held by the object.

Objects through which sound travels easily are conductors of sound. Some are poor conductors of sound, they absorb or capture the sound waves. Sound can travel through solids, liquids and gases (air).

Sound travels in some substances much faster than it does in others. In water, it goes four times as fast as it does in air. In some metals it travels about sixteen times as fast as in the air.
Our ear is our receiver of sound waves. It catches the sound waves that are moving in the air and passes the sound vibrations on to the brain. The brain then decides what the sound is.

Student Activities
1. Stand near the wall in your classroom.
2. Ask your partner to tap the wall with his/her hand. Can you hear the sound?
3. Try to listen to the sound again with one side of the ear touching the wall.
4. Share your ideas with your friends.

Summary
- Sound travels through different mediums- solid, liquid and gas
- Sound travels faster in water than in air
- Our ear receives the sound waves in the air, solid or liquid and passes it to the brain to decide what sound it is.

A. Guided lesson

Strand 1 : Life

Lesson **No. 69**

Unit 3: Human Body

Lesson title: Bones of the Human Beings

Content standard: **4.1.3** Investigate and identify the relationship between the structure and movement of the human body.

Objective: By the end of the lesson the students can be able to know that bones have special functions in the skeletal system.

Key concepts

- There are 206 bones in an adult human body
- Bones are the strong pieces that form the frames of the person's body.

Knowledge	Skills	Attitudes
• The bones support and protect the human body and the organs. • Bones of the skeletal system vary in size and shape depending on their functions.	• Identify the functions of bones in the skeletal system. • Identify and name the common bones of the skeletal system.	• Show curiosity to learn about bones of the human body.

Materials: Pencils, charts, A4 paper

Teacher's Notes:

In the human body at birth, there are over 270 bones but many of these fuse together during the development, leaving a total of 206 separate bones in the adult. The largest bone in the human bone is the **femur** or the **thigh – bone,** and the smallest is the **stapes** in the middle ear.

These bones of various sizes and shapes are joined together to support and protect the human body and the organs inside. The main bones of the human are the skull, ribs, arms, hands, spine, hip, backbone and the legs. The arm and the leg bones are divided into two parts, the **upper** and **lower** bones. The leg bones are longer and therefore heavier than the arm bones. The backbones or the spine is very important and has a collection of bones. It is made of 33 short thick bones that run from the skull to the hip, forming the main supporting structure of the skeleton.

The joints (wrist, ankle, elbow, knee, hip, shoulder and neck) of the skeleton are where the bones of the body join. The joints allow us to bend, run, walk, sit down and move in many ways because of their design. Our whole head is covered with solid bone called the skull. Inside the skull is the brain which is one of the important organs of the human.

The bones together with the muscles help us humans to move in many different ways.

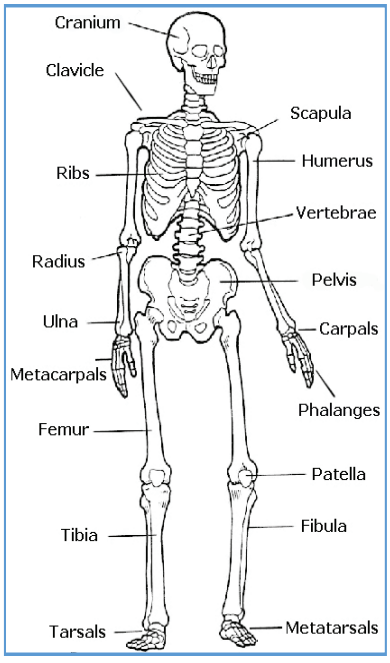
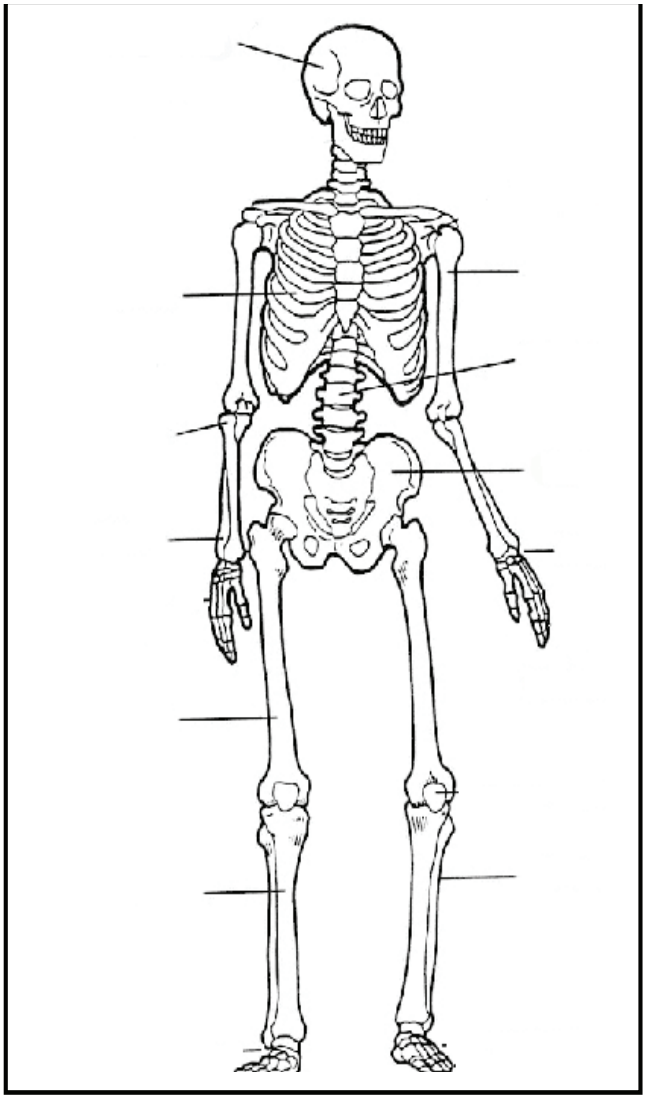


Figure 1: Skeleton

A. Guided lesson

Teaching and learning activities

Activity 1: Draw the Bones of the human body



Summary

- In the human body at birth, there are over 270 bones but many of these fuse together during the development, leaving a total of 206 separate bones in the adult.
- The largest bone in the human bone is the ***femur or the thigh – bone,*** and the smallest is the stapes in the middle ear.
- The main bones of the human are the skull, ribs, arms, hands, spine, hip, backbone and the legs.
- The joints allow us to bend, run, walk, sit down and move in many ways because of their design.
- The bones together with the muscles help us humans to move in many different ways.

A. Guided lesson

Strand 1: Life

Lesson **No. 70**

Unit 3: Human Body

Lesson title: Joints of the Human body

Content standard: **4.1.3** Investigate and identify the relationship between the structure and movement of the human body.

Objective: By the end of the lesson the students can be able to identify and list the different joints found in the body.

Key concepts:

- Joints allow the bones to move or bend freely.

Knowledge	Skills	Attitudes
• Joints is the place of attachment between two or more bones. • Joints hold the skeleton together and support movement.	• Identify the four types of joints and state their functions. • Identify and give examples of things that have the same principles as joints. Eg. Door hinge, opening a laptop or flip phone.	• Show curiosity to learn about joints.

Materials: Joints of the body chart

Teacher's Notes:

Joints hold the skeleton together and support movement. The place of attachment between two or more bones is known as a joint. All the joints of the body are capable of movement except for the joints of the bones of cranium, which houses the brain. There are various kinds of movable joints depending upon the movements they perform. Thus the knee joint is like a hinge, which allows the lower leg to move up or down, but not sideways. Following are different kinds of joints.

1. **Hinge-joint** - This allows the movement of the part of body in one direction. Up or down but not sideways. Examples of this joint are knee-joint, elbow-joint, movement of the lower jaw.

2. **Pivot-joint** - As the name suggests, this kind of joint permits pivotal movement of the parts of body. Movement of the skull is an example. A man can turn his head from one side to the other by rotating the skull, which is joined to the backbone at its top in such a way that a pivotal movements is possible

3. **Ball and socket joint** - When a part is capable of making an all-round movement up and down and sideways- this is possible by a joint of this kind. The leg can be moved in any direction, sideways, up and down.

4. **Gliding joint -** An example of this kind of joint is the movement of the wrist. At the wrist there are a number of small boned which glide one over the other, when we turn our palm upwards or downwards.

Summary

- The place in the body where two bones meet is called a joint.
- Joints allow the bones to move or bend freely.
- The four types of joints are hinge joint, ball and socket, pivot joint and gliding joint.

A. Guided lesson

Strand: 1 Life

Lesson **No. 71**

Unit 3: Human Body

Lesson title: Muscles of the Human body

Content standard: **4.1.3** Investigate and identify the relationship between the structure and movement of the human body.

Objective: By the end of the lesson the student can be able to name and list the function of the muscular system.

Key concepts:

- The muscles help with the movement of bones.
- There are 700 muscles.

Knowledge	Skills	Attitudes
• Muscles are made up of thousands or even ten thousand fibers. • The muscles help with the movement of the human body	• Identify and state the function of familiar muscles.	• Appreciate the function of muscles in the body.

Materials: Muscular system chart

Teacher's Notes:

The muscular system is responsible for the movement of the human body. Attached to the bones of the skeletal system are about 700 named muscles that make up roughly half of a person's body weight. There are three different types of muscles in our body: smooth muscle, cardiac muscle and skeletal muscle.
Smooth muscles - this muscle is sometimes called the voluntary muscle. We cannot control them. Our brains tell the muscles what to do without us even thinking about it.
Cardiac Muscle - the muscle that makes up the heart. It has the similar role as the smooth muscle.
Skeletal muscle - are called voluntary muscles. These muscles help to make up musculoskeletal system (the combination of the muscles and the skeleton or bones.)
Every physical action that a person performs (e.g. walking, writing, speaking) requires the skeletal muscle. The function of the skeletal muscle is to contract to move parts of the body closer to the bone that the muscle is attached to. Most skeletal muscles are attached to two bones across a joint, so the muscles serves to move parts of these bones closer to each other.

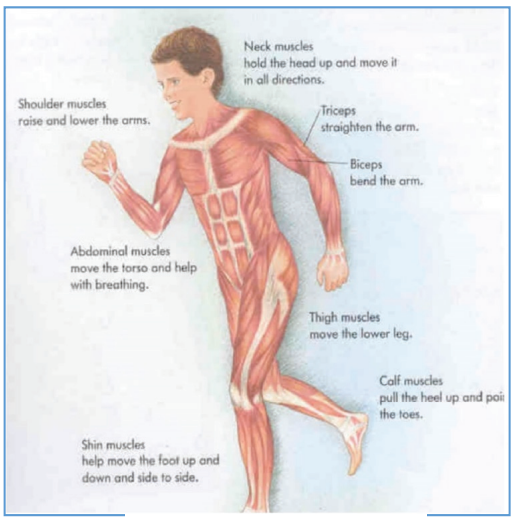


Figure 2: Muscular system

Generation of body heat. As a result of high metabolic rate of contracting muscle, our muscular system produces a great deal of waste heat. Many small muscles contractions within the body produce our natural body heat. When we exert ourselves more than normal, the extra muscle contractions lead to rise in body temperature and eventually sweating.

A. Guided lesson

The function of muscle tissue

The main function of the muscular system is movement. Muscles are the only tissue in the body that has the ability to contract and therefore move the other parts of the body.

Related to the function of movement is the muscular system's second function: the maintenance of the posture and body position. Muscles often contract to hold the body still or in a particular position rather than cause movement. The muscles responsible for the body's posture have the greatest endurance of all muscles in the body- they hold the body up the body throughout the day without being tired

Generation of body heat. As a result of high metabolic rate of contracting muscle, our muscular system produces a great deal of waste heat. Many small muscles contractions within the body produce our natural body heat. When we exert ourselves more than normal, the extra muscle contractions lead to rise in body temperature and eventually sweating.

Summary

- The main function of the muscles in the body is movement.
- The main types of muscles are, smooth muscle, cardiac muscle and skeletal muscles.
- Skeletal muscles come in many different sizes and shapes to allow them to do many types of jobs. Some of the biggest and most powerful muscles are in your back.

A. Guided lesson

Lesson **No. 72**

Strand 1: Life

Unit 3: Human Body

Lesson title: Mechanism of the arm and hands

Content standard: **4.1.3** Investigate and identify the relationship between the structure and movement of the human body.

Objective: By the end of the lesson the students can be able to:
- know the definition of bones and state its function
- draw the different bones of the hand.

Key concepts
- The bones help the body to stay upright.

Knowledge	Skills	Attitudes
• The bones, muscles and the joints help the arm to move freely.	• Identify the different bones, muscles and joints that help the arm to move.	

Materials: Charts, markers, pencils, stickers

Teacher's Notes:

The arm is made up of three bones: the upper arm bone ***(humerous)*** and two forearm bones (the ***ulna*** and the ***radius***).The bones of the arm and hand have the important jobs of supporting the upper limb and providing attachment points for the muscles that move the upper limb

A need for strength makes the bones rigid, but if the skeleton consisted of only one solid bone, movement would be impossible. Nature has solved this problem by dividing the skeleton into many bones and creating ***joints*** where the bones intersect. Joints, also known as ***articulations*** are strong connections that join the bones, teeth and cartilage of the body to another. Each is specialised in its shape and structural components to control the range of motion between the parts that it connects.

Teaching and Learning Activities
Activity 1: Bones of the hand and legs

1. Guess the types of bones they have in the hands by feeling them.
2. Draw the picture of their own bones.
3. Share your pictures with the class.
4. Trace the shape of your arm and hand on a chart (A3).
5. Attach stickers or mark the parts that you can bend on your hand
6. Record your results on the A3 chart.

Summary

- The arm is made up of three bones- humerous, ulna and radius.
- The joints and the muscles help to move the hand and arm freely.

A. Guided lesson

Lesson **No.74**

Strand 2 : Physical Science

Unit 2: Force and motion

Lesson title: What is force and motion?

Content standard: **4.2.3** Differentiate between force and motion and identify the characteristics and uses of simple machines.

Objective: By the end of the lesson the Students can be able to define what force and motion is by doing simple demonstrations.

Key concepts:

- Motion is movement from one place to another.
- A force is a push or pull.

Knowledge	Skills	Attitudes
• A force is a push or pull. • Motion refers to how things move. It can be of different types- straight, circular, zigzag	• A force is needed to make an object move. • Identify different types of motion- straight, circular, zigzag.	Show curiosity in learning about force.

Materials: Toy cars (for the remote schools where you do not have access to these material, you can improvise by making a toy car using 500ml container and using the lids as wheels).

Teacher's Notes:

A force is pushing or pulling of things. The forces cause changes in motion and are not associate with motion itself. Forces are our way of describing the way effects such as pushes, pulls or gravity can influence the motion of things. A change in motion (speeding up, slowing down, and swerving) is caused by an external effect and not by the object itself or something inside it.

Teaching and Learning Activities

Key Question "What is force and motion?"

Activity: Force and motion

What to do:

1. Place the toy car on the table.
2. Push the toy car from behind and observe.
3. Record your observation by describing what happened.

Discussion

Based on demonstration done, discuss the following points with your classmates

1. What did you do to make the car move?
2. What would happen if you did not apply force?
3. What can you say about force and motion?

Summary

- A force is needed to start an object to move, slow the object down or change the direction of the object.
- Motion is movement from one place to another. It can be fast or slow. It can be back and forth, up and down, in a circles, straight or zigzag.

A. Guided lesson

Lesson **No. 75**

Strand 2 : Physical Science

Unit 2 : Force and motion

Lesson title: Describing motion based on speed, direction and distance

Content standard: **4.2.3** Differentiate between force and motion and identify the characteristics and uses of simple machines.

Objective: By the end of the lesson the students can be able to describe the motion based on speed, direction and distance by doing simple demonstrations.

Key concepts:

- Force is needed to make and object move.

Knowledge	Skills	Attitudes
• The motion of an object can be increased by pushing and pulling the object harder. • A force is needed to change the direction of the moving object.	• Differentiate between force and motion. • Use different words to describe force and motion.	Appreciate motion.

Materials: pictures of jumping frog, hopping rabbit, sport car, flowing river

Teacher's Notes:

Force is a push or pull needed to start an object moving. We know that force causes motion, but how do we describe it? We can describe motion with 3 types of words:

1. Type of motion
2. Speed
3. Direction

These words describe what kind of motion it is;	• running • jumping • skiing • climbing
These words describe the speed of the motion:	• fast • quick • slow • rapidly
These words describe the direction of the motion:	• left • up • sideways • north

A. Guided lesson

Teaching and Learning Activities

A**ctivities:** Describing motion of an object

What to do?

Answer the following questions using words of different types of motions, speed and directions.

1. How would you describe the type of motion this rabbit is doing?
2. How would you describe the type of motion of this frog?
3. How would you describe the speed of a snail?
4. How would you describe the speed of a sport car?
5. How would describe the direction of the flowing river?

Discussion

1. Compare the speed of a cheetah and a
2. Compare the speed of a cheetah and a snail, which of these animal is fastest? Giver your reason.
3. Describe how crabs move based on their directions?

Summary

- We can describe motion with 3 types of words:
  - Type of motion
  - Speed
  - Direction

A. Guided lesson

Lesson **No.76**

Strand 2 : Physical Science

Unit 2 : Force and motion

Lesson title: Measuring motion of an object

Content standard: **4.2.3** Differentiate between force and motion and identify the characteristics and uses of simple machines.

Objective: By the end of the lesson the students can be able to measure motion of objects by doing simple experiments.

Key concepts

- Motion is the movement of an object from one place to another.

Knowledge	Skills	Attitudes
The unit used to measure motion is meters.	Observe and measure the motion of an object.	Show curiosity to learn about motion.

Materials: toy cars, 30 cm ruler, masking tape, chalk (marker)

Teacher's Notes:

The physics or science of motion is all about forces. A force needs to act upon an object to begin and maintain motion as well as to change an objects motion.

In the study of motion, there are simple movements and complex movements. When objects move in a straight line, with force acting on it only one direction, it is a simple movement. Curved or circular movements, for example, the motion of a ball being thrown through the air, is a complex movement since there are forces "pushing" and "pulling" it in different directions.

The motion probe has three units that it can measure;

- measure distance in meters - m
- measure speed – m/s (this will be taught in senior primary)
- measure acceleration – m/s2 (this will be taught in senior primary).

Teaching and Learning Activities

Key Question "How can we measure motion of an object?"

Activity: Measuring motion of an object

1. Mark the starting point on the floor of the classroom with a chalk (marker) or a masking tape where the object will be placed.
2. Apply force by pushing the toy car along the floor.
3. Take the measurement of the distance covered using the unit in centimeter (cm).
4. Repeat this experiment two or more times with different students and get the measurements.

Discussion

Based on the experiment done, discuss the following points with your classmates.

1. For the three repeated experiments done, what did your find out?
2. Why are the measurements different?
3. What causes the measurements to be different?

Summary

- Motion can be measured in centimeters or meters.
- Measurement of the same object can be different based on the size of the force applied to the object.

A. Guided lesson

Lesson **No.78**

Strand 2 : Physical science

Unit 2 : Force & Motion

Lesson title: Simple machine - Lever

Content standard: **4.2.3** Differentiate between force and motion and identify the characteristics and uses of simple machines.

Objective: By the end of the lesson the students can be able to understand and describe the function of the lever.

Key concepts

- Simple machines make work easier for us by allowing us to push or pull over increased distances with less effort.

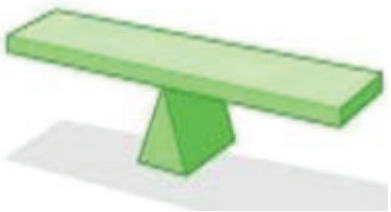
Knowledge	Skills	Attitudes
• Lever is a simple machine that uses less force to lift a load. • The closer the fulcrum is to the object, the easier the lift.	• Apply the skill of using levers in daily practice. • Demonstrate by putting the load at different locations.	• Appreciate the use of simple machines in daily.

Materials: Plank (1 meter), bags of sand/soil (as loads), trapezium (fulcrum)

Teacher's Notes:

A seesaw is a type of lever. It is a rigid bar or plank with a central point, called a fulcrum. If you push down on one end of the lever, you get a force pushing up at the other end. The closer the load is to the fulcrum, the easier it is to lift the load.

Prepare a seesaw for students to observe its function. Increase the load at various lifts for student's observation. Moving the fulcrum away from the effort arm increases the effort of lifting the load easier. Students should also be involved in the exercise of packing the loads, moving the fulcrum and applying the lift during the lesson.



Student Activities

1. What happened when more bags were added on for the load? (the effort applied increased)
2. What happened when fulcrum was moves toward the bags of load? (lift easily)

Summary

- A lever is simple machine that uses less effort to carry a heavy load.
- A lever consist of a pivot (fulcrum), load and the effort.

A. Guided lesson

Lesson **No.79**

Strand 2: Physical Science

Unit 2: Force & Motion

Lesson title: Simple machine – Pulleys

Content standard: **4.2.3** Differentiate between force and motion and identify the characteristics and uses of simple machines.

Objective: By the end of the lesson the students can be able to describe and understand the function of a pulley.

Key concepts:

• Pulley is a simple machine that is used to lift loads with less effort.

Knowledge	Skills	Attitudes
• Pulley is a simple machine that is used to lift or lower load. • Pulley changes the direction of the force to do the work.	• Classify pulleys into categories. • Apply the use of pulleys in practical situations.	• Appreciate the use of pulleys in daily life.

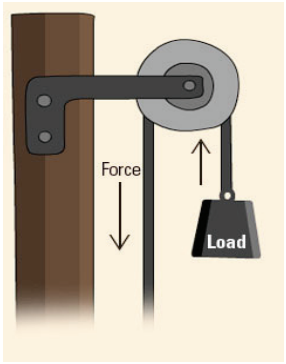
Materials: Pulleys, ropes and loads (1- 5kg)

Teacher's Notes:

A pulley is a simple machine and has two parts. One part is a wheel with a groove. The other part is a rope or cable that fits in the groove. When you pull on one end of the rope, you can lift an object on the other end of the rope. A pulley can help lift load by pulling a rope through a pulley attached to the load. The more pulleys added to the load, the less effort in lifting the load

Types of pulleys

There are three types of pulleys. Each pulley system depends on how the wheel and rope are put together.

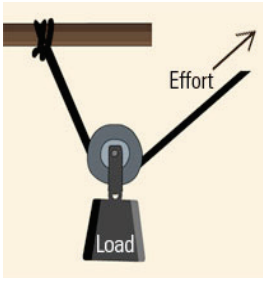


Fixed Pulley

This is the simplest form of pulleys. Simple pulleys have their axles fixed in place and cannot be moved. The rope move in the grove of the pulley but the wheel is fixed to one spot. The wheel on the school flag pole is a good example

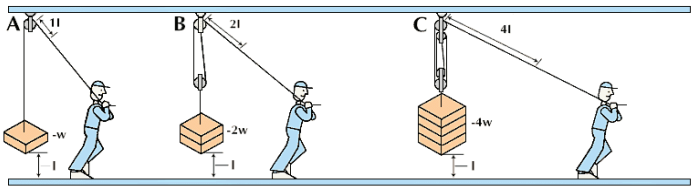
Movable Pulley

Ina movable pulley (see diagram on right), the load is attached to the pulley and both of them can move from place to place. In this type, one end of the rope is attached to a fixed point that does not move. With a movable pulley, you need less effort to lift a load. The load is between the effort and the fulcrum.



Compound Pulley

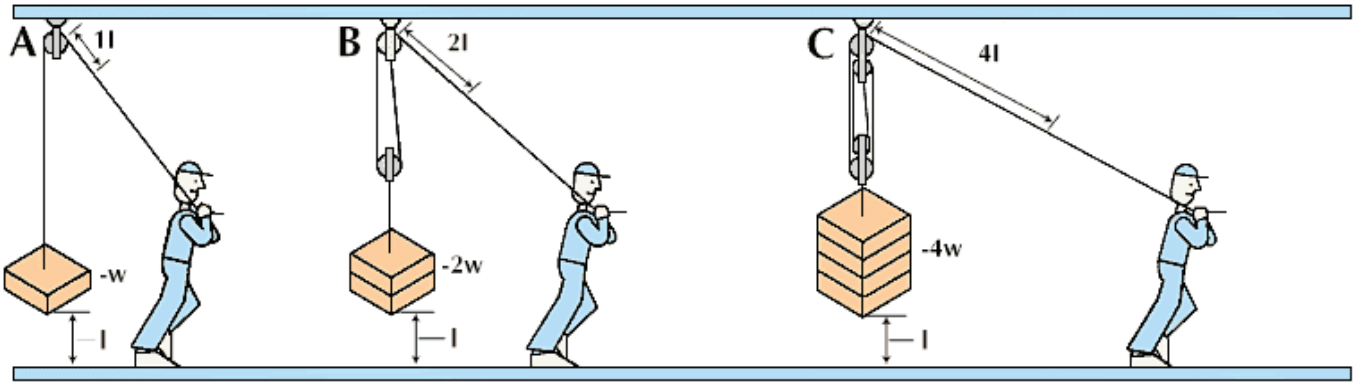
This is also called a combined pulley. It is a combination of pulleys designed to make the effort less than half of the weight of the load. This kind is very common at construction sites where cranes lift very heavy steel and concrete objects.



A. Guided lesson

Teaching and Learning Activities

Get the students to have the feel of lifting loadusing the pulley. Attach certain weight by which they are to pull up.



Summary

- Pulley is a simple machine that is used to lift or lower load. Pulley changes the direction of the force to do the work.

A. Guided lesson

Lesson **No.80**

Strand 2 : Physical Science

Unit 2 : Force & Motion

Lesson title: Simple machine - Incline planes

Content standard: **4.2.3** Differentiate between force and motion and identify the characteristics and uses of simple machines.

Objective: By the end of the lesson the students can be able to understand the function of incline planes.

Key concepts:

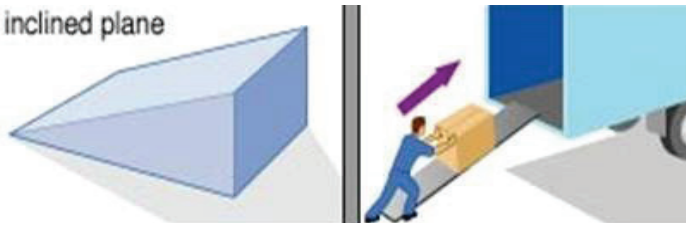
- An inclined plane makes it easy to lift heavy objects by enabling a person to apply little force over a greater distance.

Knowledge	Skills	Attitudes
• The inclined plane is a flat surface that is raised so one end is higher than the other. • The inclined plane helps move heavy objects up or down with less force.	• Differentiate the use of inclined planes from levers.	• Appreciate the use of pulleys in daily life.

Materials: a plank, some load

Teacher's Notes:

An inclined plane is a simple machine, consisting of a ramp or a similar wedge-shaped device that makes doing a given amount of work easier. In physical terms, work is the result of a force, such as the effort of pushing or pulling something that moves an object over a distance. An inclined plane makes it easier to lift heavy objects by enabling a person to apply the necessary force over a greater distance. The same amount of work is accomplished in lifting the object with or without the inclined plane, but because the inclined plane increases the distance over which the force is applied, the work requires less force.



Summary

- An inclined plane makes it easier to lift heavy objects by enabling a person to lift a load that would be too heavy to lift straight up.
- The steeper the ramp, the more effort required to lift an object.

A. Guided lesson

Strand 1 : Life

Lesson **No.86**

Unit 1: Plants

Lesson title: Observing plant growth - Fruit

Content standard: **4.1.1** Identify and explain the different stages in the life cycle of plants.

Objective: By the end of the lesson the students can be able to describe and explain that flowers change into fruits containing seeds as a result of pollination and fertilization of the female part by the male part.

Key concepts:

- Fruits form as a result of pollination and fertilisation of the female and male parts of the flower.

Knowledge	Skills	Attitudes
• Pollination is the transfer of pollen from the male part to the female part of the flower to fertilize the	• Describe the process of pollination.	• Value the importance of fruits.

Materials: : Plants with flowers that have fruits, hand lens, flower samples

Teacher's Notes

Flowers are not beautiful to look at but they can also become fruits and seeds. The seeds are protected by the fruits. There are many types of fruits. Some fruits are soft and fleshy. Others are hard and dry. Some fruits have one seeds, some have two, three or four and some have many seeds. But a few fruits have no seeds at all e.g. banana.

Teaching and Learning Activities:

Key Question: How does a fruit form?

1. Give out the flowers to the children and tell the children to break off the petals from their flowers. Get some of the yellow powder (called pollen) form the male part and look at it under the hand lens. Do the same for the female part.

2. Tell the children that for a plant to make fruit, pollen from the male part must get into the top of the female part. This transfer of pollen is called *pollination* and is normally done by insects (bees, butterflies), birds, or wind. After the pollen gets into the female part, it fertilizes the flower. When the pollen fertilizes the flower, the eggs become the seeds and the ovary grows bigger and bigger and becomes the fruit.

Summary

- Insects help in the pollination. Not all flowering plants can bear fruits.
- Fruits develop out of a flower.

Discussion:

Does every flower turn into a fruit that people can eat?

A. Guided lesson

Strand 2: Physical Science

Lesson **No.89**

Unit 1: Energy

Lesson title: What is electricity?

Content standard: **4.2.2** Investigate the flow of electric currents using simple circuits.

Objective: By the end of the lesson the students can be able to define the term electricity.

Key concepts

- Electricity is an energy that is used to produce light, heat and make engines move.

Knowledge	Skills	Attitudes
• Define electricity. • Electricity is a form of energy.	• Name sources of electricity. • Identify the importance of electricity.	• Appreciate and accept the use of electricity in daily life.

Materials: battery, bulb, wire

- Be careful when handling bulb.

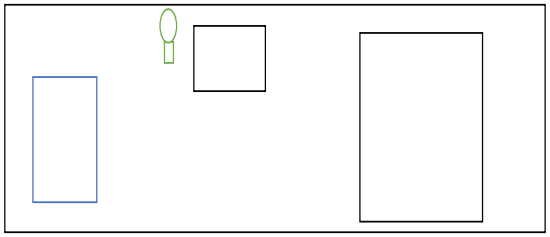
Teacher's Notes:

What is electricity? This is a hard question to answer. We cannot see electricity. We know it is present because of the effect it produces. It can light a bulb. If the bulb lights we know that electricity is present. It can make a bell ring. It can produce heat. The light bulb gets hot when it lights up. Electricity does not make noise. Under certain circumstances we can feel it. It will give us a shock if enough is present. Because we cannot tell if it is present by looking, smelling or listening we must treat all electricity wires with caution. As long as we experiment with just small amounts like the electricity in a torch battery, we are safe.

We are familiar with torch batteries or dry cells, the kinds that run our small radios or make our torches work. Batteries are good ways to store electricity and carry it about. They are small but expensive. When we need large amounts of electricity, batteries are not enough. Large generators (factories for electricity) produce electricity from flowing water or from large steam plants. The electricity produced by these generating plants is carried by thick wires to the cities and towns where electricity is needed and used.

How can you find if electricity is present?

1. Have one battery, one bulb and one wire in each group.
2. Connect as shown in the diagram below.



A. Guided lesson

Strand 2 : Physical Science

Lesson **No.91**

Unit 1: Energy

Lesson title: Connections in different ways to light a bulb

Content standard: **4.2.2** Investigate the flow of electric currents using simple circuits.

Objective: By the end of the lesson the students will be able to identify the different ways of connecting wires to light a bulb.

Key concepts:

- A power source is needed to light up a bulb.
- Not all connections will light the bulb.

Materials: 1 bulb, 1 bulb socket, 1 dry cell battery, Red & Black wires (with alligator clips).

- Be careful when handling bulb.

Teacher's Notes:

To turn on the bulb, one wire has to be connected to the ◯ of the battery and the other wire to the ⊖ of the battery. The connection allows the electricity to flow from the ◯ (of the battery) into the bulb and back to the ⊖ (of the battery). This flow of electricity is called the circuit.

Teaching and Learning Activities

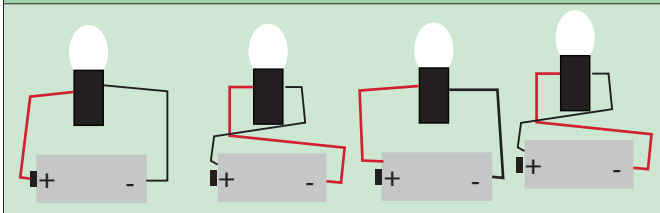
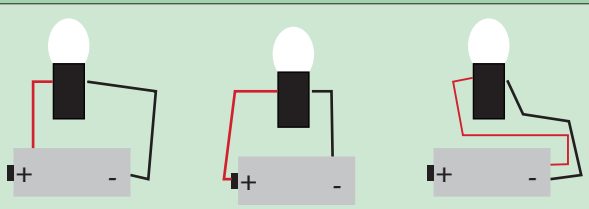
Activity 1

1. Screw the bulb into the socket properly.
2. Connect the red and black wires to the socket (with alligator clips).
3. Try various ways to connect the battery to light up the bulb.
4. Draw the diagrams of your findings in the table below.

Connections that turn the bulb on	Connections that turn the bulb on

Results

Below are examples of the different types of connections made to the battery.

Connections that turn the light on	Connections that didn't turn light on
	

Summary

- To light a bulb, the wires should be connected to the right terminals to allow current to flow through. If the circuit is open, the bulb will not light.

A. Guided lesson

Strand 2: Physical Science

Lesson **No. 92**

Unit 1: Energy

Lesson title: Connecting without a socket

Content standard: **4.2.2** Investigate the flow of electric currents using simple circuits.

Objective: By the end of the lesson the students can be able to connected the wires without a socket to light up a bulb.

Key concepts:

- Certain materials allow electricity to flow through.

Materials: a bulb, battery, 2 lead wires, battery holder

- Be careful not to let the wires to come in contact during the experiment.
- Do not connect a lead wire across the battery, it might be too hot to touch.
- Remember not to let two bare wires have contact with each other.

Teacher's Notes:

The flow of electricity through a pathway is known as a circuit. A circuit is made up of a power source (battery), wires and bulbs. When connected properly, the bulb will light up to show that there is flow of electricity.

Teaching and Learning Activities

1. Make prediction if a bulb will light up without a socket.
2. Share your ideas with reasons based on the result based on prediction.
3. Connect a single wire to the socket and test using various connections.
4. Observe and record your results by drawing them.
5. Connect the double wire to the socket and test using various connections.
6. Observe and record your results by drawing them.

How to test	Results	
Single lead wire connection	Bulb lights up	Bulb does not light up
Two lead wire connection		

Summary

- The bulb still lights up when the wires are connected properly in the circuit.

A. Guided lesson

Strand 2 : Physical Science

Lesson **No. 94**

Unit 1 : Energy

Lesson title: Conductive and non-conductive materials of electricity

Content standard: **4.2.2** Investigate the flow of electric currents using simple circuits.

Objective: By the end of the lesson the students Students can be able to:
- list the materials that allow electricity to flow through
- understand why electricity cannot pass through other materials.

Key concepts:
- Material that ***allow*** electricity to flow through are called ***conductors.***
- Materials that do not allow electricity to flow through are called ***insulators.***

Materials: Battery, bulb, 30cm lead wires(x3), paper clips, paper, coke can, 5 & 2 toea coins, scissors, nail, tin can (empty spray) plastic bottle, wood

- Be careful not to let the wires to come in contact during the experiment.
- Do not connect a lead wire across the battery, it might be too hot to touch.
- Remember not to let two bare wires have contact with each other.

Teacher's Notes:
Electricity will travel from place to place as long as it has something through which it can travel. Some materials allow electricity to travel through them easily. Other materials will not. When we want to make electricity move along a path, called a **circuit**, we use materials that will carry electricity. These materials are usually called conductors. We say that they conduct or move electricity around the circuit. Most metals will allow electricity to travel through them. Copper is a very good example of a metal that is a conductor or lets electricity travel through it. Materials that will not let electricity to flow through them are called **non-conductors** or **insulators.** Examples of materials that will not allow electricity to travel through them are glass, string, rubber bands and papers. Most of these materials are not metals.

Teaching and Learning Activities

Activity 1
1. Copy the table below and list the different materials to be tested.
2. Predict whether electricity will flow or not flow in the materials listed.
3. Test the items by connecting them between the two wires.
4. Record your results in the table.
5. Organize the materials according to those that allow electricity to flow through and those that do not allow electricity to flow through.

How to test	Results	
Single lead wire connection	Bulb lights up	Bulb does not light up
Two lead wire connection		

A. Guided lesson

Materials		Prediction	Results
1. Aluminium can		x	
2. Tin can			
3. Nail			
4.			
5.			
6.			
7.			

Activity 2

Separate and organize materials that make the bulb light or other materials that do not by using flash cards

Materials that allow electricity to flow	Materials that do not allow electricity to flow
1. Aluminium can	

Summary

- Materials that allow electricity to flow through are called conductors of electricity.
- Materials that do not allow electricity to flow through are called non-conductors of electricity.

B. Knowledge, Skills, Attitudes and Values

Knowledge, skills, atitudes and values for the lessons that will be written by the teachers

Strand	Content standard	Performance standard	Lesson title	Knowledge	Skills and processes	Values and attitudes
Life	**4.1.4**	Describe that the living things provide food, shelter and clothing.	People and Living things **Lesson No. 3**	• Living things provide food, shelter and clothing for human beings. • People use living things to make other useful things. E.g tables, chairs, books, herbs	• Use available resources for food consumption and to make shelter and clothing • Identify living things that provide food, shelter and clothing for human beings	• Appreciate what the environment provides • Care and respect for the environment
Earth and Space	**4.3.2**		Changes in the sky **Lesson No.6**	• Weather changes from day to day • The weather is different at different places	Identify the different weather conditions and record them in a table	Appreciate the different weather conditions for each day
Earth and Space	**4.3.2**		Measuring Weather **Lesson No.7**	Use different instruments to measure weather	Measure weather using the thermometer	Value the importance of instruments used to measure weather
Earth and Space	**4.3.2**	Identify and describe examples of how weather affects human activities.	Factors affecting weather **Lesson No. 8**	Weather can affect human activities such as heavy rain can cause flash flood, landslides which affects houses, gardens and etc	Identify and describe how weather affects human activities	
Physical Science			Properties of Air-Air can be compressed **Lesson No.15**	• Air can be compressed. When air is pressed, it can shrink its size and when released it expands its size	• Observe and identify the difference when air in a container is pressed and water in a container is pressed. • Identify use of compressed air in daily life	
Earth and Space	**4.3.1**	Explain the importance of soil and its uses to human beings.	Uses of soil for human beings **Lesson No. 18**	• Soil are used for planting crops • Soil can be used to make building materials. Eg concrete • Soil is used to make pottery	Explain the importance of soil and its uses to human beings Identify products that made from soil.	Value the importance of soil

B. Knowledge, Skills, Attitudes and Values

Knowledge, skills, atitudes and values for the lessons that will be written by the teachers

Strand	Content standard	Performance standard	Lesson title	Knowledge	Skills and processes	Values and attitudes
Earth and Space	**4.3.1**	Define and give examples of soil pollution	What is soil pollution **Lesson No. 19**	Soil pollution is caused by the presence of human-made chemicals or other alteration in the natural soil environment. It typically caused by industrial activity, agricultural chemicals, or improper disposal of waste.	Identify examples of soil pollution Identify ways to minimize soil pollution	Appreciate soil as one important condition to the surviving of most plants on Earth Value the importance of soil
Earth and Space	**4.3.1**	Identify the causes and effects of soil pollution	Effects of soil pollution **Lesson 20**	Some of the main soil pollution effects include; • Effect on health of humans. • Effect on growth of plants. • Decreased soil fertility.	Identify the causes and effects of soil pollution Identify ways to minimize soil pollution	Protect the soil from pollution Value the importance of soil
Earth and Space	**4.3.1**	Suggest ways to conserve soil Develop a positive attitude to protect soil	Protecting and conserving soil **Lesson 22**	Soil conservation is the preventing of soil loss from erosion or reduced fertility caused by over usage and other chemical soil contamination.	Identify ways to protect and conserve the soil Apply simple methods in protecting and conserving soil	Develop a positive attitude to protect the soil
Life	**4.1.2**	Explain how human beings grow and change	Growing and changing **Lesson 24**	Human beings change in their appearance as they grow starting from infant to young adolescents to adult and to old age.	Describe how human beings grow and change	Appreciate and respect human body as we grow and change
Life	**4.1.2**	Compare the life cycle of different animals such as butterflies, frogs, chickens, fish and dogs	Life cycle of fish **Lesson No.28**	Fish like all other animals go through a cycle.	Identify and describe the different stages of life cycle of a fish	Appreciate the life of fish Value the importance of life cycle of fish as the continuity of its life form

B. Knowledge, Skills, Attitudes and Values

Knowledge, skills, atitudes and values for the lessons that will be written by the teachers

Strand	Content standard	Performance standard	Lesson title	Knowledge	Skills and processes	Values and attitudes
			Discovering the moon **Lesson No. 32**	• The surface of the moon is covered by craters, hills, mountains • The moon is smaller than the earth. It appears large because it is close to the earth • The moon does not produce its own light.it gets it from the sun	• Identify the things that make up the moon • Identify the size of the moon compared to the earth • Explain why the moon shines in the night	
Earth and Space	**4.3.3**	Observe and describe the movement of the moon	Movement of moon **Lesson No.37**	• The moon rises in the east and sets in the west. • The Moon turns on its axis every 27 days. • Same side of the Moon always faces Earth.	Observe the movement of the moon Describe the movement of the moon	Value the importance of moon
Physical Science	**4.2.5**	Observe and describe the changes in states of water in relation to temperature	Changes in states of water – water to water vapor **Lesson No.46**	Evaporation is the process in which water changes from liquid to gas.	Observe the changes of states of water to water vapor Describe the changes of water to water vapor	Appreciate the changes of states of water in our daily life Value the importance of changing states of water
Physical Science	**4.2.5**	Explain the relationship between temperature, states of water, and volume.	Relationship between, temperature, states of water, and volume **Lesson No.**	When heat is added to water, the temperature increases, when heat is removed the temperature decreases	Compare and explain the relationship between temperature, states of water and volume	Appreciate the relationship between temperature, states of water and volume
Physical Science	**4.2.1**	Investigate the properties of sounds	Properties of sound **Lesson No. 63-64**	Sound is caused by vibrations.	Investigate the properties of sounds	Appreciate the properties of sounds
Physical Science	**4.2.1**	Identify the differences between echo, pitch and volume	Differentiating between echo, pitch and volume **Lesson No.** **65-67**	Objects vibrating faster have a higher pitch than objects vibrating slower.	Identify and describe the differences between, echo, pitch and volume	Appreciate the differences between echo, pitch and volume

B. Knowledge, Skills, Attitudes and Values

Knowledge, skills ,atitudes and values for the lessons that will be written by the teachers

Strand	Content standard	Performance standard	Lesson title	Knowledge	Skills and processes	Values and attitudes
				An echo is more likely to happen when the sound has a lot of surfaces to bounce off of.		
Earth and Space	**4.3.2**	Define and explain water cycle	Water cycle **Lesson No.56**	The **water cycle** is the movement of water from the ground to the air and back to the ground by evaporation, condensation, and precipitation. The energy that drives this cycle comes from the sun.	Define and explain water cycle	Value the importance of water cycle
Earth and Space	**4.3.2**		Importance of water in daily activities **Lesson No.57**	Water is the most important resources All living things need water to survive	Identify and describe the importance of water in daily activities	Value the importance of water
Earth and Space	**4.3.2**	Investigate and discuss how to conserve and protect water.	Conservation of water **Lesson No.59**	Water is an essential need for living things and should be conserved. Our water supply on Earth is limited. Pollution reduces the amount of usable water;	Investigate and identify how to conserve and protect water	Value the importance of water conservation Appreciate uses of water in daily lives.
Physical Science	**4.2.1**	Recognize that sound is transmitted by vibrating through objects	Making sound **Lesson No.63**	Sound is caused by vibration	Use different materials to make sound	Appreciate how to make sound
Physical Science	**4.2.3**	State the characteristics of different simple machines such as levers, inclined planes, screws, pulleys, wheel & axle and wedges	Simple machine – Screws **Lesson No. 81**	The **screw** is an inclined plane wrapped around a cylinder or cone. A common use of the screw is to hold objects together. **Examples** include a jar lid and wood screw.	Describe the characteristics of screw	Appreciate the work of screw in our daily life

B. Knowledge, Skills, Attitudes and Values

Knowledge, skills, atitudes and values for the lessons that will be written by the teachers

Strand	Content standard	Performance standard	Lesson title	Knowledge	Skills and processes	Values and attitudes
Physical Science	**4.2.3**	State the characteristic of different simple machines such as levers, incline planes, pulleys, wheel & axle and wedges	Simple machine - Wheel and axle **Lesson No.82**	The **wheel and axle** consists of a rod attached to a wheel. A wheel and axle makes it easier to move or turn things. **Examples** include bicycle wheels, roller skates, and a door knob.	Describe the characteristics of wheel and axle	Appreciate the work of wheel and axle in our daily life
Physical Science	**4.2.3**	State the characteristic of different simple machines such as levers, incline planes, pulleys, wheel & axle and wedges	Simple machine 6- Wedges **Lesson No.83**	The **wedge** is wide at one end and pointed at the other to help cut or split other objects. Examples include a knife or axe.	Describe the characteristic of wedges	Appreciate the work of wedges in our daily life
Physical Science	**4.2.2**	Identify and discuss sources and uses of electricity.	Sources and uses of electricity **Lesson No.90**	A **battery** can act as a source of electricity in circuits. **Water power** (hydropower) can produce electrical energy. Dams are used to contain flowing river water, forming lakes and reservoirs.	Identify and describe the sources and uses of electricity	Appreciate electricity Value the importance of electricity in daily life
Physical Science	**4.2.2**	Demonstrate how to make a simple circuit	Make a traffic light **Lesson No.96**	The concept of circuits are used to make toys	Construct a traffic light	Appreciate simple circuits

Assessment, Recording and Reporting

Assessment and reporting is an integral part of the curriculum. Assessment is the process of identifying, gathering and interpreting information about students' learning. It is administered to provide information on student's achievement and progress. It directs teachers on their way of teaching and the how students learn.
In standard based curriculum, assessment is viewed not only as a final product (summative), but more importantly as a continual process (formative) that provides pupil performance data to teachers and students regarding their progress towards achieving the intended standards.

What is Assessment?

The term ''Assessment" is generally used to refer to all activities teachers use to help students learn and to monitor and measure student progress. It is an ongoing process.

Purpose of Assessment

The purpose of assessment is to inform:

- Students about their progress and achievements in their learning
- Teachers of the progress of students learning in order to adjust teaching and planning to improve students' learning.
- Parents and guardians, about their children's progress and achievements.
- Schools, province and NDOE to make decisions about how to improve the quality of teaching and learning in the education system.
- Other educational institutions and the communities about the standards of teaching and learning strategies, curriculum and resource allocation that may affect students' learning.

Overall assessment is seen as an integral part of the learning and teaching program rather than a separate process.

Types of Assessments

There are three types of assessments in the Standard based curriculum. These are;

- ***Assessment as*** or ***in***;
- ***Assessment for***; and
- ***Assessment of***

Assessment ***as*** and Assessment ***for*** are also known as *Formative* Assessments and Assessment ***of*** is also known as Summative Assessment.

Assessment *as* or *in* learning

Assessment ***as*** or ***in*** learning is the use of a task or an activity by the teacher in his/her everyday teaching to allow students the opportunity to

use assessment to further their own learning. Self and peer assessments allow students to reflect on their own learning and identify areas of strength and weakness. These tasks offer students the chance to set their own personal goals and advocate for their own learning.

Assessment *for* Learning

Assessment ***for*** learning, also known as classroom assessment, is different. It is an ongoing process that arises out of the interaction between teaching and learning. It is not used to evaluate learning but to help learners learn better. It does so by helping both students and teachers to see:

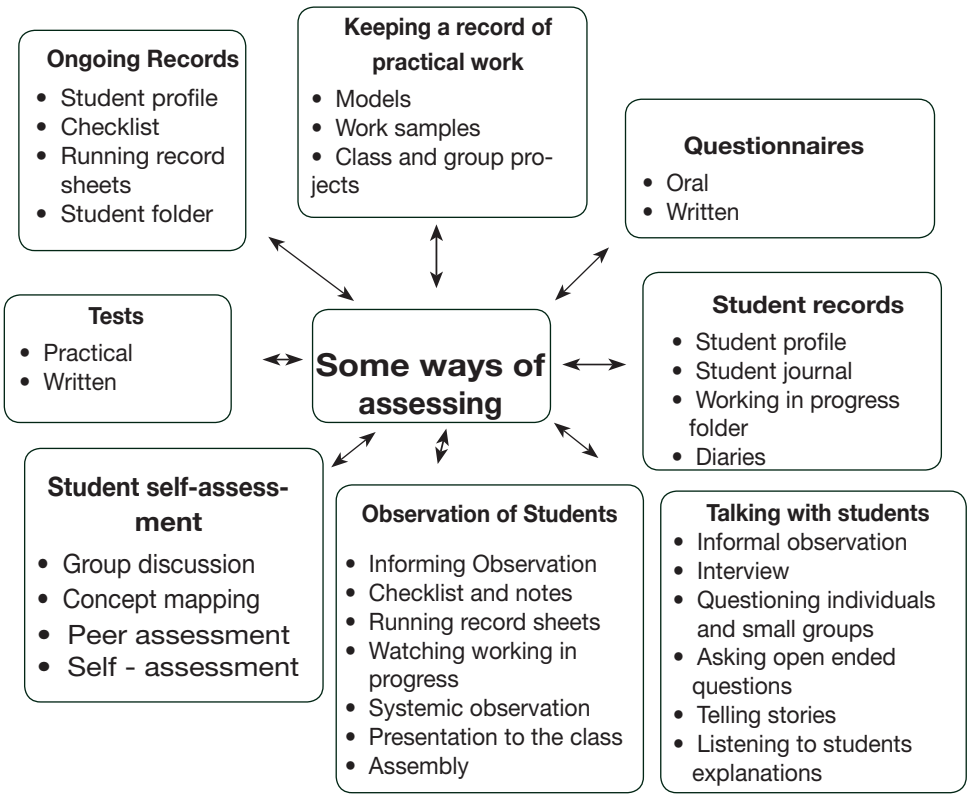
- the learning goals and criteria
- where each learner is in relation to the goals
- where they need to go next
- and ways to get there

Assessment *of* Learning

Assessment ***of*** learning is the use of a task or an activity to measure, record and report on a student's level of achievement in regards to specific learning expectations such as unit tests and end of term or year exams.

Methods of Assessment

Assessment is an integral part of students learning and can be done using different methods. Below are some of these methods.



Assessment, Recording and Reporting

Assessment Tasks Overview

The Assessment Tasks overview is organised by weeks, strands, units, content standards and performance standards to show the linkage, when the assessment tasks should be conducted, and where the assessment tasks are extracted from which performance standards.

WEEK	STRAND	UNIT	CONTENT STANDARD	PERFORMANCE STANDARD	ASSESSMENT TASK
	Life	Interaction and relationship in the environment	**4.1.4**	a) Explain how living things depend on each other in the environment in terms of food and water.	1. Draw and, match living things with /to their habitats. 2. Give examples of living things that depend on others for survival.
				b) Describe the reasons why living things depend on each other.	Naming 3 living things that live in a habitat and depend on each other.
	Earth and Space	Weather and climate	**4.3.2**	a) Describe types of weather	Match pictures of instruments used to measure weather conditions.
				b) Define and explain water cycle.	1. Draw a flow chart of water cycle.
				c) Investigate and discuss how to conserve and protect water.	2. Identify ways to preserve water.
	Physical Science	Matter	**4.2.4**	b. Describe and explain properties and characteristics of air.	Name the properties of air
	Physical Science	Matter	**4.2.5**	a) Explain the differences between chemical and physical change.	1. List various examples of physical and chemical change.
				e. Observe and describe the changes in states of water in relation to temperature.	3. Identify the relationship between temperature and states of water.
	Life	Plants	**4.1.1**	d) Identify the different stages of plant cycle	Model the plant life cycle
	Earth and Space	Our Earth	**4.3.1**	a) Explain the importance of soil and its uses	1. Explain the importance of soil to human beings.
				c. Identify the causes and effects of soil pollution. d. Discuss how soil pollution affects the Earth.	1. Name a type of pollution that makes the soil infertile.
	Life	Animals	**1.1.2**	b) Compare the life cycle of different animals such as butterflies, frogs, chickens, fish and dogs	1. Draw and label the life cycle of an animal.
	Earth and Space	Space	**4.3.3**	c) Monitor and describe the direction of the moon from observation. d) Identify and describe the different phases of the moon.	4. Draw the different phases of the moon according to the order they appear and name each phase.
	Physical Science	Energy	**4.2.1**	a) Recognize that sound is transmitted by vibrating through objects	1. Make simple instrument that produce sound.
				b) Identify the differences between echo, pitch and volume	2. Listen to recorded sounds and say whether it is an echo, a pitch or volume.

	Life	Human Being	**4.1.3**	a) Identify the body parts of human beings in terms of bones and muscles.	Draw the bones, joints and muscles of the arm and hand
				b) Define and explain how bones and muscles work on human beings	Name the skeletal system of the human body
	Physical Science	Force and motion	**4.2.3**	a) Investigate and explain the relationship between force and motion.	Demonstrate the relationship between force and motion
				e) Classify and give examples of the different types of simple machines and their uses in daily lives.	Identify a simple machine used in daily lives and describe how it is used.
	Physical Science	Energy	**4.2.2**	c) Demonstrate how to make a simple circuit d) Explain how to light a bulb in a closed circuit , in terms of closed and open circuit	2.Draw a diagram of a simple circuit and label their components (no symbols included)
				e) Identify and explain conductors and insulators.	3. Select either a conductor or an insulator and describe how it responds to electricity.

Assessment Task Samples

Assessment Task sample: 1

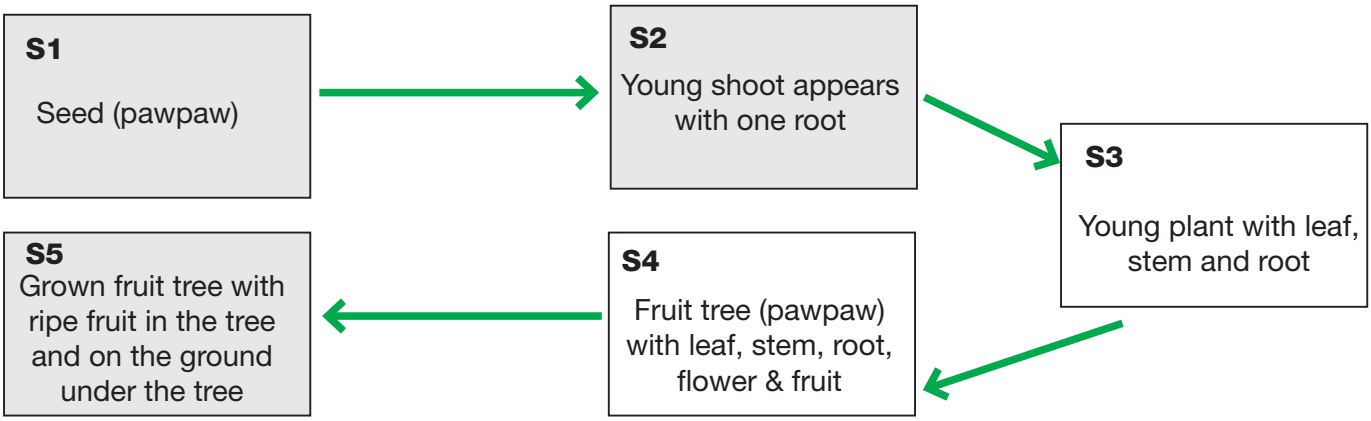
Strand: Life **Reference:** Primary Science Syllabus. **Page:**

Unit:	Plants
Content Standard	**4.1.1**
Assessment Task	Identify the stages of plant life cycle on flash cards and arrange them in the correct order **Things to do:** **Teacher:** 1. Prepare on flashcard each stage of the plant life cycle. 2. Color the pictures on the cards 3. Make sure each stage has a secret numbering on one side each card in the pack. 4. Train the group leader on how to do the activity with each member. **Note:** Teacher note that the assessment task has 2 main ideas therefore each one must be addressed in separate activities
Assessment Criteria	1. Plant life cycle stages are arranged in correct order. 2. Explain each stage meaningfully. 3. Correctly name and spell the parts of a seed where germination begins 4. Confident when responding.
Assessment Method	**Peer Assessment**
Recording & Reporting Method	**Observation - Checklist** Have a group observation check list done before the groups are tasked.

Assessment Task sample: 1

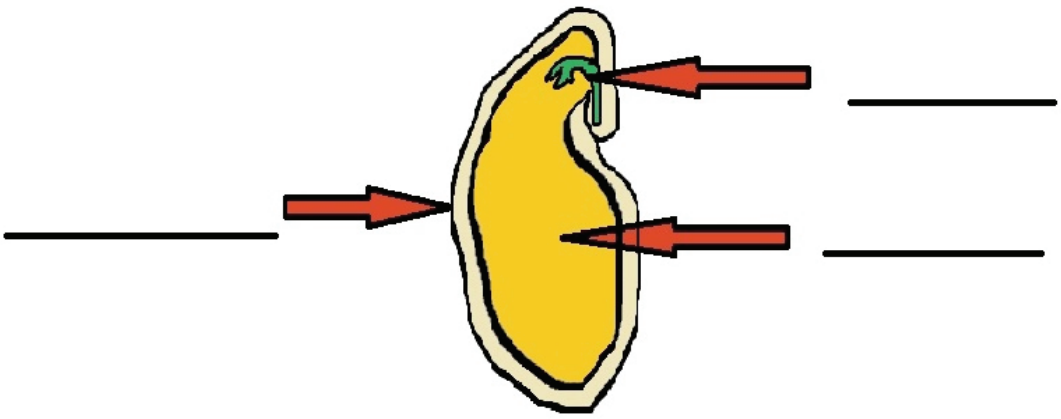
Activity 1: **Plant Life Cycle**

Plant Life cycle - Fruit Tree (cards for stages of growth)



Assessment Task 1

Activity 2: Seed Germination
Words for Seed parts: food wall, seed cover, embryo



Class Checklist sample for Assessment Task 1.

Assessment Task 1.	**Marking Code Keys :** 1. Well done confident in all statements 2. Part response given with some confidence 3. Limited or little response to each statement.			
Name	**C Statement** 1. Arranged all stages of plant life cycle in correct order	**C Statement** Explanation of each stage is meaningful	**C Statement 3** 3. Correctly name and spell the parts of a seed where germination begins	**C Statement** 4. Shown confidence to speak in front of group members
Pidi	1	2	1	1
Kaytee	1	3	1	2
Saloiri	2	2	3	2
Mipa	3	3	1	2
Esgo	2	1	1	2

Assessment Task Samples

Assessment Task sample: 2

Strand: Physical Science **Reference:** Primary Grades, 3,4 & 5 Science Syllabus.

Unit:	Matter
Content Standard	**4.2.4**
Assessment Task	1. Study the given diagrams, identify and name 2 properties of air learnt if the diagrams were to be conducted as experiments. **Things to do:** • Teacher makes sure that this assessment task must be conducted after the students have done the experiments. • Read the descriptions with the students and let them identify the respective properties on their own.
Assessment Criteria	1. Correctly identify diagram 1 as air takes up space 2. Correctly identify diagram 2 as air has mass
Assessment Method	**Student work sample**
Recording & Reporting Method	**Journal reporting**

Assessment Task 2

Worksheet 1

The following diagrams are about air and the properties of air. They are of air experiments you already have done. Study the diagrams carefully. Identify the property and state each one in the space provided under each diagram.

Diagram 1

Diagram 2

Answer the following questions:

1. What is the property of air experimented in **diagram 1.** ? Explain how you got your answer

_____
_____
_____
_____

2. What is the property of air experimented in diagram 2? Explain how you got your answer.

_____
_____
_____
_____

Recording Method sample
Class Checklist

Assessment Task 1.		**Marking Code Keys :** **A :** Achieved **PA**: Partly Achieved **NA:** Not achieved	
Class List (Total number of students on roll)	**C1.** Correctly identify diagram 1 as air takes up space	**C2.** Correctly identify diagram 2 as air has mass	**C3.** Explanation for each diagram is clear and meaningful
1. David			
2. Emmanuel			
3. Annie			
4. John			
5.			
6.			
7.			
8.			
9.			
10.			

Assessment Task Samples

Assessment Task sample: 3

Strand: Physical Science **Reference:** Primary Grades, 3,4 & 5 Science Syllabus.

Unit:	Energy
Content Standard	**4.2.2**
Assessment Task	**2.** Draw a diagram of a simple series circuit and label its components (no symbols included) **Things to do:** **Teacher note that:** 1. This assessment task will be done in 2 Science lessons (Lessons 4 &5) which will take a total of 60 minutes 2. This will be practice task whereby the students will build a model of the circuit first. 3. Then draw the circuit they have built.
Assessment Criteria	1. Correct formation of the series circuit with 2 bulbs 2. Correct labels on the parts of the circuit 3. All connections are in the right place including the switch 4. Both bulbs light up when the circuit is closed
Assessment Method	**Work sample**
Recording & Reporting Method	**Individual Checklist**

Assessment, Recording and Reporting

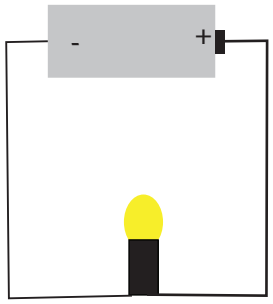
Assessment Task 3:

Worksheet: Drawing of the simple circuit (students version)

The list of materials is given. The student will show on the diagram where each material is placed in the circuit by drawing the materials connecting each one to form the circuit. This assessment task may take 2 lessons.

Materials:

1. Battery-1
2. Copper wires
3. Bulb- 1
4. Switch -1



Students complete version of the simple circuit diagram.

Note: This activity to be done on A4 Paper- if not a page from the students' exercise book.

Recording Method sample:

Individual Check List

Name of Student and date:	**Marking Code:**	**1.** Performed all the criteria to an excellent level. **2.** Performed criteria 1, 2, 3 and 4 to about 50%. **3.** Performed criteria1 and 2 at 50%-3 and 4 well. **4.** Performed criteria 1, 2, 3 and 4 below 50%.			
	Criteria:	**C1.** Correct formation of the simple circuit	**C2.** Correct labels on the parts of the circuit	**C3.** All connections are in the right place including the switchcircuit	**C3.** All connections are in the right place including the switch
Rai James 16/07/16					
					-
17/08/16	Marking Code Criteria:				
19/09/16	Marking Code Criteria:				

Assessment Task Samples

Assessment Task sample: 4

Strand: Earth and Space **Reference:** Primary Grades, 3,4 & 5 Science Syllabus. **Page:**

Unit:	Weather and Climate
Content Standard	**4.3.2**
Performance Standards	**c.** Identify and describe examples of how weather affects human activities.
Assessment Task	**4.** Match the descriptions with correct pictures of the weather conditions. **Things to do:** **Teacher note that:** **1.** Prepare 2 worksheets a. Instruments, descriptions and weather condition. b. Concept map of human activities affected by weather condition. **2.** This can be done on A3 paper or butcher paper for the whole class
Assessment Criteria	1. Match descriptions with the pictures of the weather conditions correctly. 2. Correctly complete flow chart on how weather affects human activities.
Assessment Method	**Work sample**
Recording & Reporting Method	**Anecdotal notes**

Assessment Task: 4

Activity 2: Fill the empty boxes with the correct missing ideas.
Missing ideas: Destroy man's road and homes, Man's garden dries up food crop affected, fishing in the rivers.

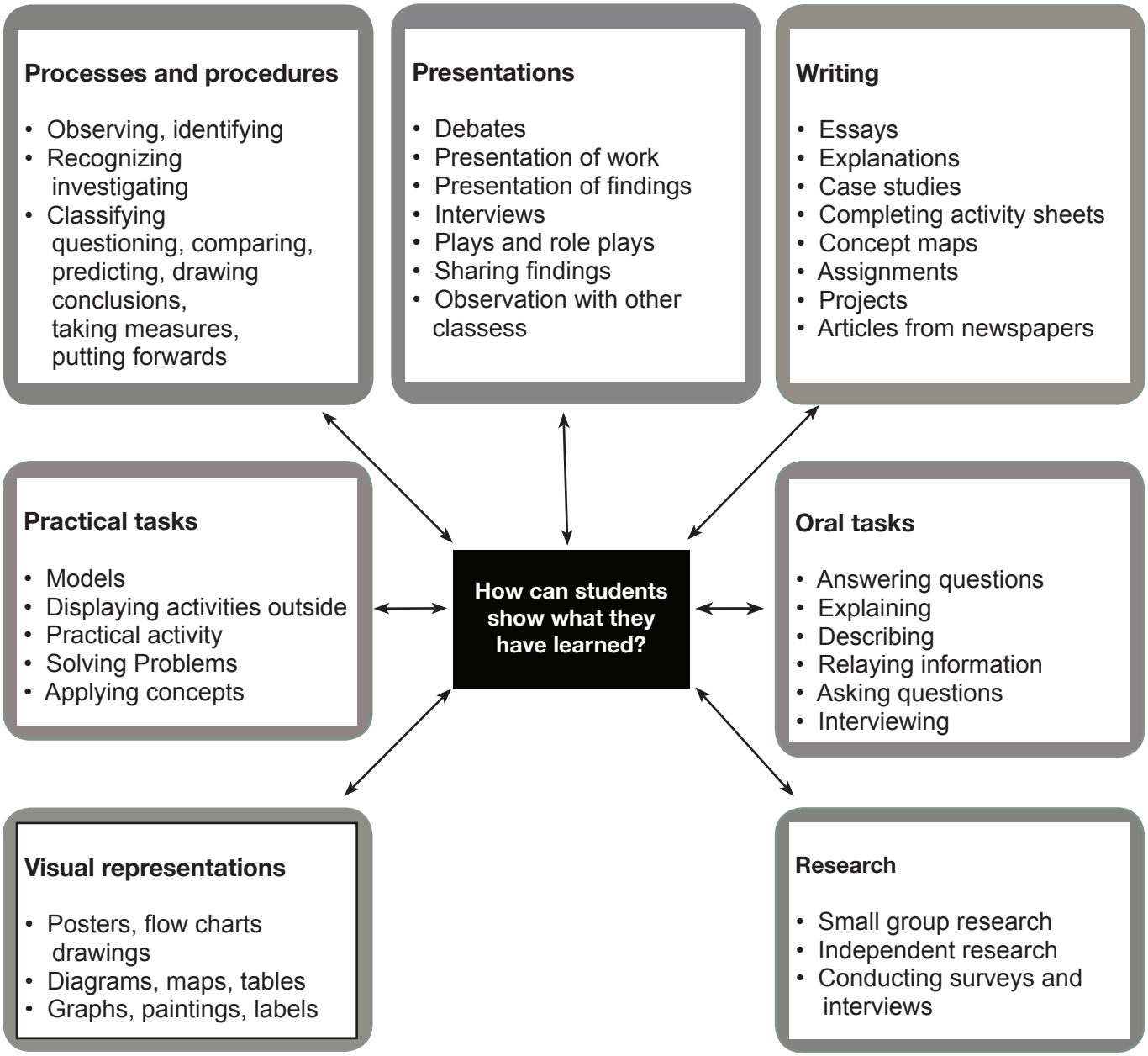
Sample: Anecdotal Notes – Class Grid 4A

Record the dates of assessment tasks write comments on the performance observed as per the criteria given. One box is for a student. This same grid can be used for a term depending on the type and number of assessment tasks prepared

Ceevee 3/7/16 • Competent in achieving the criteria for worksheet 1& 2.	**Fredie**	**Molly**	**Banny**	**Lexie**	**Trekie**	**Meki**	**Mimila**
Lucy 3/7/16 • Had problem matching	**Tatianna**	**Gabriella**	**Martha**	**Kevin**	**John**	**Manu**	**Gilbert**

Recording, reporting and evaluating

Assessment is an integral part of students learning and can be demonstrated in many ways. Below are some of these ways.



Resources

Strand: **Life**		
No	**Teacher Resources**	**Student Resources**
1.		Life Cycle of Plants Chart
2.		Life cycle of Animals Chart- Butterfly, Dog, Fish, Frog and Chicken
3.		Chart with pictures of common plants in Papua New Guinea
4.		Skeletal and Muscular system chart
5.		Different joints of the human body chart
6.		Chart containing pictures of the environment with people
		Chart containing pictures of animals in different habitats

Strand: **Physical Science**		
No	**Teacher Resources**	**Student Resources**
1.		Chart of Sound as Energy
2.		Chart with pictures of circuit, conductors and non-conductors of electricity
3.		Chart with the six types of simple machines – Lever, pulley, inclined plane, screws, wheel and axle and wedges.
4.		Chart with properties of Air
5.		Chart with Physical and Chemical change examples
6.		Chart with pictures of different weather instruments.
7.		Charts with different situations where force is applied to change position of an object, change shape and direction of an object and objects at rest
8.		Chart with examples of pulley, lever and inclined plane and their descriptions/functions
9.		Chart of different matter according to their shapes, colours and sizes

10.		Chart with diagrams of sieving method and filtration method of separating mixtures

Strand: **Earth and Space**		
No	**Teacher Resources**	**Student Resources**
1.		Plant Growth Chart
2.		Reproduction process of animals chart -
3.		Chart with different adaptations
4.		Three States of Matter Chart
5.		Simple machine Chart
6.		Chart with the diagrams showing the movement of the Sun.

Glossary

Words	Definitions
Air	The invisible mixture of gases (such as nitrogen and oxygen) that surrounds the Earth and that people and animals breathe.
Boiling point	The process by which a substance moves from the liquid state to the gaseous state is called boiling. The temperature at which a liquid begins to boil is called the boiling point.
Chemical change	A chemical change is a change in which a new kind of matter is being made. Chemical changes occur when a substance combines with another to form a new substance.
Chemical property	A chemical property is a property of matter that can only be observed when matter is changed into another new kind of matter.
Classify	To group things based on common characteristics
Compare	To identify similarities and differences between objects, concepts or processes
Condensation	Condensation is the process where the water vapor in the air condenses from a gas, back to liquid form.
Conductor	Materials that allow electricity to flow easily. Most types of metals are good conductors.
Construct	To put a set of components together, based on a given plan.
Describe	To state in words (using diagrams where appropriate) the main points of a topic.
Differentiate	To identify the differences between objects, concepts or process
Discuss	To reflect on and explore a topic in speech or writing
Echo	a sound or sounds caused by the reflection of sound waves from a surface back to the listener:
Electric circuit	Electric circuit is like a pathway of made of wires that electrons can flow through.
Electric current	Current is the flow of an electric charge. Current flows through a circuit when a voltage is placed across two points of a conductor.
Evaporation	Evaporation is the process where liquids change to gas or vapor.
Frequency	The frequency of sound is the number of vibrations in a given unit of time.
Fruit	It is the edible part of the plant that contains the seeds.
Germination	The seed coat splits. A tiny root grows downwards and a shoot grows upwards. This produces a seedling of a plant, which ultimately grows into a new plant.
Hatch	To come out of an egg.
Identify	To select and /or name the object, event, concept or processes.
Inclined plane	An inclined plane is a ramp that assists moving heavy objects up and down heights. It is a plane surface set an angle, other than a right angle, against a horizontal surface.
Incubate	To maintain (as eggs, embryos of animals) under prescribed and usually controlled conditions (temperature) favorable for hatching.
Infer	To draw conclusions based on observations .
Insulator	Materials (such as rubber or glass) that do not conduct heat or electricity.
Investigate	To find out by carrying out experiments .
Lever	The lever is a stiff bar that moves about a fixed point (fulcrum). It is a simple machine that is used to push, pull, or lift things.
Life cycle	The stages a living thing goes through during its life.
List	To give a number of points or items without elaboration.

Glossary

Words	Definitions
Manipulate	To control an object in order to explore and discover its behaviour .
Measure	To obtain a reading from a suitable measuring instrument.
Melting point	When solid begins to change from a solid state to liquid state. The temperature at which melting occurs is the melting point of the substance.
Moon's phases	The phases of the moon are the different ways the Moon looks from Earth over about a month. The phase or the shape of the moon depends upon on its position in relation to the Sun and the Earth.
Muscular system	The muscular system consists of the muscles associated with tendons. It is to aid in movement.
Observe	To obtain information through the use of senses .
Physical change	A change from one state (solid, liquid, gas) to another without a change in chemical composition. A physical change in a substance does not change what the substance is.
Physical property	Properties that we can observe using our senses without changing the matter.
Pitch	The pitch is simply the rate at which the vibrations are produced. The pitch of a sound is determined by the rate of vibration, or frequency of the sound wave.
Precipitation	The process where water falls from the clouds (sky) and reach the ground in the form of drizzle, rain, snow and hail.
Pulley	A wheel that has a rope wrapped around it. Pulleys can be used to lift heavy objects by changing the direction or amount of the force.
Recognise	To identify facts, characteristics or concepts that are critical to the understanding of a situation, event, process or phenomenon
Relate	To identify and explain the relationships between objects, concepts or process
Screw	An inclined plane wrapped around a cylinder or cone. A common use of the screw is to hold objects together.
Seed	A tiny developing plant that is enclosed in a protective coat usually along with a supply of food that is able to develop under suitable conditions into a plant.
Seedling	A young plant that is grown from seed.
Skeleton system	Structure of the body, consisting of bones and other connective tissues, which protects and supports the body tissues and internal organs.
Soil pollution	When human introduce harmful objects, chemicals or substances, directly or indirectly into the soil in a way that causes harm to other living things or destroys soils.
Sound	Sound is a form of energy produced and transmitted by vibrations.
State	To give a concise answer with little or no supporting argument
States of matter	All matter exists as solids, liquids, or gases. These are called the states of matter. Matter can change from one state to another if heated or cooled.
Vibration	The action of moving or causing to move back and forth or from side to side very quickly. As a result vibration forms sound.
Water cycle	Water cycle is defined as continuous cycle of in which water changes water vapor in the atmosphere to liquid water through condensation and precipitation and then back to water vapor through evaporation.
Water vapor	A substance (water) in the form of gas. It is formed when water reaches the boiling point 1000C.
Weather	Weather is the day to day conditions of the atmosphere (or air) in a particular place.
Wedge	A wedge is made up of two inclined planes. These planes meet and form a sharp edge.
Wheel and axle	Wheel and axle uses a wheel with a rod attached in the middle as an axle to help it to lift or move loads. For example, a bicycle.

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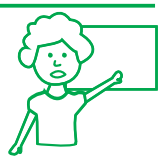
Appendix - Guided Lesson Template

1. GUIDED LESSON TEMPLATE



Strand: _____ **Unit:** _____
Topic: _____
Content Standard: _____
Lesson Title: _____

Objective: By the end the lesson the student will be able to:
- _____

Key concepts
- _____
- _____
- _____

Knowledge, Skills, Attitudes and Values (KSAV)

Skills	Attitudes	Values

Materials/Reference:

Teachers Notes:
Introduction:

_____
_____

Body:

_____
_____

Teachers Activities

_____
_____

Students Activities

_____
_____

Conclusion:

_____

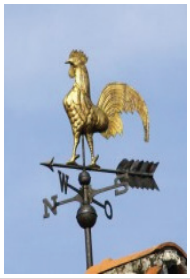
Evaluation:

_____
_____

Appendix

Measuring Weather Instrument Worksheet

Match the instrument with its function

Instrument	Function
Wind Vane 	It is a container with an opening at the top so that it collects rain or other precipitation that fall into it
Rain gauge 	It is used to measure wind speed. The cups catch the wind, turning a dial attached to the instrument. The dial shows the wind speed.
Thermometer 	It is used to determines the direction from which the wind is blowing.
Anemometer 	It is used to measure the temperature. Temperature is how hot or cold something is