South Sudan

Primary Science 4

Primary Science has been written and developed by Ministry of General Education and Instruction, Government of South Sudan in conjunction with Subjects experts. This course book provides a fun and practical approach to the subject of Science, and at the same time imparting life long skills to the pupils.

The book comprehensively covers the Primary 4 syllabus as developed by **Ministry of General Education and Instruction.**

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The Teacher's Guides provide:

- Full coverage of the national syllabus.
- A strong grounding in the basics of Science.
- Clear presentation and explanation of learning points.
- A wide variety of practice exercises, often showing how Science can be applied to real-life situations.
- It provides opportunities for collaboration through group work activities.
- Stimulating illustrations.

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Primary Science Teacher's Guide 4

South Sudan

Primary Science 4

Teacher's Guide

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South Sudan

PRIMARY 4

Science

Teacher's Guide

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FOREWORD

I am delighted to present to you this Teacher's Guide, which is developed by the Ministry of General Education and Instruction based on the new South Sudan National Curriculum. The National Curriculum is a learner-centered curriculum that aims to meet the needs and aspirations of the new nation. In particular, it aims to develop (a) Good citizens; (b) successful lifelong learners; (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society. This textbook, like many others, has been designed to contribute to achievement of these noble aims. It has been revised thoroughly by our Subject Panels, is deemed to be fit for the purpose and has been recommended to me for approval. Therefore, I hereby grant my approval. This Teacher's Guide shall be used to facilitate learning for learners in all schools of the Republic of South Sudan, except international schools, with effect from 4th February, 2019.

I am deeply grateful to the staff of the Ministry of General Education and Instruction, especially Mr Michael Lopuke Lotyam Longolio, the Undersecretary of the Ministry, the staff of the Curriculum Development Centre, under the supervision of Mr Omot Okony Olok, the Director General for Quality Assurance and Standards, the Subject Panelists, the Curriculum Foundation (UK), under the able leadership of Dr Brian Male, for providing professional guidance throughout the process of the development of National Curriculum, school textbooks and Teachers' Guides for the Republic of South Sudan since 2013. I wish to thank UNICEF South Sudan for managing the project funded by the Global Partnership in Education so well and funding the development of the National Curriculum, the new textbooks and Teachers' Guides. I am equally grateful for the support provided by Mr Tony Calderbank, the former Country Director of the British Council, South Sudan; Sir Richard Arden, Senior Education Advisor of DfID, South Sudan. I thank Longhorn and Mountain Top publishers in Kenya for working closely with the Ministry, the Subject Panels, UNICEF and the Curriculum Foundation UK to write the new textbooks. Finally, I thank the former Ministers of Education, Hon. Joseph Ukel Abango and Hon. Dr John Gai Nyuot Yoh, for supporting me, in my role as the Undersecretary, to lead the Technical Committee to develop and complete the consultations on the new National Curriculum Framework by 29 November 2013.

The Ministry of General Education and Instruction, Republic of South Sudan, is most grateful to all these key stakeholders for their overwhelming support to the design and development of this historic South Sudan National Curriculum. This historic reform in South Sudan's education system is intended to benefit the people of South Sudan, especially the children and youth and the future generations. It shall enhance the quality of education in the country to promote peace, justice, liberty and prosperity for all. I urge all Teachers to put this textbook to good use.

May God bless South Sudan. May He help our Teachers to inspire, educate and transform the lives of all the children and youth of South Sudan.

Deng Deng Hoc Yai, (Hon.)
Minister of General Education and Instruction, Republic of South Sudan

Table of content

Introduction

Book organisation

This teacher's guide is organised into two main sections part 1 is the general introductionn section detailing information on competence based curriculum and pedagogical issues.

The main elements of Part 1 are:

- **Background in formation** to the new curriculum - It gives a brief overview of the general requirements of the new South Sudan competence-based including the guiding principles, the competences the students are expected to acquire, crosscutting issues to be addressed during learning.
- **Basic requirements for an effective Science lesson**- It highlights the teacher and learner's roles for effective teaching and learning of Science, teaching and learning resources, grouping learners for learning and teaching methods

Part 2 provides a topic-to-topic guide to the teacher on how to facilitate learners to acquire the knowledge, skills and attitudes envisaged in each unit. This part is therefore structured into units.

The main elements of each unit guide are:

- **Unit heading**
- **Unit syllabus**
- **Contribution to learner's competences**: The section explains how the unit/topic will facilitate the learner to acquire to the specified competences. These competences will be discussed in detail later in the next section.
- **Cross cutting issues to be addressed**

  The section outlines the specific cross cutting issues that will be addresses through infusion as the learners do the activities and interacts with concepts planed for the unit This is meant to make the teacher conscious on and be on the look out for suitable opportunities through out the teaching and learning process in the entire unit to address the cited cross cutting issues. These issues will be discussed in detail later in this section.

Note: a unit or topic may not necessarily address all the cross cutting issues outlined in the curriculum

- **Intoduction to the unit -** This section outlines key knowledge, skills attitudes and values that learners need to have acquired earlier that will facilitate easier acquisition of the new knowledge, skills attitudes and values envisaged in this unit. It also guides the teacher on how to find out that the learners posses them before they start learning the concepts in this unit, and how to help learners in case they do not posses them.

- **Suggested teaching and learning activities-** This section provides guidance to the teacher on how to facilitate students to learn by doing the activities outlined in the student's book. It also guides the teacher on how to assess the learning.

Background Information on the new curriculum

The aim of the South Sudan Competence-based Curriculum is to develop in the learners competences that will enable them interact with the environment in more practical ways.

It clearly defines the knowledge, skills and attitudes that the learner should acquire by doing the specified learning activities.

a. Learner's competences to be attained

Competencies are statements of the characteristics that learners should demonstrate, which indicate they have the ability to do something to the required level of performance. The following are the four competencies envisaged in this curriculum:

1. Critical and creative thinking

Science lessons and activities facilitate learners to acquire these competences by giving then opportunities to:

- Plan and carry out investigations, using a range of sources to find information.
- Sort and analyse information and come to conclusions.
- Suggest and develop solutions to problems, using their imaginations to create new approaches.
- Evaluate different suggested solutions.

2. Communication

Science lessons and activities facilitate learners to acquire these competences by giving then opportunities to:

- Read and comprehend critically a variety of types and forms of texts during research activities.
- Write reports on scientific investigations and activities.
- Speak clearly and communicate ideas and science related information coherently.
- Listen and comprehend scientific facts presented by fellow classmates, group members, teachers and resources persons.
- Use a range of media, technologies and languages to communicate messages, ideas and opinions.

3. Cooperation

Science lessons and activities facilitate learners to acquire these competences by giving then opportunities to:

- Work collaboratively towards common objectives when doing activities.
- Be tolerant of others and respectful of differing views, when working together.
- Adapt behaviour to suit different situations.
- Negotiate, respect others' rights and responsibilities, and use strategies to resolve disputes and conflicts.
- Contribute to environmental sustainability.

4. Culture and identity

Science lessons and activities facilitate learners to acquire these competences by allowing them to:

- Take pride in South Sudanese identity and the diverse nature of South Sudanese society.
- Build understanding of South Sudanese heritage in relation to the wider world.
- Appreciate and contribute to the development of South Sudanese culture.
- Value diversity and respect people of different races, faiths, communities, cultures, and those with disabilities.

(b) Cross-cutting issues to be addressed during learning

These are issues that are of high national priority and hence have been incorporated in the learning process. The three cross-cutting issues for that should be addressed through the teaching/learning process are:

1. Environment and sustainability

A well-conserved environment is obviously key to our health and survival. It is therefore important for the Science teacher to make use of the opportunities that arise in the process of teaching and learning Science through activities to sensitise learners on the importance of conserving the environment. One way is by ensuring that the learners always dispose off the waste materials at the end of an activity in ways that do not ***pollute the environment.***

2. Peace education

Peace is critical for a society to flourish and for every individual to focus on personal and national development.

The Science teacher needs to be in the fore front in educating his/her students on the need for peace, for example by encouraging group work in the learners activities and showing the them ways of solving peacefully interpersonal problems that occasionally arise during interactions and discussions.

3. Life Skills

Learners need to progressively acquire some skills abilities and behaviors that will help them effectively deal with the events a nd challenges of every day life . Such skills include first aid, communication skills, conflict resolution, basic ICT skills etc. The Science teacher should as much as possible facilitate the learners to acquire these skills whenever an opportunity arises in the lesson execution

Basic requirements for an effective Science lesson

Teacher's role and basic skills for effective Science lesson

The teacher is the most important resource for an effective. Science lesson. (a) Some of the key roles of the Science teacher include:

- Organising the classroom to create a suitable learning environment.
- Preparing appropriate materials for learning activities.

- Engaging students in variety of learning activities.
- Encouraging and accepting student autonomy and initiative.
- Allowing student responses to drive lessons, shift instructional strategies,
- Familiarizing themselves with learners understandings of concepts before sharing their own understandings of those concepts.
- Encouraging learners to engage in dialogue, both with the teacher and one another.
- Engaging students in experiences that pose contradictions to their initial hypotheses and then encouraging discussion.
- Providing time for learners to construct relationships and create metaphors.
- Using a variety of teaching and assessment methods.
- Adjusting instructions to the level of the learner.
- Nurturing learners' natural curiosity.
- Motivating learners to make them ready for learning.
- Coordinate learners' activities so that the desired objectives can be achieved.
- Assessing learners' activities and suggest solutions to their problems.
- Assist learners to consolidate their activities by summarising the key points learnt.

(b) Some of the key skills that the Science teacher should have include:

- Creativity and innovation.
- Makes connections/relations with other subjects.
- A high level of knowledge of the content.
- Effective disciplining skills manage adequately the classroom
- Good communicator.
- Guidance and counselling.

Learner's role in learning Science

Learning takes place only when the learner acquires the intended knowledge, skills and attitudes. As such, learning is a highly personal and individual process. Thus, a learner must be actively engaged in the learning exercise.

For active participation in learning, the learner should:

- Raise questions about what is observed.
- Suggest solutions to the problems observed.
- Take part in planning investigations with appropriate controls to answer specific questions.
- Carry out investigations to search for answers with the help of materials in search of patterns and relationships while looking for solutions to problems.
- Working collaboratively with others, communicating their own ideas and
- Considering others' ideas.
- Expressing themselves using appropriate Science terms and representations in writing and talk.
- Engaging in lively public discussions in defence of their work and explanations.
- Applying their learning in real-life contexts.
- Reflecting critically about the processes and outcomes of their inquiries.

Teaching and learning resources

These refer to things that the teacher requires during the teaching process. They include:

- The classroom
- Textbooks
- Wall charts and wall maps
- Materials and apparatus
- Various tools and equipment
- Science models

- Resource persons
- Firms such as hydroelectric power stations, engineering firms among others

Learning environment

A Classroom generally refers to the place where learning takes place. Learners learn from everything that happens around them, such as the things that they hear, see, touch, taste, smell and play with.

(a) Classroom organisation

- It is important for the teacher to make the classroom an attractive and stimulating environment. This can be done by:
- Carefully arranging the furniture in the classroom in an organised way. to allow free movement of learners and the teacher.
- Putting up learning and teaching aids on the walls. Examples are wall charts, pictures and photographs.
- Displaying teaching models.
- Providing objects for play for example toys.
- Having a display corner in the classroom where learners display their work.
- Setting a corner for storing materials so as not to obstruct learners or distract them.
- Spreading out the learners evenly so that they do not interfere with one another's activities.
- Setting up the materials for the series of lessons or activities going on for a number of days or weeks in a location where they do not interfere with other daily activities.
- Organizing the sitting arrangement such that learners face the lighted areas of the room.
- Choosing the most appropriate location for the teacher and the chalkboard such that they are visible to all learners and the teacher has a good view of all learners in the class.

(b) Apparatus and materials

For learners to study Science through the activity method, a number of materials and apparatus are required. The important role played by materials in learning

has been felt for centuries. This is noted for instance in the old Chinese proverb that says:

When I hear I forget

When I see I remember

When I do I understand

Since Science is highly practical subject, materials help the teacher to convey his/ her points, information or develop skills simply and clearly, and to achieve desired results much faster.

Some of the materials that a teacher requires for Science activities and calculations can be collected from the local environment.

Many others can be improvised while some have to be purchased. Whether collected, improvised or purchased, there are certain materials that are valuable to have around almost all the time.

These include:

(i) Science Kit

A science kit is a special box containing materials, apparatus and equipment necessary to conduct an array of experiments. The content of the Science kit depends on the curriculum requirements per level. Most science kits are commercially available and target particular levels of learners. However, the teacher is encouraged to come up with a kit based on the syllabus requirement

(ii) Models

A model refers to a three-dimensional representation of an object and is usually much smaller than the object. Several models are available commercially in shops. Examples of Science models include models of electric motors, hydraulic systems among others. These models can be purchased by schools for use during Science activities.

(iii) Resource persons

A resource person refers to anybody with better knowledge on a given topic area. Examples include health practitioners such as doctors, nurses and laboratory technologists, agricultural extension officers, environmental specialists among others. Depending on the topic under discussion, the teacher can organize to invite a resource person in that area to talk to learners about the topic. The learners should be encouraged to ask as many questions as possible to help clarify areas where they have problems.

(iv) Improvisation

If each learner is to have a chance of experimenting, cheap resources must be made available. Complicated apparatus may not always be available in most schools. Such sophisticated equipment made by commercial manufacturers are usually expensive and majority of schools cannot afford them. The teacher is therefore advised to improvise using locally available materials as much as possible.

(vi) Scheduling learning activities and venues

Some of the activities suggested in the student's good planning and scheduling in order to get accurate results. The teacher should therefore think ahead while making the scheme of work so that the prevailing weather pattern and the most appropriate timing are considered..

Grouping learners for learning activities

Most of the Science activities suggested in the student's book are carried out in groups and therefore the teacher should place 2 or 3 desks against each other and then have a group of learners sitting around those desks.

In certain activities, the teacher may wish to carry out a demonstration. In this case, the learners should be sitting or standing in a semicircle, or arranged around an empty shape of letter "U" such that each learner can see what the teacher is doing clearly and without obstruction or pushing. If the learners are involved in individual work, each learner can work on the floor or on the desk or a portion of the desk if they are sharing. In this case, they need not face each other.

Grouping learners for learning has increasingly become popular in recent years. In fact, the shift from knowledge-based to competence curriculum will make grouping the norm in the teaching process.

Learning grouping can be formed based one or a number of the following considerations:

- Similar ability grouping
- Mixed ability grouping
- Similar interests grouping
- Common needs grouping

- Friendship grouping
- Sex-based grouping

Grouping learners in a Science class has several advantages that include:

- The individual learner's progress and needs can easily be observed.
- The teacher-learner relationship is enhanced.
- A teacher can easily attend to the needs and problems of a small group.
- Materials that were inadequate for individual work can now be easily shared.
- Learners can learn from one another.
- Cooperation among learners can easily be developed.
- Many learners accept correction from the teacher more readily and without feeling humiliated when they are in a small group rather than the whole class.
- Learners' creativity, responsibility and leadership skills can easily be developed.
- Learners can work at their own pace.
- The type of "grouping" that a teacher may choose may be dictated by:
- The topic or task to be tackled.
- The materials available.
- Ability of learners in the class (fast, average, slow).

Class size

There is no one method or approach to teaching that is appropriate to all lessons. A teacher should, therefore, choose wisely the method to use or a combination of methods depending on the nature of the topic or subtopic at hand.

Teaching methods

There are a variety of possible methods in which a teacher can help the learners to learn. These include:

(a) Direct exposition

(b) Discovery or practical activity

(c) Group, class or pair discussion

(d) Project method

(e) Educational visit/ field trips

(f) Teacher demonstration

(g)Experimentation/Research

The particular technique that a teacher may choose to use is influenced by several factors such as the:

- Particular group of learners in the class.
- Skills, attitudes and knowledge to be learned.
- Learning and teaching aids available.
- Local environment.
- Teacher's personal preference
- Prevailing weather condition.
- Requirements of Science syllabus

(a) Direct exposition

This is the traditional way of teaching whereby the teacher explains something while the learners listen. After the teacher has finished, the learners may ask questions. However, in a competence-based curriculum, this technique should be used very minimally.

(b) Guided Discovery

In this technique, the teacher encourages learners to find out answers to problems by themselves. The teacher does this by:

- Giving learners specific tasks to do.
- Giving learners materials to work with.
- Asking structure

or guided questions that lead learners to the desired outcome. Sometimes learners are given a problem to solve and then left to work in an open-ended manner until they find out for themselves.

This is the most preferred method of teaching in the implementation of competency- based curriculum.

(c) Group/class discussion or pair work

In this technique, the teacher and learners interact through question and answer sessions most of the time. The teacher carefully selects his/her questions so that learners are prompted to think and express their ideas freely, but along a desired line of thought. The method leads learners from the known to unknown in a logical sequence; and works well with small groups. The method boosts confidence in learners and improve interpersonal and communication skills.

The main disadvantage of this method is that some learners maybe shy or afraid to air their opinions freely in front of the teacher or their peers. It may give them more confident learners a chance to dominate the others.

(d) Project method

In this approach, the teacher organizes and guides a group of learners or the whole class to undertake a comprehensive study of something in real life over a period of time such as a week or several weeks.

Learners using the project method of studying encounter real life problems, which cannot be realistically brought into a normal classroom situation. A project captures learners' enthusiasm, stimulates their initiative and encourages independent enquiry. The teacher, using the project method, must ensure that the learners understand the problem to be solved and then provides them with the necessary materials and guidance to enable them carry out the study.

The main disadvantage of this method is that if a project is not closely supervised, learners easily get distracted and therefore lose track of the main objective of their study. Studying by the project method does not work well with learners who have little or no initiative.

(e) Educational visits and trips and nature walks

This is a lesson conducted outside the school compound during which a teacher and the learners visit a place relevant to their topic of study. An educational visit/nature walk enables learners to view their surroundings with a broader outlook that cannot be acquired in a classroom setting.

It also allows them to learn practically through first- hand experience. In all "educational visit/nature walk lessons", learners are likely to be highly motivated and the teacher should exploit this in ensuring effective learning. However, educational visits are time consuming and require a lot of prior preparation for them to succeed. They can also be expensive to undertake especially when learners have to travel far from the school.

(f) Demonstration lessons

In a demonstration, the teacher shows the learners an experiment, an activity or a procedure to be followed when investigating or explaining a particular problem. The learners gather around the teacher where each learner can observe what the teacher is

doing. It is necessary to involve the learners in a demonstration, for example by:

- Asking a few learners to assist you in setting up the activity.
- Requesting them to make observations.
- Asking them questions as you progress with the demonstration.

This will help to prevent the demonstration from becoming too teacher centred.

When is a demonstration necessary?

A teacher may have to use a demonstration, for example when:

- The experiment/procedure is too advanced for learners to perform.
- The experiment/ procedure is dangerous.
- The apparatus and materials involved are delicate for learners to handle.
- Apparatus are not enough for all learners or groups.

UNIT 1 Caring for our environment

Refer to learner's book pages 1-10

Learn about	Key inquiry questions
Learners should know about the importance of a clean environment and the impact and damage of a polluted environment on animals and plants (food chains and air quality). They should learn about the tools and chemicals (water) required to clean the school compound and how they work, and the safety and hygiene precautions required. They should carry out a survey of the immediate environment and classifying the types and amount of rubbish in terms of its material and chemical composition. They should work in groups to discuss choices of disposal, noting for example that burning creates smoke, and some rubbish is biodegradable and some not. They should learn of about ways reducing dangers of careless disposal of rubbish and sewage.	• How do we make and keep our environment clean? • Why do we keep our environment clean and tidy? • Why does some rubbish disappear naturally and not others? • Why do people admire a clean environment? • Why should we avoid careless disposal of rubbish and other wastes? • Why should we be aware of the impact of pollution on environment?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Know how to care for the environment.	• Observe and classify different types of rubbish • Collect and measure different types of rubbish • Record results and draw conclusions • Make recommendations to keep the environment clean	• Appreciate the importance of a clean environment

Contribution to the competencies:
Critical thinking: what is polluting the environment Co-operation and Communication: group discussions
Links to other subjects:
Social Studies: Environment Environment and Sustainability: sources of pollution

Introduction to the unit

This unit is about caring for our environment, specifically the school environment. Care and protection of the environment is a very broad subject touching on very many areas of our life such as food, health, economic and social activities and so on. It is therefore imperative that the teacher tries as much as possible to link this topic to other areas to be covered in the book such as the impact of a polluted environment to the survival of other animals in terms of food security and good health.

The activities suggested in the unit are simple but with the aim of helping learners know how to take care of the school environment and eventually appreciate the importance of a clean environment.

Competencies to be developed

1. Critical and creative thinking

This will be developed as learners investigate how to care for the environment.

2. Communication

This will be developed during group discussions and practical activities. This will help learners to improve on their language use as they discuss and present ideas on item tasks. Encourage learners to take part in discussions as well as answering of questions.

3. Co-operation

This will be developed as learners work harmoniously in groups. Encourage learners to work independently as well as co-operate with others and work in teams. Encourage them to be tolerant of others, to negotiate and respect

other's rights and responsibilities as well as to contribute to environmental sustainability

Cross cutting issues

1. Environmental awareness and sustainability

Environmental protection:This will be addressed as learners look at reasons for keeping our environmental clean. Encourage learners to protect their environment by always ensuring proper sanitation.

2. Life skills

This will be addressed as learners develop a caring attitude towards the environment.

Meaning new words

- **Biodegradable** – Waste which can be decomposeded by natural methods.
- **Disposal** – act of getting rid of or throwing away something.
- **Garbage** – another name for rubbish or dirt.
- **Gear** – A device, tool or what one is wearing.
- **Non-biodegradable** – wastes which cannot decompose and therefore they remain in the environment for a long time.
- **Overall** – a form of clothing with shorts and trousers joined together worn when one is working.
- **Waste** – something that is not needed or end product.

1.1: Importance of cleaning our surroundings

Refer to Learners Book page 1

Activity 1.1: Refer to Learner's Book page 1

Introduce the unit by making a link to what the learners have already learnt in the previous classes.

1. Ask Learners to look under their seats and the classroom floor, walls and windows.

2. Ask them to describe the state of the classroom – whether it is clean or dirty.
   a) Can your learners iedentify a clean envorionment?
   b) Can they distinguish between a clean and dirty environement?
3. Explain to them that their classroom is their immediate surrounding or environment.
4. Ask the learners to thinks about their home environments and say if their home compounds and its environment/surroundings are clean or dirty. Is there rubbish lying about or is rubbish disposed of in rubbish bins or rubbish pits? Are the floors in their houses kept clean?
5. Pair up the learners based on the requirements of inclusive education and guide them to study the pictures in Activity 1 in the Learner's Book.
6. Ask them guided activity questions provided in the Learner's Book and guide them in answering the activity questions as they discuss the differences between a dirty and a clean environment.
7. Display a chart of a clean and dirty environment you brought to class. Let the learners discuss them as you ask them probing questions such as:
   (a) What do you understand by the word "environment"?
   (b) How do you care for your surroundings at home and at school?
   (c) How will learning about caring for our surroundings environment help you?
   (d) What is the harm of staying in a dirty environment?
   (e) What diseases can be easily contracted in a dirty environment?
   (f) Why do we keep the environment clean and tidy?
8. Link up what you have discussed during the activity with the learning points in the Learner's Book and explain the importance of a cleaning our environment.
9. Write a chalkboard summary or what has been discussed in this lesson (main points only).
10. Ask the learners to research more on the environment, importance of keeping the environment clean and the possible harm caused by staying in a dirty environment.

Answers to Check your progress 1.1

Refer to Learner's Book page 1

1. It is safe and healthy
2. Papers, plastics, kitchen waste, glass, etc.
3. It is unsafe and unhealthy .

1.2: Tools for cleaning and their uses

Refer to Learner's Book page 2-4

Activity 1.2: Refer to Learner's Book page 2-3

Introduce learners to the lesson by ask them to look at the pictures of tools in Activity 2 in the Learner's Book.

1. Ask learners to look at and discuss the pictures of tools in Activity 2.
2. Ask them to name the tools depicted and state their uses.
    a) Can you learners correctly identify and name the tools and state their uses?
    b) Can they discuss how these tools are used and how they are important to the environment?
3. Explain to them that we clean our surroundings/environment using various tools.
4. Organise learners into small multi-ability groups and guide them to discuss the cleaning tools depicted in the pictures.
5. Assist them in their discussions by asking them probing questions such as:
    a) Have you seen these tools before?
    b) Which of these tools are found in your home?
    c) What are the names of these tools?
    d) How are these tools used?
    e) Which of these tools are used together? Examples: bucket and mop or duster, and rake and wheelbarrow.
    f) Can you state how these tools are important for the environment?

6. Let them name the tools and state their uses.
7. Display the set of tools that you brought to class and demonstrate how a tool or two is used.
8. Ask individual learners to come to the front of the class and demonstrate how some of the tools are used.
9. Using the facts from the learning points section of the Learner's Book, explain to the learners how various cleaning tools are used.
10. Write shorts summary points on tools and their uses on the chalkboard for the learners to copy.
11 Caution learners to be careful as some tools can be dangerous and should be handled with care.
12. Guide learners with special education needs appropriately.

Lesson assessment

Observation – Check if learners can identify tools for cleaning and their uses.

Product – learner should be able to use cleaning tools correctly.

Homework

Ask the learners to draw cleaning tools in their science notebooks.

Answers to Check your progress 1.2

Refer to Learner's Book page 3-4

1. (a) Slasher

   (b) It is used to clear grass and shrubs.

   (c) It keeps the grass and shrubs in the environment short and neat, thus preventing disease-carrying vectors such as mosquitoes and rodents.

2. Swept: floors, verandahs, corridors, etc.

   Mopped: floors, verandahs, corridors, etc.

   Dusted: desks, tables, window panes, etc.

(i) Rake – (b) school compound

(ii) Mop – (a) classroom

(iii) Wheelbarrow – (c) areas around the school

1.3: How to clean our environment

Refer to Learner's Book pages 4-6

Activity 1.3: Refer to Learner's Book page 4

1. Introduce the lesson by asking the learners to recall the names and uses of the tools they learnt about in the previous lesson. Ask them:
   (a) Can you name the tools we learnt about in the previous lesson?
   (b) Can you state the uses of each of the tools you have mentioned?
   (c) How are tools important to our environment?
   (d) What do you think would happen to the environment if we had no tools at all?
2. Divide the class into small, manageable multi-ability groups based on the requirements of inclusive education and allocate them an area they are going clean.
3. Explain to each group clearly what they are going to do.
4. Demonstrate to the learners how some of the tools are used.
5. You may teach them the following work song sung to the tune of ***Twinkle, twinkle little star***. Vary the activities done in the song depending on where the learners are cleaning, i.e., classroom, school compound and areas around the school.

Clean up

Clean up, clean up, clean up good,

Stop to clean up where you are,

Clean the classroom floors and walls,

Sweep the dirt and dust the desks,

Clean up, clean up, clean up good,

Everybody do your share.

6. Let the learners move to their cleaning area in an orderly manner.
7. Move from one group to the next as frequently as you can to observe and ensure that the learners are following the current steps and using the tools safely. Each one in the group must actively participate.
8. Allow the learners to sing as they work. This will motivate them to actively participate in cleaning. Allow them to be creative and use their own work phrases as long as it suits the cleaning activity they are doing at that moment. They can also use tunes associated with songs sung locally.

Answers to Check your progress 1.3

Refer to Learner's Book page 5

1. a) Classroom – Brooms, buckets, dustbin, mop, wiping cloth, hand brush (any three)
   b) School compound – Brooms, bucket, slasher, hoe, rake, wheelbarrows dustbin (any three)
   c) School surrounding – Brooms rake, dustbins, wheel barrow, spade (any three)
2. a) Rake – For gathering loose dirty/leaves.
   b) Bucket – For holding and carrying water
   c) Dustbin – For disposing rubbish
   d) Mop – For drying wet floors
3. a) Rake b) Bucket

Lesson assessment

Observation – observe each learner as they carry out the cleaning exercise.

Conversation – Listen to learners as they discuss on how and which tools to use when cleaning.

Product – learner should be able to use cleaning tools correctly.

1.4: Safety and hygiene when cleaning

Refer to Learner's Book page 6-8

- protective gear used during cleaning through explanation of concepts.

Activity 1.4: Refer to Learner's book page 6

1. Introduce the lesson by asking learners to study the two pictures in Activity 4 in the Learner's Book.
2. Ask learners questions such as:
   (a) What do you see on the picture?
   (b) What are your thoughts after seeing these pictures?
   (c) What can you say about how the people are dressed in the pictures?
   (d) If you were telling someone else about these pictures, what would you say to them about the pictures?
3. Give the time to discuss as a class and write their answers on the chalkboard.
4. Organise learners into multi-ability pairs and engage them to discuss the way the two people are dressed for handling garbage through the questions in the activity. Observe learners to ensure that each one of them actively participates.
5. Using the information given in the learning points section, explain to the learners why it is necessary to wear the appropriate protective gear/clothing when cleaning. Discuss with them the function of each protective gear.
6. Write short summary notes on the use of each protective gear for the learners to copy in their notebook.
7. Collect photographs of people who are engaged in different activities which entail the wearing of safety gears e.g., construction workers, power company employees, mechanics, policemen, e.t.c.
8. Show the learners the photographs you collected of people engaged in different activities which entail the wearing safety gears.
9. Let them discuss what the people in the photos are doing and given reasons why it is important for them to dress the way they are.

Lesson assessment

Conversation – Listen to learners as they discuss how to dress when cleaning.

Product – learner should be able to identify correct dressing when cleaning.

Homework

Ask the learners to draw some of the protective gear in their science notebooks.

Answers to Check your progress 1.4

Refer to Learner's Book page 7

1. Gumboots, goggles, dust mask, overalls, gloves, helmet.
2. a) Gumboots b) Gloves c) Goggles
3.

Safety gear	Function
a) Gumboots	Protects our feet from injury
b) Dust mask	Stops dust particles and bad smell from entering our mouths and nostrils
c) Overall	Protects our clothes from getting dirty
d) Goggles	Protects our eyes from injury

1.5: Proper disposal of different types of wastes

Refer to Learners's Book pages 8-10

Activity 1.5: Refer to Learner's book page 8

Introduce the lesson by reminding the learners about the need to wear safety gear while handling wastes as was discussed in the previous lesson.

This lesson should be best carried out when the school is just about to close and there are different types of wastes available in the school compound. Select an isolated part of the school where learners will not interfere with the rest of the school for doing the sorting. Sorting containers should also be sort for and labelled well in advance.

Lesson assessment

Give learners a written exercise. Ask them to do check your progress 1.4 from the Learner's Book.

Home work

Ask the learners to practise sorting of garbage into biodegradable and non-biodegradable wastes home before disposal.

Answers to Check your progress 1.5

Refer to Learner's book page 10

1. a) Biodegradable b) Non-biodegradable
2. Biodegradable wastes
3.

Biodegradable	Non-biodegradable
Rotten cabbages	Glass
Rotten mangoes	plastic bottles
Stale bread	Nails
Spoilt onions	Broken plastic plate

4. Manure
5. Recycling

UNIT 2 Grouping plants and animals, their conservation and food chain

Refer to learner's book page 11-37

Learn about	Key inquiry questions
Children should group animals according to their feeding habits by discussing how African animals are grouped as herbivores (plant eating animals), carnivores (flesh eating animals) and omnivores (animals that feed on flesh and vegetation). They should learn that animals feed on different types of food and they have specialist structures to eating specific types of food.eg dogs have sharp canines that enable them to tear flesh and goats have teeth that enable them to cut and chew on vegetation. Some insects bite, some chew and others suck up liquid food. Birds have different beaks depending on the food they eat. They should learn how animals depend on each other for food, and the idea of interdependence of living organisms. Children should learn about ways of conserving plants and animals and why it is important to conserve the food chain. They should learn about taking care of flowers in the school compound and visit national parks, farms or zoos to observe how animals are kept. They should learn about the idea of climate change and how this is effecting plants and animals.	• How do we group animals according to their feeding habits? • How do organisms depend on each other? • How do we conserve plants and animals? • Why do we conserve plants and animals? • What are the dangers of the destroying forests and killing wild animals and what is the impact on human life?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Understand the feeding habits of animals • Understand how the food chain operates	• Observe carefully the similarities and differences between animals • Group animals according to their feeding habits • Record observations in drawing and writing • Find patterns in records • Predict what food an animal might eat	• Appreciate the importance of conservation of animals and plants.
Contribution to the competencies: Critical thinking: understanding ways of conserving plants and animals Co-operation and Communication: performing activities		
Links to other subjects: Agriculture: animal husbandry and crop production Social Studies: wild life conservation Environment and Sustainability: interdependence		

Introduction to the Unit

All animals obtain their food from their natural surroundings or their immediate habitat. In order to do this effectively, they have developed certain characteristics and features which enable them to succeed in their quests to obtain and utilise the food adequately. This unit will assess the characteristics and adaptations in different animals, birds and insects and how each category of the animals is grouped according to their feeding habits. In addition, the unit introduces conservation of

plants and animals, and the effects of climate change on plants and animals. All the lessons are introduced by a way of practical activities which will mostly be out of the classroom and therefore you are advised to prepare well and in good time to minimise time wastage. This early preparation will entail grouping learners well before the lesson, identifying places to be visited to get maximum results and assembling the required materials in advance.

Cross-cutting issues

1. Environmental awareness and sustainability

This unit will make the learners aware of the animals and plants found in their local environment and how they depend on each other through the study of food chain. It will also enable them to appreciate the importance of conserving both animals and plants.

2. Life skills

This unit will equip the learners with the critical thinking and decision making skills that will enable them to take initiative to conserve animals and plants in their environment.

3. Peace and values education

Through the study of interdependence of animals and food chain, the learners will see the importance of all plants and animals in the ecosystem. This will promote in them the desire to protect and sustain all the components of the environment since each plays an integral part. It will also instill in them the desire to co-exist and leave in peace among each other.

Core competencies

1. Cooperation

Encourage learners to work as a team through group discussions and pair work. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resource sharing and exchange of ideas in relation to grouping plants and animals, their conservation and food chain. The principle of cooperation should be listening actively to understand but not listening to respond. All learners should be given equal opportunities.

2. Communication

During group discussion and pair in relation to grouping of plants and animals and interdependence of living organisms, encourage learners to share their opinions,

suggestions and ideas freely. This way they will build on their language command as well as ability to participate effectively in discussions. Ask them questions and give them a chance to attempt answering the questions in the simplest way possible. This way, they will build on their confidence and soon develop the love and passion for the subject. Allow some room for learners to make mistakes and then correct them in a nice, positive way lest they will feel demoralised.

3. Critical and creative thinking

Use probing questions during the lessons to elicit critical thinking in learners. Help them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Use videos, pictures and photographs to make learners discuss the activities therein. Ask learners to come up with diagrams that illustrate learning aspects. This encourages creativity.

New words in the unit

- **Browsers** – herbivores that feed on leaves, branches and twigs.
- **Carnivores** – animals which feed only on meat or flesh of other animals.
- **Chew cud** – to bring up food from the stomach and chew it again.
- **Climate change** – adverse changes in the weather conditions.
- **Conservation** – protection for future use.
- **Food chain** – a feeding relationship between animals and plants.
- **Grazers** – animals which graze (feed on) on grass and pasture.
- **Habitat** – natural living place of an animals or a plant
- **Herbivores** – animals which feed only on plants and plant materials.
- **Interdependence** – the dependence of one person or one living thing upon another.
- **Non-ruminant** – an animal that does not chew cud.
- **Omnivores** – animals which feed on both plants and meat (or flesh).
- **Organism** – a living thing, for example, a plant or an animal.
- **Predator** – an animal that primarily obtains food by killing and consuming other animals.
- **Prey** – an animal which is hunted and killed for food by a predator.

- **Proboscis** – long, piercing, needle-like mouth of an insect.
- **Ruminant** – an animal which chews cud.

2.1 Grouping animals according to their feeding habits

Activity 2.1

Refer to Learner's Book page 11

Sit beside your learners or walk around the classroom to observe learners as they discuss and group animals according to their feeding habits. This will enable you to gain a great deal of insight into your learners by watching them at work. Watch out for frustration (a learner is unable to do the work independently) and boredom (the learner may not be challenged by the content). Engage learners in a discussion to assist them to actively participate in grouping animals according to their feeding habits. Discussions make learning more interesting and learners are often more motivated when they are actively involved in using the course material. Ask your learners probing questions on grouping animals according to their feeding habits to develop their critical thinking on the topic and to stimulate independent learning. Unlock your learners' understanding of grouping of animals according to feeding habits through explanation and clarification of facts and concepts.

Activity 2.2: Herbivores

Refer to Learner's Book page 12.

In this activity, monitor your learners' interactions as they discuss and name examples of herbivores. Plan and write down the questions to be used in a lesson, and anticipate possible learners' responses, especially partially correct or incorrect ones. Ask questions on herbivores and allow learners to work together to determine the answers and report them. As learner work to discover the answers on their own, they remember the concepts better and more fully. Guide learners to take turns to carry out classroom discussions on herbivores and their feeding adaptations. This will enable you to assess their knowledge and discover which learners grasp the concepts and to what extent. Guide learners to work together to discuss and name examples of herbivores. Provide learners with chats showing pictures of different herbivores If possible, visit a nearby butcher with the learners and ask the butcher to show the learners a head of a cow, sheep or goat to observe. Let the learners open wide and observe the mouth, and try to identify the teeth. Use these questions as guidelines:

a) How many types of teeth can you see?

b) Can you feel the incisors? Are their edges blunt or sharp?

c) How are the teeth adapted to their functions?

d) Can you identify the toothless gap between the incisors and premolars?

Using the information in the learning points section in the Learner's Book, explain to the learners the differences in feeding methods of a grazer and a browser, giving specific examples.

Lesson assessment

Ask learners to answer questions in check you progress 2.1 in the Learner's Book.

Answers to check your progress 2.1

Refer to learner's book page 14-15

1.

Browsers	Grazers
Elephants	*Cows*
Goats	*Gazelles*
Giraffes	*Sheep*

2. (a) False (b) False (c) True (d) False

NB: Ruminants are animal that chew cud; they chew again what has been swallowed.

3. lower

4. Molars and premolars

Activity 2.3 Carnivores

Refer to Learner's Book page 15

In this activity make learners to be in different groups, monitor your learners' interactions as they discuss and name examples of carnivores. Ask questions on carnivores and allow learners to work together to determine the answers and report them. As learner work to discover the answers on their own, they remember the concepts better and more fully. Guide learners to take turns to carry out classroom discussions about carnivores and their feeding adaptations. This will enable you to assess their knowledge and discover which learners grasp the concepts and to what extent. Unlock your learners' understanding of carnivores and their feeding adaptations through explanation and clarification of facts and concepts. Prepare a chat or collect pictures of different carnivores or a CD documentary showing how carnivores hunt their food.

Answers to check your progress 2.2

Refer to learner's book page 17

1. A
2. Lions, cheetahs, leopards (accept any other correct answers listing carnivores)
3. C
4. D
5. Flesh
6. Canines and claws
7. (a) Cow (b) Giraffe (c) Man
8. (a) True (b) False (c) True

Activity 2.4 Omnivores

Refer to Learner's Book pages 18

In this activity make learners to be in different groups and let them choose a leader among themselves. Monitor your learners' interactions as they discuss and name examples of omnivores. Plan and write down the questions on omnivores to be used in a lesson, and anticipate possible learners' responses, especially partially correct or incorrect ones. Ask questions on omnivores and allow learners to work together to determine the answers and report them.As learner work to discover the answers on their own, they remember the concepts better and more fully. Unlock your learners' understanding of omnivores and their feeding adaptations through explanation and clarification of facts and concepts. Provide learners with materials like chats of omnivorous, Real food such as oranges and video clips on omnivores feeding habits to enhance their study.

Lesson assessment

Ask the learners to answer the question in check your progress 2.3 in the Learner's Book.

Homework

Ask learners to collect pictures of omnivores from old newspapers and magazines, and bring to school. Pin them in the curiosity corner in the classroom.

Answers to check your progress 2.3

Refer to learner's book page 19

1. a) Grasping

   b) Incisors, canines, molar and premolar

   c) Incisors - biting

      Canines - tearing

      Molar and premolar - grinding

2. Goat

Activity 2.5 Birds

Refer to Learner's Book pages 20

This activity involves studying birds or aves. Guide your learners' interactions as they name examples of birds that they know, and discuss the food they eat and birds' adaptations to feeding. Write down the questions on birds and their feeding habits to be used in a lesson, and anticipate possible learners' responses, especially partially correct or incorrect ones. Ask questions on birds, the food they eat and their feeding adaptations, and allow learners to work together to determine the answers and report them. Guide learners to take turns to carry out classroom discussions about birds and their feeding adaptations. This will enable you to assess their knowledge and discover which learners grasp the concepts and to what extent.

Provide a better knowledge to your learners' understanding of bird and their feeding adaptations through explanation and clarification of facts and concepts. Collect pictures of different birds and prepare index cards or flashcards with bird pictures.

Introduce the lesson by reminding learners of what they learnt in the previous lesson on the feeding habits of omnivores. Ask learners to remember the basic attributes of carnivores, omnivores and herbivores and state how they think these attributes apply to birds, who do not have teeth or hooves. Have them think of a hawk and a duck if they need some prompting.

- Carnivores eat meat. This relates to birds' sharp hooked beaks, claws and eyes pointing toward the front (even if they appear to be located on the sides of their heads).
- Herbivores eat plants. This relates to bird's flat beaks either used as a spoon or nutcracker and eyes pointing toward the sides.

- Omnivores eat plants and flesh. This relates to birds that eat berries, nectar, fish, insects, worms and small rodents.

Give learners a written exercise and ask them to do check your progress 2.4 in the Learner's Book.

Homework

Ask the learners to draw the different types of breaks and feet found in birds and indicate the type of food each bird feeds on.

Answers to check your progress 2.4

Refer to learner's book page 23

1. A - Scavenger
   B - Nector
   C - Flesh
   D - Filter

2. Chicken - Grain feeder
   Flamingo - Filter feeder
   Owl - Flesh feeder

Activity 2.6 Insects

Refer to Learner's Book pages 23

Monitor your learners' interactions as they observe and discuss insects, their mouth parts and their adaptation to feeding. Plan and write down the questions on insects and their feeding habits to be used in the lesson. Ask questions on insects, the food they eat and their feeding adaptations, and allow learners to work together to determine the answers and report them. Guide learners to take turns to carry out classroom discussions about insects and their feeding adaptations. This will enable you to assess their knowledge and discover which learners grasp the concepts and to what extent. Unlock your learners' understanding of insects and their feeding adaptations through explanation and clarification of facts and concepts.

This lesson involves a nature walk around the school compound as the learners collect various insects. Organise the learners into multi-ability groups and direct them to specific locations where they should collect different types of insects. Caution learners on the dangers involved since some of the insects may cause bites or stings and some may be poisonous. The learners may already know dangers of some of these insects found in their local environment, but still a word of caution is necessary.

Lesson assessment

Ask the learners to answer the questions on check your progress 2.5 in the Learner's Book.

Answers to check your progress 2.5

Refer to Learner's Book pages 25

1. C
2. Housefly, mosquito, bee
3. a) Cockroach b) Bedbug
4. a) False b) True c) False

2.2 Interdependence of living things

Activity 2.7 Investigating interdependence among living things

Refer to Learner's Book pages 26

This activity involves learning of interdependence among living things. Monitor your learners' interactions as they observe during a nature walk and discuss interdependence among living organisms. Plan and write down the questions on interdependence among living organisms to be used in the lesson. Ask learners guided questions on interdependence among living things and allow learners to work together to determine the answers and report them.

Guide learners to take turns to carry out classroom discussions on interdependence among living organisms.This will enable you to assess their knowledge and discover which learners grasp the concepts and to what extent. Unlock your learners' understanding of interdependence among organisms through explanation and clarification of facts and Collect pictures showing how living things depend upon each other.

Prepare charts showing simple two-level and three-level food chains.

Lesson assessment

1. Ask learners to construct simple food chains involving the following organisms:
   (a) Grasshopper, hawk, grass and chicken.
   (b) Big fish, algae, kingfishers and small fish.

Expected answers

(a) Grass→Grasshopper→Chicken→Hawk

(b) Algae→Small fish→Big fish→Kingfisher

2. Ask learners to answer the questions in check your progress 2. 6 in the Learner's Book.

Activity 2.8 Investigating interdependence between plants

Refer to Learner's Book pages 27-28

Guide or monitor and observe- your learners' interactions as they observe and discover interdependence between plants in the environment. Plan and write down the questions to ask and discuss with learners on interdependence between plants. Take learners outside the classroom so they can observe plants in the environment, and question and discover for themselves how plants depend on each other. Guide learners to carry out classroom discussions (once they are back to the classroom after the nature walk) on interdependence between plants. Before the discussion starts, ask them to take several minutes to write down everything they know about interdependence between plants from what they observed during their walk. Unlock your learners' understanding of interdependence between plants through explanation and clarification of facts and concepts.

Organise the learners into multi-ability groups and give them instructions on what they are going to do. Explain to them that part of the lesson will be spent outside the classroom making observation and collecting some plants to bring back to class. Direct the learners where to do the collection and caution them against some poisonous plants.Give the duration you expect them to take before they come back to class to record their findings.

Lesson assessment

Ask the learners to answer the questions on check your progress 2.6 in the Learner's Book.

Homework

Ask the learners to collect some other plants that depend on others or pictures of these plants and bring them to class. Caution the learners through against damaging plants or overharvesting the plants. Keep the collected plants in the Curiosity/Science Corner.

Activity 2.9 Investigating how plants and animals depend on each other

Refer to Learner's Book pages 28

Divide the learners into small, manageable, multi-ability groups and give them instructions on what they are going to do. Explain to them that this lesson will be an outdoor lesson and monitor and observe your learners' interactions as they discuss in pairs and in groups how plants and animals depend on each other in the environment. Write down the questions to ask and discuss with learners on interdependence between plants and animals. Take learners outside the classroom so they can observe plants and animals in the environment, and question and discover for themselves how plants and animals depend on each other. Guide learners to carry out classroom discussions (once they are back to the classroom after the nature walk) on interdependence between plants and animals. Before the discussion starts, ask them to take several minutes to write down everything they know about how plants and animals depend on each other from what they observed during their walk.

Answers to check your progress 2.6

Refer to learmer's book page 31

1. False

   True

   True

   True

2. Plants → Antelope → Lion

3. Plants → Goat → Man

   Plants → Cows → Man

2.3 Conservation of plants and animals

Activity 2.10 Investigating ways of conserving plants in the school environment

Refer to Learner's Book pages 32

This lesson would be best taught during the rainy season when the plants are in seasons. You should also plan to have a resource person such as the school gardener, to explain or demonstrate how to plant, weed, prune and water flowers

and trees growing in the school compound. Monitor and observe your learners as they observe and talk about the plants in their environment. Plan and write down the questions to ask and discuss with learners on plants in their environment and conservation efforts put in place. Guide learners to carry out discussions in pairs and in groups on conservation of plants. You can use open-ended, collaborative exchange of ideas with your learners for the purpose of furthering their thinking, learning, problem solving and understanding. As you observe and assess learners, record the information collected on tools that are manageable to use and easy to analyse later. Some of these tools may include observation checklists and student record sheets.

Lesson assessment

1. Ask the learners to list down three things they should do to maintain the flowers growing in the school compound.

Expected answers

(a) Weeding

(b) Pruning

(c) Spraying

(d) Watering

Activity 2.11 Investigating ways of conserving animals in the environment

Refer to Learner's Book pages 33

Organise a field trip for your learners to enable them to learn firsthand about conservation animals in the environment. Prepare them by developing their visual literacy. Field trips allow learners to connect to the real world, thus they make lifelong memories among peers, which is no doubt a fun learning experience in itself. Make learning about conservation of animals to be fun and motivating by incorporating role plays into the classroom to add variety and a change of pace. It gives them a chance to express themselves in a more forthright way.

plan and write down the questions to ask and discuss with learners on plants in their environment and conservation efforts put in place. Guide learners to carry out discussions in pairs and in groups on conservation of plants. You can use open-ended, collaborative exchange of ideas with your learners for the purpose of furthering their thinking, learning, problem solving and understanding.

Alternatively you can use a collection of wild animal, pictures or videos

Let learners respond to whether they have seen them in their locality.

National game park, they can visit include: Bandingilo Nimule, Boma and Southern National Game park

Lesson assessment

1. Ask the learners to list at least five animals that are conserved in the national game park in the country.

Expected answer

1. Answers will vary but any correct five will suffice.

2. Ask learners to write a pledge to do one thing to conserve plants and animals in the environment. Let them share the actions they have done based on their pledge.

2.4 Effects of climate change on animals and plants

Activity 2.12

Refer to Learner's Book pages 35

Guide and observe your learners as they discuss effects of climate change on plants and animals. Plan and write down the questions to ask and discuss with learners on effects of climate change on plants and animals, and try to come up with ways of preventing the effects.

help to build your learners' language and communication skills on climate change and its effects by using simple poems and songs. Unlock your learners' understanding of conservation of plants through explanation and clarification of facts and concepts.

Lesson assessment

Ask learners to answer the questions in check your progress 2.5 in the Learner's Book.

Homework

Organise you learners into multi-ability groups. Tell them to imagine that they are the President of the Republic of South Sudan and that they expected to make a speech to the country on the important issue of climate change. The goal of the speech is to persuade citizens of the Republic of South Sudan, both individuals and companies, to make changes they can make that will help solve the climate change problem. To support why change is important, the speech must describe what climate change is and its effects on plants and animals. Remind them to use details from

their Learner's Book to discuss and write their speeches. Encourage learners to review and edit each other's speeches. Allow time for this project (say a week) so that learners may do further research from books in the library, Internet and peers. At the end of the project time, have learners present their speeches to the class.

Answers to check your progress 2.7

Refer to learmer's book page 36

1.

- Plants mitigate the effects of climate change
- Plants increase biodiversity
- Plants provide food, medicine
- Plants beautify our surroundings.

2. Weeding, watering and pruning
3. National park
4. Lions, zebra, antelope, crocodile, leopard
5. Droughts, lack of pasture and water

UNIT 3

Seeds and Germination

Refer to learners' book pages 38-52

Learn about	Key inquiry questions
Children should learn about the structure of seeds and germinations by observing bean seeds and dissecting them to show the internal structure at different stages of germination. Children should investigate seed germination by observing the changes that take place as seeds germinate under different conditions of light and heat, and record the changes by performing simple controlled tests.	• How do different parts of the seed contribute to germination? • What conditions are necessary for germination? • What will happen if one of the conditions is omitted? • What will happen to parts of seeds after germination? • Why do seeds not germinate where it is very dry, wet, hot or cold?

Learning outcomes

Knowledge and understanding	Skills	Attitudes
• Understand the structure of a seed and the process of seed germination	• Examine parts of a seed • Observe and record changes in a seed as it germinates • Predict what happens if one of the conditions is omitted • Interpret results	• Appreciate the importance of seeds in our lives

Contribution to the competencies:

Critical thinking: understanding ways of conserving plants and animals

Co-operation and Communication: performing activities

Culture: valuing plants and animals

Links to other subjects:

Social Studies: Wild life conservation

Environment and Sustainability: conditions for growth

Introduction to the unit

it is believed that at this level, the learners have already learnt about the parts of the plant and their functions. They should also know the names of some local plants and crops and their importance in the local community. The concept in this unit is to enable the learners to realise that many crops and plants grow from seeds and for seeds to germinate the right conditions must be provided. Let the learners realize that these are the factors the farmers deal with all the time and that is why certain crop husbandry practices are only carried out during certain times of the year. The learners should also realise that crop farming is an important economic activity which many people in the world rely on.

Plants reproduce through vegetative propagation (asexual reproduction) or through seeds (sexual reproduction). In the later, the flower is the main reproductive organ of a flowering plant and seeds, which are basically fertilized. Ovules of a flower are the origins of a new plant. Provided with the right conditions where there is air, warmth and moisture, the seeds will germinate into new plants (seedlings).

This unit aims at helping the learners to observe the structure of a seed at different stages of germination and to investigate seed germination by observing the changes that take place under different conditions through simple controlled experiments. This will assist them to appreciate environmental sustainability through growing new crops and soil conservation.

Pertinent and contemporary issues

1. ***Cross-cutting issues to be developed***

   Plants provide a home and shelter for many animals especially the wild life. Trees help to break the speed of wind while there roots help to hold soil particles together. A good vegetation covered in an area will reduce soil erosion thus stop desertification.

Competencies to be developed

1. ***Communication***

   During group discussion when reporting back results of the experiments carried out and while setting up the experiments, the learner's will improve on their use of language and communication skills. Group work activities will forge collaboration.

2. ***Critical thinking and Problem solving***

   Learners will be involved in practical activities in which entails collection of materials, setting up experiments, making predictions observing and recording results all of which require logical and co-ordinated thinking.

Meaning of new words

- **Dicotyledon** - a seed having two cotyledons. It is also known in short a dicot.
- **Embryo** - the young plant in a seed.
- **Endosperm** - food stored in grains like maize.
- **Fruit** - a mature ovary with fertilised ovules called seeds.
- **Germination** - change of a seed into a seedling.
- **Hilum** - a scar showing where the seed was originally attached to a fruit Wall.
- **Micropyle** - a small hole through which the seed absorbs water before germination.
- **Monocotyledon -** a seed having one cotyledon. It is also known as a monocot.
- **Seedling** - a very young plant germinating from a seed.
- **Seed** - a fertilised ovule which germinates into a seedling.
- **Plumule** - part of a seed that grows into a shoot (stem).
- **Radicle** - part of a seed that grows into a rood.

3.1: Structure of seeds

Refer to Learner's book pages 38

Activity 3.1

Refer to Learner's book pages 38

1. Introduce the lesson by asking learners to name their favourite fruit.
2. Display all the fruits collected and let the learners identify them and name them.
3. Ask the learners to name other fruits that they know which are not among those that are displayed. Write the names of the fruits correctly identified on the chalkboard.
4. Ask oral questions on where fruits come from and what are the contents of a fruit.
5. Guide the learners through Activity 3.1 in the Pupil's Book by cutting open one fruit and let the pupils observe the contents.
6. Using a table, guide the pupils in filling in the name of the fruit and the number of seeds counted.
7. Allow one or two pupils to repeat what the teacher has done above and repeat the process of filling the table.

   NB: where the seeds are too small, ask pupils to use a magnifying glass to observe the seeds.
8. Divide pupils in groups and let them repeat what has been done in steps 1, 2 and 3 above.
9. Write summary notes on what has been learnt.

Suggested Homework

- Ask the learners to draw some fruits showing the number of seeds found in them.
- Ask learners to find out the importance of washing all fruits before we eat them.
- Ask learners to find out names of some fruits which should not be eaten found in the locality.

Lesson Assessment

Observation – observe each learner as they carry out the activity. How they handle materials.

Product – learner should be able to identify different kinds of fruits .

Parts of a Seed

Refer to Learner's book pages 39-42

The teacher should ensure that the seeds to be used for the lesson are soaked at least a day or two before the actual lesson. Other items e.g. magnifying glass and razors should also be availed in good time and the learner should be grouped for the practical work in advance. The chart showing the external and internal parts of a seed (seed structure) should also be prepared in advance.

Activity 3.2

Refer to Learner's book pages 39

1. Introduce the lesson by telling learners that they are going to learn about parts of a maize and bean seed.

2. Explain and demonstrate to the learners how to bisect a maize and a bean seed in order to observe the internal parts.

3. Divide the leaner's into groups and allow them to bisect seeds and use a magnifying glass to observe the internal parts.

4. Ask learners to draw the maize and bean seed structures and name the parts.

Lesson assessment

Product - Check if learner's are able to:

- Name some external parts of a bean seed.
- Name some internal parts of a bean seed.
- Observe the internal parts of a seed.

Functions of the parts of a seed

Make sure that the pupils have drawn and labelled both the external and internal parts of a maize and a bean seed correctly. Prepare a chart on the same so that the learners can use it to compare and match all the parts to their diagrams.

1. Introduce the lesson by asking the learners to name both the external and internal parts of a maize and a bean seed.

2. Display the chart showing the external and internal parts of a seed. Go through the parts and ask the pupils to match them with what they have drawn.
3. Using the information about the functions of the pats of the seed in the learning points section in the Pupil's Book, go over the functions of the parts of a maize and a bean seed.
4. Give/write a short summary of the functions of the parts of the seeds on the chalkboard for the learners to copy in their note books.
5. Review the lesson through oral questions by asking the learners to state the functions of the various parts of a seed.

Lesson assessment

Answers to Check your progress 3.1

Refer to learners' book page 42

1. (a) False (b) False (c) True (d) False
2. (i) and (ii)
3. (iv)
4. Scar

Examining the Differences between a maize and a bean seed Activity 3.3

Refer to learner's book page 42

1. Make sure that items for the activity are available. These include some soaked maize and bean seed (which must be soaked at least two days before the actual lesson), sharp clean razor blade and a magnifying glass. Divide learners into groups.
2. Introduce the lesson by orally going over the previous lesson on the parts of a seed and their functions. You may ask pupils/learners oral questions to state the functions of the parts as they are mentioned.
3. Divide the learners into small working groups.
4. Explain to the learners that the activity they are going to undertake of bisecting seeds is similar to what they did in Activity 2 but this time they are to observe the differences between the two seeds as opposed to the parts.

5. Guide the learners through Activity 3.3 in the learner's Book.
6. Let the learners carry out the activity. Draw a table on the chalkboard and as the learner's observe the differences, discuss each of them and fill the information in the table. Differences will be on number of cotyledons and endosperm, scar, etc.
7. Let the learners draw the table showing the differences between the seeds.

Lesson Assessment

Conservation: Ask learners questions such as:

- What did you observe when you cut open the seeds?
- How many cotyledons does a bean/maize seed have?
- What are some of the differences between a maize seed and a bean sead?

Difference between monocotyledons and dicotyledons
Activity 3.4

Refer to learner's book page 43

Follow the steps for this activity. The differences this time will be in roots and leaves.

For the conclusion, let the learner's draw the table on summary of differences between monocotyledons and cotyledons.

Lesson Assessment

Product - Check if learners are able to differentiate between monocots and dicots.

Answers to check your progress 3.2

Refer to learner's book page 45

1. Wheat
2. Endosperm
3. Fibrous
4. Refer to learners book page 44
5. Refer to learners book page 44

3.2: Germination and growth of seeds

Refer to learner's book page 45

Observing germination and growth in a maize and bean seed

This lesson and next lessons after this one are basically long term project activities and therefore the preparation work for the activities and assembly of materials should begin way before the actual lesson. This therefore means that the teacher can go through the activities, set up the experiments and the learners can continue to observe and record the results as other topics are being covered. This is simply for the obvious reason that seeds will not germinate in a day.

The activities also give room for improvisation and the teacher should feel free to improvise especially where the suggested materials are not available. However, what is most important is that the materials should be collected in good time and a strict adherence to the variables maintained. Several set-ups should be done for ease of observation.

Activity 3.5

Refer to learner's book page 45

Introduce the lesson by asking learners oral questions about some local farming activities such as:-

1. Which are the common crops grown in their locality?
2. What preparations do farmers make before they start planting?
3. When is the planting season and why do farmers prefer that season?
4. Guide the learners through Activity 3.5 in the learners Book by explaining to them the materials they will need the steps they will have to follow to set up the experiment and finally what they will be observing and at what intervals.
5. Divide the Learners into manageable groups. Give each group the materials they will need.
6. Allow each group to set up their experiment. Ensure that the steps are properly followed.
7. Explain to them when and how the observations will be conducted and what parts of the seedlings should be observed. Explain how the observations made shall be recorded.

8. At the end of observation period, let the pupil's compare and discuss their results.
9. Discuss the conditions necessary for germination of seeds and the stages of seed germination.
10. Write a chalkboard summary on the key points discussed in this lesson for the learners to copy down.

Investigating conditions necessary for seed germination

Refer to Pupil's book page 47-51

Activities 3.6, 3.7, 3.8 and 3.9

Its necessary to state that even though your activities to investigate each condition for germination have been outlined in the Pupil's Book, in order to save time, the teacher can put up only one set up to investigate all the four elements. However this will only be achieved if the teacher has taken the class through each activity outlined in the Pupil's Book and good labelling practice is used. Early preparation and collection of all the materials in advance is also important if the objective is to be achieved. Alternatively, the teacher may decide to divide the learners into four groups and task each group to set up an experiment to investigate only one aspect of the conditions then report to the rest of the class.

Since the outcome of results of these experiments will take a long time, its suggested like with the previous lesson that the teacher and pupil's can set up the experiments and continue with other topics as they await the results to draw conclusions.

In the event that the teacher decides to conduct all the experiments at once, they will require the following five containers but with the same number of seeds.

Tin	Requirements
A	Seeds should be placed under the conditions required for seed germination.
B	Seeds with all the right conditions for germination but add ice cubes or put in the refrigerator.
C	Seeds with the right conditions for germination. Cover with a carton with a hole on the side or put in a dark cupboard.
D	Seeds put in boiled water and covered with oil
E	Seeds put in boiled water but in normal classroom conditions

The expected results will be as follows:-

- Tin A Seeds will germinate because all the requirements for seed germination (air warmth, moisture are provided.)
- Tin B Seeds will not germinate because of the low temperatures.
- Tin C Seeds will germinate because all the right conditions for germination have been provided but the plant will tend to bend towards the directions of light.
- Tin D Seeds will not germinate. Air cannot dissolve in water covered with oil.
- Tin E Seeds will germinate. Boiled water will allow air to dissolve in it again.
- If on the other hand the teacher chooses to do single lessons for each requirement, the lessons will take the following format:

1. Introduce the learners to the lesson by going over the conditions necessary for seed germination as discussed in the activities.
2. Guide the learners through Activity 6 in the Pupil's Book stressing on the variables to be controlled.
3. Divide the learners into working groups and guide them as they set up the experiment
4. Remind the pupils that the results will not be immediate but the observations will continue for the next 4 – 5 days.
5. Guide the learners to draw conclusions and record results of the experiment

Lesson assessment

Product - check if learners are able to carry out the projects successfully.

Answers to Check your progress 3.3

Refer to learners' book page 52

1. Air, warmth, moisture

2. (a) False (b) False (c) True (d) False (e) True

UNIT 4 Water and its properties

Refer to Learner's Book pages 53-66

Learn about	Key inquiry questions
Learners should investigate the physical properties of water and investigate what happens to water under different physical conditions such as a change in (heat energy) temperature e.g. what happens when water is boiled, cooled or when water vapour is condensed. Children should learn how to draw on their prior learning to predict what happens when water changes state and observe demonstrations to develop the idea that water can exist in three states of matter as a result of temperature changes. They should be observe water droplets and consider why some materials absorb or dissolve and others repel water or are insoluble and learn why building materials, some clothes, the fur of animals and bird feathers repel water. They should investigate why some objects float while others sink in water. They can do these through carrying out practical investigations using objects of different mass, sizes, shapes and types of materials. This further develops the idea of densities of substances.	Why does water exist in different states? Why does water change state? How does heat energy cause water to change state? How might the particles be acting when water changes state? Why do some materials absorb water but not others? Why do some objects float and others sink in water? How do we find out which objects float and which ones sink?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
Understand the physical properties and what happens to water under different conditions Understand why certain objects float and sink in water	Observe the changes in water under different conditions Record changes as water changes from one state to another, and how it reacts with different materials. Predict what might happen if the temperature is increased or reduced. Predict what might happen to objects placed in water Perform tests on floating and sinking of objects, and soluble and insoluble substances	Appreciate the value of changes in states of water
Contribution to the competencies: Critical thinking: finding out why water exists in all the three states of matter and finding out why some objects float and why others sink Co-operation and Communication: carrying out experiments and presenting their findings		
Links to other subjects: Social Studies: Weather and climate		

Introduction to the unit

This unit is about properties of water. Learner at this level have handled water and used it for various purposes such as bathing, washing clothes and utensils, drinking, cooking, etc. The concept in this unit is to enable learners know water beyond simply using it - such as physical properties of water, dissolution of substances in water, and floating and sinking in water. Proper knowledge and understanding some of the properties of water will enable the learners to see the need to take good care of water, for example, using water without wasting or polluting it. This unit will also enable the learners to appreciate water in its different states of matter.

Competences to be attained

1. Co-operation

Encourage learners to work as a team through group discussions. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas. The principle of co-operation should be listening to understand but not listening to respond. All learners should be given equal opportunities.

2. Communication

During group discussion, encourage learners to share their opinions, suggestions and ideas freely. This way they will build on their language command as well as ability to participate in discussions. Ask them questions and give them a chance to attempt answering in the simplest way possible. This way, they will build on their confidence and soon develop the love and passion for the subject. Allow some room for learners to make mistakes and then correct them in nice way lest they will feel demoralized.

3. Critical and creative thinking

Use probing questions during the lessons to elicit critical thinking in learners. Help them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Use videos, pictures and photographs to make learners discuss the activities therein. Ask learners to come up with diagrams that illustrate learning aspects this encourages creativity.

4. Culture and identity

Make learners to research on ways in which they can use the knowledge acquired from the unit in improving the living conditions of their communities. The greatness of a nation lays in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive

Cross cutting issues

1. Environmental awareness and sustainability

Learners should endeavor to keep and maintain a clean environment. By doing this they not only prevent diseases but also be aware of the importance the environment is for sustainability purposes.

2. Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the discussions they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process. Any form of intolerance should be highly condemned.

3. Life skills

The knowledge of hygiene and diseases is important in life. Learners should be sensitized on the need to maintain personal hygiene to prevent diseases. They should actively participate in communal activities such as: anti-jiggers campaign or cleaning exercises. Involve learners in activities that foster coherence, respect, gender inclusivity and patriotism.

New words and their meanings

- **Condensation** – the process by which a gas changes into a liquid.
- **Cool** – to reduce temperature.
- **Dissolve** – to become broken up or absorbed by something or to disappear into something else.
- **Evaporation** – the process by which a liquid changes into a gas.
- **Floating** – ability of a substance to remain at the surface of water.
- **Freezing** – the process by which a liquid changes into a solid.
- **Gas** – a substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape.
- **Heat** – to increase temperature.
- **Ice** – water in solid form.
- **Insoluble** – incapable of being dissolved.
- **Liquid** – a substance that flows freely but is of constant volume such as water and oil.
- **Melting** – the process by which a solid changes into a liquid.

- **Sinking** – ability of a substance to remain at the bottom of a container full of water.
- **Solid** – a substance that is firm and stable in shape.
- **Solubility** – ability of a solid to dissolve in water.
- **Soluble** – able to be dissolved, especially in water.
- **Solute** – a solid that can dissolve in water.
- **Solution** – a liquid mixture in which the solute is uniformly distributed within the solvent.
- **Solvent** – a liquid that allows a solid to dissolve in it.
- **Temperature** – hotness or coldness of a place or a substance.
- **Water vapour** – water in form of a gas.

4.1 Water in different states

Activities 4.1 and 4.2

Refer to learner's book pages 53 and 54

In this activity prepare questions on water and changes of states of water, for example, "What happens to water when it is heated? What happens to water when it is cooled?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating water in different states (by heating and cooling) to learn about the changes of states of water. Discuss with your learners their observations with regard to properties and changes of states of water.

Demonstrate to your learners the changes of states of water by carrying out an activity before they do. This allows them to learn about properties and changes of state of water by reason or proof, explaining or making clear by experiments. Monitor your learners' interactions as they carry our experiments or practical activities to investigate changes of states of water.

Check your progress 4.1

Refer to learner's book page 56

1. B

2. P – Melting, Q – Evaporation, R – condensation and S – freezing

3. (i) False (ii) True

4.2 Physical properties of water

Activity 4.3

Refer to learner's book page 57

In this unit, discuss with your learners their observations with regard to physical properties and changes of states of water. Allow your learners to learn by experimenting and manipulating water in different to learn about its physical properties. Ask learners questions and assist them to carry out experiments on water to enable them to discover its properties on their own. As learners work to discover the answers on their own, they remember the concepts better and more fully. Monitor your learners' interactions as they carry our experiments or practical activities to investigate physical properties of water. Prepare questions on water and changes of states of water, for example, "What shape is water? What happens to water when you pour it from one container into another?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Collect bottles of different shapes, two measuring cylinders, weighing machines and two cups to enhance learners experiment.

Answers to Check your progress 4.2

Refer to learner's book page 58

1. B. water has no definite shape

2. D. Water has a definite shape.

3. (a) True (b) False (c) False

4.3 Solubility of substances in water
Activities 4.4 and 4.5

Refer to learner's book page 59

This activity involves discussing with your learners their observations with regard to tests on substances to check for their solubility in water. Prepare questions on solubility of substances in water, for example, "Which substances are soluble in water? Which ones are not soluble in water?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Monitor your learners' interactions as they carry our experiments or practical activities to investigate solubility of substances in water.

Demonstrate to your learners how to test for solubility of substances in water by putting one of the substances, say sugar, in water. This allows them to learn about solubility of substances in water by reason or proof, explaining or making clear by experiments. Ask learners questions and assist them to carry out experiments on solubility of substances in water to enable them to discover soluble and insoluble substances on their own. As learners work to discover the answers on their own, they remember the concepts better and more fully. Allow your learners to learn by experimenting and manipulating substances in water to learn about their solubility

Go through the content of the lesson in advance, and collect and avail the materials needed for the activities of this lesson before the lesson begins. You may ask learners the previous day to bring some of the materials such as flour, sugar, salt, soil, sand, water, holding containers, etc.

Lesson assessment

Ask learners to answer questions in check your progress 4.3 in the Learner's Book.

Homework

Ask learners to think about substances that they use at home and list them down as soluble and insoluble in a table like the following:

Soluble	**Insoluble**
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.

Answers to Check your progress 4.3

Refer to Learner's Book page 62

1. Increase temperature of solvent, stir the solute in the solvent and crush the solute in powder

2. Solvent

3. D. Chalk powder

4. C. Increasing the amount of the solvent.

5. False

4.4 Floating and sinking
Activities 4.6 and 4.7

Refer to Learner's Book pages 63 - 65

Prepare questions on floating and sinking, for example, "Which of these items will float/sink? Will a paperclip float or sink? Will a stone float or sink?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Discuss with your learners their observations with regard to floating on and sinking in water. Allow your learners to learn through experimenting by placing objects to test whether they are floaters or sinkers. Monitor your learners' interactions as they carry our experiments or practical activities to investigate floating on and sinking in water. Demonstrate to your learners how to some objects sink in water and how some float on water. This allows them to learn about sinking and floating by reason or proof, explaining or making clear by experiments. Ask learners questions and assist them to carry out experiments on sinking and floating to enable them to discover and categorise sinkers and floaters on their own. As learners work to discover the answers on their own, they remember the concepts better and more fully.

Answers to Check your progress 4.4

Refer to Learner's Book page 66

1. Floating

2. Accept any other answers that list floaters and sinkers

Floaters	Sinkers
Plastics	Stone
Rubber bands	Steel nail
Maize cob	Marble

3. A. Size

4. B. shape

5. Shape

UNIT 5 Matter and materials

Refer to Learner's Book pages 67 - 86

Learn about	Key inquiry questions
Learners should investigate how matter and materials occur in different states by observing objects in the classroom such as books, chalk, desks, liquids etc. They should talk about the states of matter and why some materials exist in all the three states of matter and under what conditions. Children should investigate how mixtures can be separated using simple methods like sieving, winnowing, dissolving and use of magnets to develop the idea that mixtures of different materials can be separated using physical methods.	• How would you describe matter? • How do you design a fair test to separate different states of matter? • How do you use a magnet to separate mixtures?

Learning outcomes

Knowledge and understanding	Skills	Attitudes
• Understand the concept of matter • Use simple methods of separating materials such as sieving, winnowing dissolving and use of magnetism	• Observe how materials are separated • Record the observations • Design fair tests • Interpret test results • Assess results against ideas	• Appreciate the importance of matter

Contribution to the competencies: Critical thinking: understanding the concept of matter Co-operation and Communication: carrying out experiments and presenting their findings
Links to other subjects:

Introduction to the Unit

This unit is about matter and materials. Matter and materials are everywhere. Learners at this level have handled and used various types of matter, for example, books, pens, ink, pencils and desks, to mention but a few. They have also handled and used matter in different states, for example, books, pens, erasers and pencils (which are solids), ink, juice, milk and water (which are liquids), and air and cooking gas (which are in gaseous states). The concept in this unit is to enable learners know matter beyond simply using it – such as states of matter, physical properties of matter and separation of mixtures (mixtures are made of matter). Proper knowledge and understanding of some of the properties of matter will enable the learners to appreciate matter in its different states.

Competences to be attained

1. Co-operation

Encourage learners to work as a team through group discussions. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas. The principle of co-operation should be listening to understand but not listening to respond. All learners should be given equal opportunities.

2. Communication

During group discussion, encourage learners to share their opinions, suggestions and ideas freely. This way they will build on their language command as well as ability to participate in discussions. Ask them questions and give them a chance to attempt answering in the simplest way possible. This way, they will build on their confidence and soon develop the love and passion for the subject. Allow some room for learners to make mistakes and then correct them in nice way lest they will feel demoralized.

3. Critical and creative thinking

Use probing questions during the lessons to elicit critical thinking in learners. Help them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Use videos, pictures and photographs to make learners discuss

the activities therein. Ask learners to come up with diagrams that illustrate learning aspects this encourages creativity.

4. Culture and identity

Make learners to research on ways in which they can use the knowledge acquired from the unit in improving the living conditions of their communities. The greatness of a nation lays in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive

Cross cutting issues

1. Environmental awareness and sustainability

Acquiring knowledge about matter and its states will enable learners to endeavour to keep and maintain a clean environment. By doing this they not only prevent diseases but also be aware of the importance the environment is for sustainability purposes. Sustainability is important as it ensures that people have and will continue to have water, materials and resources to protect human health and our environment.

2. Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group and in pairs. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the discussions, they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process. Any form of intolerance should be highly condemned.

3. Life skills

The knowledge of matter and materials is important in life. This unit will equip learners with knowledge that they can apply in real life to solve problems. Knowing that mixtures are made by physically mixing components together and that these components can be separated easily by physical means such as sieving, using a magnet, filtering and evaporation, enable them to learn how thee method can be applied in real life. They will also learn to identify the components in a mixture and decide which method can be best used to separate the mixture, thus this unit promotes critical thinking.

Meaning of new words

- **Chaff** – the husks of grains or other seeds separated by winnowing or threshing.
- **Classify** – to arrange or organise by classes or into groups.
- **Decanting** – to pour a liquid gently from one container into another, typically in order to separate out sediment.
- **Dissolving** – broken up or absorbed by something or to disappear into something else such as a liquid.

- **Evaporation** – the process by which a liquid changes into a gas.
- **Filtration** – the process in which solid particles in a liquid are removed by the use of a filter medium that permits the liquid to pass through but retains the solid particles.
- **Gas** – a substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape.
- **Insoluble** – incapable of being dissolved.
- **Liquid** – a substance that flows freely but is of constant volume such as water and oil.
- **Magnet** – a piece of material (such as iron or steel) that is able to attract certain metals.
- **Mass** – the amount (quantity) of matter in a particle or object.
- **Material** – the matter from which a thing is or can be made.
- **Matter** – anything that has mass and occupies space.
- **Mixture** – a substance that contains two or more substances that are not chemically combined.
- **Sieving** – the process of separating solids from liquids through a sieve.
- **Solid** – a substance that is firm and stable in shape.
- **Soluble** – able to be dissolved, especially in water.
- **Solute** – a solid that can dissolve in water.
- **Solution** – a liquid mixture in which the solute is uniformly distributed within the solvent.
- **Solvent** – a liquid that allows a solid to dissolve in it.
- **States of matter** – the distinct forms in which matter can exist.
- **Winnowing** – to free (grain) from the lighter particles of chaff, dirt, etc., especially by throwing it into the air and allowing the wind to blow away impurities.

5.1 and 5.2: States and physical properties of matter
Activity 5.1, 5.2, 5.3, 5.4, 5.5

Refer to Learner's Book pages 67-73

Prepare questions on states of matter, for example, "What is matter? What are the states of matter?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating matter in different states and to learn about the changes of states of matter. Discuss with your learners their observations in relation to properties of matter and changes of states of matter. Demonstrate to your learners how matter changes from one state to another by carrying out an activity before they do. This allows them to learn about properties of matter and changes of state of matter by reason or proof, explaining or making clear by experiments. Monitor your learners' interactions as they carry out and discuss group work and pair work to ensure that they understand what matter and that matter is all around us.

Collect all the items needed for the activities in advance (and ask learners to bring some of the items from home). Guide learners to discuss the items. Can your learners identify and name the items to be used in the activity? Can they recognise that all the items are examples of matter? Can they recognise that the balloon is matter? Can they recognise that the balloon contains air that is matter? Can they recognise that matter occupies space? Can they recognise that some matter such as books and rulers have regular shapes and sizes whereas some such as gases have irregular shapes? Can they also recognise that some matter (such as books, desks, rulers and geometrical sets) is in solid state, some (such as ink, water and office glue) is in liquid state whereas some (such as air) is in gaseous state? Can they identify the three states of matter?

Caution!

- Only "safe" liquids should be used in these lessons.
- When describing any objects, the sense of taste should not be used. Even edible food or liquids should be off-limits to taste tests due to allergies, contamination, etc.
- When handling various liquids, goggles could be worn to protect the eyes from splashes.

Answers to check your progress 5.1

Refer to learner's book page 68

1. Spoons, plates, cups, flour, sieve, maize, beans, tables, chairs/seats, etc. (Accept any other correct answers from learners.)
2. Mass

3. It occupies space, it has a definite mass (it can be weight) and has a definite volume.

4. (a) True (b) False (c) True (d) False

Answers to check your progress 5.2

Refer to learner's book pages 81 - 82

1. Grouping materials

Solid	Liquid	Gas
Book, desk, chalk, rubber, cup, chair, ice, pen, box, and ruler	Water, juice, kerosene, milk, office glue and porridge.	Air and water vapour.

2. A – stone

3. C – juice

4. (a) False (b) True (c) True

5.3 How some matter exist in all the three states

Activity 5.6

Refer to learner's book page 73

Prepare questions on the change of state of matter, for example, "What are the three states of matter? Can matter change from one state to another?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating ice cubes (solids) to show change in state of matter. Discuss with your learners their observations in relation to change of state of matter. Monitor your learners' interactions and how they share their ideas in relation to change of state of matter.

- Define these terms with the class: condensation and freezing. Write the terms on the board and work with the learners to come up with working definitions, for example:
- **Condensation:** water changes from a gas to a liquid, occurs when warm water vapour gets cold or touches something cold (like a cold lid.)
- **Freezing:** water changes from a liquid to a solid.

Write a chalkboard summary of what has been discussed for the learners to copy in their science notebooks.

Answers to check your progress 5.3

Refer to learner's book page 74

1. Temperature
2. Freezing
3. The ice cube will melt to a liquid
4. The ice cube would melt into liquid water.

5.4 Methods of separating mixtures

Activity 5.7

Refer to learner's book pages 75

In this activity discuss with your learners their observations with regard to mixtures and separation of mixtures. Allow your learners to learn by experimenting and separating various mixtures. Ask learners questions and assist them to carry out experiments on application of methods of separating mixtures. As learners apply the various techniques to separate mixtures, they remember the concepts better and more fully. Monitor your learners' interactions as they carry our experiments or practical activities to investigate separation of mixtures. Prepare questions on mixtures and separation of mixtures, for example, "What is a mixture? How do you separate a mixture of maize and beans?" While asking questions, keep in mind the abilities, educational needs and interests of your learners.

Learning points section in the Learner's Book to discuss the different types of mixtures:

(a) Solid mixtures: mixtures of two or more solids such as maize and rice.

(b) A solid and a liquid mixture: a mixture of a solid and a liquid such as sand and water.

(c) Liquid mixture: a mixture of two or more liquids such as kerosene and water.

Explain to them that there are various methods of separating mixtures which include winnowing, sieving, using magnets, dissolving and evaporation, decanting and filtering.

Write a chalkboard summary of what has been discussed for the learners to copy in their science notebooks.

Answers to check your progress 5.4

Refer to learner's book page 76

Z	A	R	U	Z	K	P	D	I	D
A	E	V	A	P	O	R	A	T	E
Z	W	B	M	E	A	I	Z	B	C
F	I	L	T	E	R	J	K	V	A
G	N	I	W	I	E	F	E	M	N
Y	N	L	Q	S	H	L	E	A	T
A	O	J	G	B	D	Z	P	G	B
C	W	K	C	L	K	S	I	N	T
T	I	U	A	Y	M	T	R	E	Z
V	N	M	Q	N	A	P	Y	T	I
R	G	S	I	E	V	E	K	Q	R

Winnowing

Activity 5.8

Refer to learner's book pages 76

Tell your learners that they are going to learn about winnowing. Ask them, "By show of hands, who can tell us what winnowing means?" Write learners responses on the chalkboard.

Define winnowing to them as removing something lighter (such as chaff or dirt) from grains, especially by throwing the grains into the air and allowing the wind to blow away impurities.

Ask, "How do people in your community separate grains from chaff or husks after harvesting?" Give learners time to discuss and respond. *(Answers will vary depending on what is used in a learner's home.)* Gather the learners around you. Demonstrate winnowing by picking a handful of roasted groundnuts and rubbing the groundnuts between your palms. Blow over the groundnuts and ask the learners:

Answers to check your progress 5.5

Refer to learner's book page 77

1. Because winnowing depends on strong winds to blow away dirt (chaff or husks), leaving behind clean grains/products.

2. Both maize and been seeds are heavy, thus none will be blown away by wind. Maize and bean seeds are best separated by hand picking.

Sieving
Activity 5.9, 5.10

Refer to learner's book page 78

Organize learners in multi-ability pairs and ask them to study the picture in the Learner's Book.

Let them discuss the method of separation of mixtures used depicted in the pictures. Ask the probing questions such as, "What method of separation is shown in the picture? What mixtures can you separate using this method? "Let the learners discuss. Can they recognize that the method of mixture separation shown is sieving? Can they tell the mixtures that can be separated by sieving? *(Examples: mixtures of tea leaves and tea, rice and flour, maize seeds and flour, bean seeds and flour, etc.)* Tell your learners that they are going to learn about sieving. Ask them, "By show of hands, who can tell us what sieving means?" Write learners responses on the chalkboard. Define sieving as the process of separating solids from liquids through a sieve.

Explain to them that a sieve is used to separate small solid particles from larger ones. A sieve is used when substances are too fine to be separated by hand. The mixture is placed in the sieve which is then shaken from side to side.

Answers to check your progress 5.6

Refer to learner's book page 78

1. Assess learner's drawings to find out whether sieving has been reflected or represented as should be. Check that they have labelled the sieve, component left behind on the sieve, and the component that has passed through the sieve and is in a receiving container or tray or mat.

2. Sieving. Dissolving and evaporation can work but should not be recommended here because the beans will become soaked. Sieve will work fine because beans and salt have particles of different sizes.

3. To ensure that the component that has small particles all pass through the holes in the sieve.

4. Sieving

Using magnets
Activity 5.11, 5.12

Refer to learner's book page 79

Before beginning the lesson on practical separation of components in a mixture using magnets, introduce magnets to your learners. Provide them with a radio speaker and a steel nail. Have them generate hypothesis (in groups) on what will happen to the nail when they bring the nail close to the speaker. Ask them to place the nail close to the speaker and make observations. Let them discuss their observations as a class. *(Observation: the steel nail will be attracted to the magnet in the speaker, thus it will stick onto the speaker.)* Briefly describe a magnet and how it works to separate components of a mixture. Explain to them that a magnet is a special type of metal that attracts certain materials. Guide learners to study the bar magnet depicted in the picture in this activity. Let them identify and name it and discuss what happens when the magnet is placed near metals. Can they recognize that some metals will be attracted by the magnet? Can they also recognize that some metals will not be attracted by the magnet? Show learners a bar magnet and ask them what it is and how it works. Can they identify it as a magnet? Can they also identify that it attract Now that your learners have an understanding a magnet works, organise them in multi-ability groups ready to separate mixtures practically using magnets.

Answers to check your progress 5.7

Refer to learner's book page 80

1. (a) True (b) True
2. Repelled
3. It gets attracted

Separating mixtures that contain a solid and a liquid
Activity 5.13

Refer to learner's book page 80

Explain to your learners that they will be mixing some solids with water to find out whether they dissolve or not. Write the word "dissolve" on the chalkboard, and ask them to tell you if they know what it means. Give them time to share some ideas of what dissolve means. Explain to them that dissolve mean a solid being incorporated into a liquid. Ask them to raise their hands up if they know of anything that dissolves in water. Write their responses on the chalkboard. *(Possible answers: Sugar, salt, glucose, baking soda, soda ash, powdered detergent, etc.)* Ask the learners to come together so

that they can watch your demonstration. Show them a glass of water and tell them you are going to put sugar in it.

Have them make a prediction if the sugar will dissolve or not and draw it on chart

Decanting
Activity 5.14:, 5.15

Refer to learner's book pages 81-82

Gather learners around your table. Pour some water in a glass. Mix some sand in the water and stir with a spoon or stirring rod. Let the learners observe as you demonstrate. Ask them, "Did the sand dissolve in water?" *(Expected answer: No.)*

Follow their answer with the question, "Why didn't the sand dissolve?" *(Expected answer: Sand is insoluble in water.)* Ask them, "Can we separate the sand from water?" *(Answers will vary as some may say that decantation with work and others may say that filtration will work.)*

Explain to them that a mixture of sand and water can be separated through decantation.

Tell them that decantation is decanting is pouring off the water part of the mixture, leaving behind the sand. Let them know that the sand (or any solid left behind after decantation) is called **sediment**. After the sand has settled in the glass, use a stick or a rod, demonstrate to the learners how to carefully decant the sand-water mixture into an empty glass. After the demonstration, organise learners into multi-ability groups and provide each group with water, two glass bottles, sand, stick or stirring rods and sand.

Instruct them to pour the water into one of the bottles. Ask them mix in sand and shake thoroughly. Let them allow the mixture to settle. Ask them to discuss what they can observe. Instruct them to lift the bottle carefully, without disturbing the sand sediment at the bottom of the bottle. Observe as they pour out the water, leaving behind the sand. Explain to them that we can use decantation to separate water from insoluble substances that settle down.

Filtration
Activity 5.16

Refer to learner's Book page 83

Gather learners around your table and show them the materials to be used in filtration. Ask them to identify and name the materials. Take a clear container

and add water. Then ask a volunteer learner to add a spoonful of flour in the container of water and stir it. Let the mixture stand for a few minutes. Ask them: What happens? Has the flour dissolved in water? *(Expected answer: Flour does not dissolve in water.)* Has all the particles of four settled down in the water? *(Expected answer: No. Some flour particles are still suspended in water.)*How can you separate the mixture formed? *(Expect varied responses.)*

Let them and generate hypothesis on how they would separate a mixture of water and flour *(Answers may vary.)* After discussing learners ideas on how to separate water and flour, invite a volunteer to demonstrate how to. Guide him or her to tie the piece of cloth onto the mouth of the second container using the rubber band or string, and gently pour the mixture over the cloth. Ask learners to make observations and discuss their observations as a class. Have learners in multi-ability groups and provide them with materials to use to practice filtration. They can use water and flour or water and soil. Walk around the classroom listening to learners' conversations and discussions, and making observations.

Answers to check your progress 5.8

Refer to learner's book page 84

1. Filtration
2. Assess learner's drawings to find out whether filtering has been reflected or represented as should be.
3. Assess learner's drawings to find out whether decantation has been reflected or represented as should be and that labeling has been done correctly.

Evaporation

Activity 5.17

Refer to learner's book pages 84

Gather learners around your table and show them the materials to be used in filtration. Ask them to identify and name the materials. Tell them that they are going to learn about evaporation as a technique of separating mixtures. Ask them, "Who knows what evaporation means?" Encourage them to raise their hands up if they think they know the meaning of evaporation. Give them time to brainstorm and as a class, come up with the meaning of the term evaporation. *(Evaporation: the process by which a liquid changes into a gas.)* Take a small transparent bottle and pour some water in it. Then ask a volunteer learner to add sugar into the bottle of water and shake the mixture thoroughly. Ask them to note what happens. *(Expected answer: Sugar dissolved in water.)*

Ask another volunteer to pour the sugar solution into a cooking pan and carefully put it in a lit stove. Caution learners to be careful when using a lit stove to avoid being burnt or causing harm to others. Let them watch as the solution boils until all the water evaporates (turns into steam). Ask them, "What do you observe? Where does the water disappear to?"

Let the learners discuss their observation in multi-ability groups. *(Expected response: Some white solids formed in the cooking pan.)*

Answers to check your progress 5.9

Refer to learner's book page 85

1. Dissolution

Solid	Dissolves in water	Does not dissolve in water
Sand	✓	
Sugar	✓	
Salt	✓	
Flour		✓
Chalk dust		✓

2. C – vapour
3. B – By evaporating water so that sugar is left behind.
4. (a) True (b) True (c) False

UNIT 6 Light and heat

Refer to Learner's Book pages 87 - 107

Learn about	Key inquiry questions
Learners should investigate light and heat by drawing on their prior learning about their characteristics to show how they are transmitted. They should learn that light travels in straight lines from objects to the eye, how it cannot travel through most solid objects, but does travel through glass, and how heat moves through some objects faster than others. They should design simple tests to investigate these ideas and apply their findings to their daily activities. Children should learn about sources of heat as a form of energy by rubbing of hands to generate heat and rubbing sticks against other one to produce fire to introduce the idea of friction. They also explore other sources of heat and light such as the sun, fire, electricity etc. and discuss how cooling involves the removal of heat energy. They also identify the uses of heat e.g. cooking, ironing, drying, refrigeration etc.	• How does light travel? • Why does light travel through some things but not others? • Why does heat travel through some materials faster than others? • Why do we need light and heat in our daily activities?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Understand that light and heat are forms of energy • Understand that light travels from a source	• Investigate how light travels and its uses • Explore the sources of heat and its uses Design fair test on how light and heat travel • Investigate how light and heat travel • Record results and explain them • Apply the results to their homes	• Appreciate uses of light and heat in their daily activities
Contribution to the competencies: Critical thinking: investigation of how light travels and why it travels in straight line Co-operation and Communication: group work		
Links to other subjects: Environment and Sustainability		

Introduction to the Unit

This unit is about light energy and heat energy. Light and heat are everywhere around us. Learners understand things such as light and heat best when they are able to learn in a hands-on manner. Keep the experiments and demonstrations as simple as possible to ensure that the focus stays on the concepts that are being taught. Proper knowledge and understanding of some of the concepts will enable the learners to appreciate uses of light and heat in their daily activities. They will also appreciate the importance of light and heat energies thus take an initiative to conserve them.

Competences to be attained

1. Cooperation

Encourage learners to work as a team through group discussions and in pair work. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas in relation to light energy and heat energy. The principle of cooperation should be active listening to understand but not listening to respond. All learners should be given equal opportunities**.**

2. Communication

During group discussions and pair work, encourage learners to share their opinions, suggestions and ideas freely. This way they will build on their language command as well as ability to participate in discussions. Ask them questions in relation to heat and light energy and give them a chance to attempt answering in the simplest way possible. This way, they will build on their confidence. Allow some room for learners to make mistakes and then correct them in a nice, positive way lest they will feel demoralised.

3. Critical and creative thinking

Use probing questions during the lessons to elicit critical thinking in learners, for example, let them investigate how light travels and why it travels in a straight line. Help them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Use videos, pictures and photographs to make learners discuss the activities therein. Ask learners to come up with diagrams that illustrate learning aspects. This encourages creativity.

4. Culture and identity

Make learners to research on ways in which they can use the knowledge on acquired from the unit on heat energy and light energy in improving the living conditions of their communities. The greatness of a nation lays in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

Cross cutting issues

1. Environmental awareness and sustainability

Acquiring knowledge about light energy and heat energy enables learners to endeavour to use environment-friendly sources of heat and light. Sustainability is important as it ensures that people have and will continue to have energy resources that protect human health and our environment.

2. *Peace and values of education*

Throughout the unit, learners are actively involved in discussing issues as a group and in pairs. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the discussions, they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process. Any form of intolerance should be highly condemned.

3. *Life skills*

The knowledge of energy is important in life. This unit will equip learners with knowledge that they can apply in real life to solve problems, for example, using sustainable and renewable sources of energy such as solar and wind energy to produce light and heat to be used in homes.

Meaning of new words

- **Beam of light** – a collection of rays of light.
- **Conduction** – process by which heat or electricity is directly transmitted through the material of a substance when there is a difference of temperature between adjoining regions, without movement of the material.
- **Convection** – process by which heat travels through air, water, and other gases and liquids.
- **Energy** – ability to do work.
- **Heat** – a form of energy that causes things to become warmer.
- **Light** – a form of energy which our sense of sight can detect.
- **Man-made** – something that was created by human beings as opposed to existing in nature.
- **Natural** – something that is found in nature and can be used by people.
- **Opaque** – not capable of letting light pass through.
- **Radiation** – emission or transmission of energy in the form of waves or particles through space or through a material medium.
- **Ray of light** – one of the lines of light that appear to be given off by a bright object.
- **Shadow** – a dark area or shape produced when an object blocks light.
- **Sources of heat** – any device that produces its own heat.
- **Sources of light** – any device that produces its own light.

- **Traffic lights** – a set of automatically operated coloured lights (typically red, amber and green) for controlling traffic at road junctions, pedestrian crossings and roundabouts.
- **Translucent** – capable of letting some light pass through, but objects on the other side cannot be seen clearly.
- **Transparent** – allows light to pass through so that objects on the other side may be seen clearly.

Light energy

6.1 Sources of light

Activity 6.1

Refer to learner's book pages 87-88

In this activity, hold discussions with your learners on sources of light, making sure to dispel misconceptions such as the moon or mirror is a source of light. Prepare questions on sources of light, for example, "Where does light come from? What source of light do you use at home? What source of light is used at school? What sources of light are used in your community?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating sources of light such as flashlights and light bulbs, hence learn how some of the sources work. Monitor your learners' interactions as they carry out group discussions and pair work to ensure that they understand what a source of light is.

Demonstrate to your learners how some of the sources of light such as flashlights and candles work to produce light.

Answers to check your progress 6.1

Refer to Learner's book pages 88-89

1. Paraffin/kerosene

2.

Natural sources	Artificial sources
Stars, sun and firefly	Torch, tin lamp, electric bulb and pressure lamp

6.2 How light travels

Activity 6.2, 6.3

Refer to learner's book pages 89-91

Prepare questions on how light travels, for example, "When you place your hands over your eyes, can you be able to see? Why is it possible to see a candle flame on top of a table and not one that is under a table? How do you think light travels from an object to our eyes?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Demonstrate to your learners how light travels using candle light on top of a table and candle light underneath a table and guide them to discuss and understand that light travels in a straight path. Hold a discussion with your learners on how light travels, making sure they understand that light does not travel through or around opaque objects. Allow your learners to learn by experimenting and manipulating sources of light such as candle light or flashlight in order to discover that light travels in a straight path. Monitor your learners' interactions as they carry out group activities and discussions to ensure that everyone actively participates in the learning process.

Answers to check your progress 6.2

Refer to Learner's Book page 91

1. Light travels in a straight line.

2. a) False (b) True (c) False

6.3 Behaviour of light in different materials

Activity 6.4, 6.5

Refer to learner's book pages 92-94

Prepare questions on behavior of light in different materials, for example, "Which materials allow light to pass through? Which materials so do not allow light to pass through? Which ones allow some light to pass through?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating various materials and light to discover which materials are transparent, translucent or opaque. Discuss with your learners their observations in relation to behavior of light in different materials. Monitor your learners' interactions and how they manipulate light to discover its behavior in different materials.

Collect all the items needed for the activities in advance (and ask learners to bring some of the items from home). Warning: Tell learners never to point a flashlight at their own, or another learner's face/eyes. A flashlight can be very bright and can hurt their eyes. Show how to turn a flashlight on and off and ask them to always

turn their flashlight off when they have finished using it. Tell them never to put plastic wrap over their face/head or another learner's face/head.

Answers to check your progress 6.3

Refer to learner's book page 94

1. A – clear glass
2. A – a clear empty glass
3. Block of wood and a brick wall (Accept any other relevant answers from learners)
4. Opaque objects
5. (a) Clothes – materials that do not allow light to pass

   (b) Walls of houses – materials that do not allow light to pass

   (c) Mirror – materials that allow light to pass

   (d) Clear polythene bags – materials that alllow light to pass

6.4 Uses of light
Activities 6.6, 6.7, 6.8 and 6.9

Refer to learner's book pages 95-97

Monitor your learners' interactions as they discuss use of light. This will give you valuable information about your learners' progress, understanding, strengths and challenges, cooperation, study habits and attitude. Record your observations using sticky notes to jot down your thoughts and then post them on a chart with your learner's names or prepare a checklist of things you want to look for as learners work. You may also keep a folder with records of your observations written on self-stick labels or sheets of paper. Prepare questions on uses of light to use before, during or after the lesson, for example, "Is light important? What do we use light for?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating light to discover its uses and importance . Discuss with your learners their observations in relation to uses and importance of light. You may use open-ended, collaborative exchange of ideas between you and your learners or among students for the purpose of furthering their thinking, learning, problem solving, understanding or just literary appreciation. Encourage your learners to present multiple points of view, respond to the ideas of others, and reflect on their own ideas in an effort to build their knowledge, understanding or interpretation of uses and importance of light.

Collect and avail all the items needed for the activities in advance (and ask learners to bring some of the items from home, for example, containers and seeds for planting in Activity 6.8).

Answers to check your progress 6.4

Refer to Learner's Book page 98

1. C – plenty of sunshine
2. light
3. Assess learners' drawings for correctness.
4. To take photographs
5. (a) True (b) True

Heat energy

6.5 Sources of heat
Activities 6.10 and 6.11

Refer to learner's book pages 99-100

Prepare questions on sources of heat, for example, "Where does heat come from? What source of heat do you use at home? What sources of light are used in your community?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting and manipulating different materials to find out how heat can be generated. Monitor your learners' interactions as they carry out group discussions and pair work to ensure that they understand what a source of heat is and how heat can be generated. Hold discussions with your learners on sources of heat, making sure that every learner participate actively and respect other learners' opinions and ideas.

Prepare for the lesson by reading the content of the activities in advance and collecting all the required teaching and learning materials needed for the activities. Have learners bring some of the materials from home, for example, the sticks and pieces of wood to be rubbed together.

Answers to check your progress 6.5

Refer to learner's book page 101

1. Words – heater, candle, stove, gas, fire

2. Electric cooker, electric heater, electric kettle and electric bulb. (Accept any other correct answer from the learners).

6.6 How heat travels
Activity 6.12, 6.13

Refer to learner's book pages 101-102

Ask questions on heat transfer and allow learners to work together to determine the answers and report them back. As learners work to discover the answers on their own, they will remember the concepts better and more fully. Prepare questions on heat transfer to use before, during and after the lesson, for example, "Does heat travel from one place to another? Does heat travels in solids/liquids/gases? How does heat travel from one place to another?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. allow your learners to learn by experimenting and manipulating different materials to learn and understand how heat travels through materials. Monitor your learners' interactions as they carry out group discussions to ensure that all of them actively participate in discussing how heat travels though materials. Guide learners to take turns to carry out classroom discussions on how heat is transferred through materials. This will enable you to assess their knowledge and discover which learners grasp the concepts and to what extent. Guide learners to work together to discuss how heat travels through materials.

Prepare for the lesson by reading the content of the activities in advance and collecting all the required teaching and learning materials needed for the activities. This lesson involves learners experiment with rods place over a candle flame. Caution them well in advance before the experiment starts to be careful so as not to get burnt or not to cause the others.

Answers to Check your progress 6.6

Refer to learner's book page 103

1. A – A wooden spoon

2. Metals

3. Solids

4. Metal rod

6.7: Uses of heat
Activity6.14

Refer to learner's book page 104

Ask questions on uses of heat and allow learners to work together to determine the answers and report them back to the class. As learners work to discover the answers on their own, they will remember the concepts better and more fully. Prepare questions on uses of heat to use before, during and after the lesson, for example, "How do you use heat? Is heat important to us? Do animals need heat?" While asking questions, keep in mind the abilities, educational needs and interests of your learners. Allow your learners to learn by experimenting, for example, washing their own handkerchiefs, hence they can experience the usefulness of heat (sunshine monitor your learners' interactions as they carry out group discussions on uses of heat to ensure that there is active participate by all. Guide learners to take turns to carry out classroom discussions on uses of heat and how heat is applied in their soap.

Activity 6.15 Drying

Refer to learner's book page 104

Ask learners, "Do you sometimes warm yourself in the fire when it is cold?" *(Expected answer:Yes.)* Guide them to look at and discuss (in pairs) the picture in the Learner's Book. Can they correctly identify the use of heat depicted in the picture? Let them discuss how heat is used in the picture. *(Expected answer: warming the body.)* Discuss with your learners how animals and birds ruffle their hairs and feathers to trap heat from their bodies thus keep warm. Rotate the pairs and ask learners to discuss and list other sources of heat people use to warm themselves in their community. *(Possible answer: charcoal stoves, electric heaters, etc.)* Caution learners to be careful or avoid using charcoal stoves, especially in when doors and windows are closed. Charcoal stoves emit carbon monoxide which is harmful and can cause death. Use the Learning points section to discuss with your learners and summarise uses of heat for warming ourselves. Write a chalkboard summary of what has been discussed for the learners to copy in their science notebooks.

Activities 6.16 and 6.17 Warming and cooking.

Organise learners into multi-ability pairs and have them study the pictures provided in the Learner's Book. Can the learners correctly identify uses of heat depicted in the pictures? Can they correctly name the sources of heat used in each picture? Walk around the classroom and listen as your learners discuss. Have them share their ideas as a class.

Ask them to name the sources of heat used for cooking in their homes. Rotate the pairs and ask them to discuss other ways of cooking and warming that they know of and are not depicted in the pictures. Use the Learning points section to discuss with your learners and summarize uses of heat for cooking and warming. Write a chalkboard summary of what has been discussed for the learners to copy in their science notebooks.

Activity 6.18 Ironing

Organize learners into multi-ability pairs and have them study the picture provided in the Learner's Book. Can the learners correctly identify use of heat depicted in the pictures? Can they correctly identify and name the items used in each picture. Walk around the classroom and listen as your learners discuss. Provide learners with chats containing pictures of an iron box and demonstrate to them how ironing is done. Write a summary of what has been discussed for the learners to copy in their science notebooks.

Answers to check your progress 6.7

Refer to learner's book page 107

1. To remove excess moisture and prevent them from going bad.
2. electricity
3. Sun
4. (a) True (b) True (c) False

UNIT 7 Electricity and magnetism

Refer to Learner's Book pages 108 - 127

Learn about	Key inquiry questions
Learners should know about the sources of electricity and investigate circuits, positive and negative poles in batteries, switches and whether the number of batteries increases the brightness of bulbs, and how this might be explained. They should discuss the dangers of electricity and risks of electricity in their home and how to take precautions. Children should learn about the properties of magnets through discussions and investigations by carrying out fair tests e.g. finding the poles of magnets, finding out which poles attract and which repel, identifying magnetic and non-magnetic materials, investigating the strength of magnets.	• How do we produce static electricity? • How do we produce electric current? • How do we design a fair test to find how the number of batteries effects the brightness of a bulb? • How do we make a magnet? • How do we group materials by use of magnets? • How do we use magnets to identify magnetic poles? • How do design a fair test to find the strength of a magnet?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Understand magnetism as a form of energy and in relation to electricity	• Observe the brightness of bulbs as the numbers of batteries is increased in a circuit • Predict what might happen if the number of batteries is increased or reduced in a circuit. • Devise tests to measure the strength of a magnet and batteries • Analyse the results of the test • Draw conclusion from their results	• Appreciate use of electricity and magnets in their daily lives
Contribution to the competencies: Critical thinking: in understanding how electricity is generated, in investigating magnetic and non-magnetic materials Communication and Co-operation: group work		
Links to other subjects: Social Studies: Direction		

Introduction to the Unit

We use electricity and magnetism every day. This unit explains electricity from charged particles. The two main kinds of electricity are static and current. Electricity and magnetism are closely related. Flowing electrons produce a magnetic field and spinning magnets cause an electric current to flow. Electromagnetism is the interaction of these two forces.

Cross-cutting issues

1. Environmental awareness and sustainability

Acquiring knowledge about electricity and magnetism enables learners to know how garget and other machines used every day work, thus endeavour to use environment-friendly gadgets and devices. Sustainability is important as it ensures that people have and will continue to have energy resources that protect human health and the environment.

2. Peace and values of education

Throughout the unit, learners are actively involved in discussing issues as a group and in pairs. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the discussions, they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process. Any form of intolerance should be highly condemned.

3. Life skills

The knowledge of electricity and magnetism is important in life. This unit will equip learners with knowledge that they can apply in real life to solve problems, for example, in creating or assembling devices and machines that would work to improve their lives.

Core competencies

1. Cooperation

Encourage learners to work as a team through group discussions and in pair work. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas in relation to electricity and magnetism. The principle of cooperation should be active listening to understand but not listening to respond. All learners should be given equal opportunities.

2. Communication

During group discussions and pair work, encourage learners to share their opinions, suggestions and ideas freely. This way they will build on their language command

as well as ability to participate in discussions. Ask them questions in relation to electricity and magnetism and give them a chance to attempt answering in the simplest way possible. This way, they will build on their confidence. Allow some room for learners to make mistakes and then correct them in a nice, positive way lest they will feel demoralised.

3. Critical and creative thinking

Use probing questions during the lessons to elicit critical thinking in learners, for example, let them investigate magnetism work. Help them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Use videos, pictures and photographs to make learners discuss the activities therein. Ask learners to come up with diagrams that illustrate learning aspects. This encourages creativity.

4. Culture and identity

Make learners to research on ways in which they can use the knowledge on acquired from the unit on heat energy and light energy in improving the living conditions of their communities. The greatness of a nation lays in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

Meaning of new words

- **Bulb** – The glass part of an electric lamp that gives light
- **Electromagnet** – a magnet consisting of a core, often made of soft iron, that is temporarily magnetised by an electric current flowing through a coil that surrounds it.
- **Magnet** – a piece of metal that has the power to draw iron or steel objects towards it and to hold or move them.
- **Magnetic field** – a region of space surrounding a magnetised body or current-carrying circuit in which the resulting magnetic force can be detected.
- **Magnetism** – the phenomenon of physical attraction for iron, shown in magnets or by a moving electric charge or current.
- **Plug** – small device with pins inserted in a socket to connect an equipment to electricity
- **Poles** – The ends of a magnet
- **Repel** – to keep or push something away

- **Safety precautions** – Something done earlier to avoid danger
- **Socket** – a device on a wall where you put a plug to connect equipment to electricity
- **Static** – something which is not moving.
- **Switch** – a device that is moved or pressed to turn light on or off when using electricity
- **Terminals** – the ends of a dry cell. The terminals are positive and negative

7.1 Static electricity
Activities 7.1 and 7.2, 7.3

Refer to learner's book page 108-109

Prepare for the lesson by reading the content of the activities in advance and collecting all the teaching and learning items needed for the activities Introduce the lesson by asking learners oral questions on electricity and magnetism. For example organize learners in multi-ability pairs. Guide them to discuss Allow learner's time to discuss and share their ideas. Walk around the classroom listening to your learners and offer assistance as necessary. Have the learners perform some simple activities to introduce them to the concepts of static electricity. Organize learners in multi-ability groups. Let them cut a paper into small pieces of paper place them on a working table. Ask them to predict what will happen to the pieces of paper if a ruler is passed over the. Now have them rub their plastic rulers gently on their dry hair or pullover. Ask them to slowly lower the ruler near the pieces of paper. Ask your learners, "What happens between the plastic ruler and the pieces of paper? Why?" Let them discuss and share their ideas. Can your learners recognize that rubbing a plastic ruler on dry hair charges it so it attracts the pieces of paper.

Answers to check your progress 7.1

Refer to learners book page 110

1. B – Your shirt sticking to your body.
2. C – Static electricity
3. (a) False (b) True (c) False

7. 2: Current electricity
Activity 7.4-7.7

Refer to learner's book pages 110-114

Prepare for the lesson by reading the content of the activities in advance and collecting all the teaching and learning items needed for the activities. Introduce the lesson by displaying and discussing the teaching aids. Ask oral questions such as: Name some things which use dry cells to operate. At what points should the wires be connected to the dry cell for the bulb to light? What difference can you observe between the dry cell and the battery?

Activities 7.4: *Refer to Learner's Book page 110*

Ask learners to tell you the source of light they use at home. ***(Answers will vary.)***

Ask them to look at the pictures in the Learner's Book. Can they identify and name the dry cells? Show learners actual dry cells of different sizes and let them discuss their usage.

Ask them to brainstorm and name any five devices that use dry cells. ***(Expected answers: Radios, remote controls, clocks/watches, torches, toys such as toy cars, etc.)*** Use the information in the Learning point section wrap up this section. Write a chalkboard summary on dry cells and let the learners copy the summary in their science notebooks

Ask the learners oral questions on the content covered. For example: What happens to a battery when the supply of current goes down? Which are the contact points of the wire in the dry cells for the bulb to light? Draw a simple circuit that will light a bulb.

Activities 7.5: *Learner's book page 111*

Organize learners in multi-ability pairs. Have them study the picture in the Learner's Book. Guide them to discuss the battery. Can they recognize a car battery Ask them if they have ever seen the battery before and if they know what it is used for. Use the information in the Learning point section wrap up on car batteries and their uses. Write a chalkboard summary on car batteries and let the learners copy the summary in their science notebooks. Discuss the Remember section in the Learner's Book with your learners.

Activities 7.6: *Learner's Book pages 112*

Tell your learners that they are going to produce electricity using batteries, wires and a torch bulb. Ask them, "How do you think we can make the bulb light?" Have them discuss and respond. Have them show your how they would connect the materials so as to produce electricity. Before engaging learners in activities to light bulbs, first gather your learners around you and act out an electric circuit. Ask them to join you in forming a circle. Tell them that you represent a battery and they represent a wire conductor. The circle represents a circuit. (Note: The word *circuit* comes from the Latin *circuitus*, which means "to go around.") Distribute an object such as a book or a pen or a pencil, to each member of the circle, including yourself. Ideally, everyone should have the same object. Tell learners that these objects represent electric charge inside a wire conductor. Explain that a wire conductor is full of electric charge. Remind them that you are playing the part of the battery in this circuit. Explain that all batteries have a positive end, represented by your left hand, and a negative end, represented by your right hand.

Activities 7.7: *Learner's book page 113*

Organize learners into multi-ability groups and provide each group with a torch and dry cells. Ask them to tell you how they would light the torch .Ask them to switch on the torch. Ask them to put two dry cells in the torch. Ask them, "Is your torch lighting? Why or why not?" Give them time to discuss and respond as to why their torch is lighting or not lighting.

Walk around the classroom observing whether they have connected the positive terminal of one dry cell to the negative terminal of the next cell. Ask them to switch off the torch and explain what happened. Explain to the learners that a torch has a switch. Tell them that a switch is used to put an electric device on and off.

Answers to check your progress 7.2

Refer to learners book Page 114

1. Televisions, radios, iron boxes, electric cookers, etc.(Accept any other correct answers from learners.)
2. To conserve light energy and consequently, money that would go to pay bills of wasted electricity/energy/fuel.
3. (a) False (b) True (c) True
4. Assess learners' drawings for correctness in connections (contact points in cells and bulb) and labelling.

7 3: Connecting dry cells
Activities 7.8, 7.9 and 7.10

Refer to learner's book pages 114-117

Activity 7.8: *Learner's book pages 114*

Organize learners in multi-ability groups. Provide each group with the required materials.

Let them make a simple circuit using one dry cell, connecting wires and a torch bulb. Observe them to ensure that the connections are made correctly. The bulb should light.

Guide them to try out the connections shown in the Learner's Book. Let them note the positions of the negative and positive terminals of the dry cells. Ask them to make observation and record your observations in your exercise books. Guide them to conclude that the bulb lights only when the connection is made correctly. For example: When the bottom contact of the bulb is connected to the positive terminal of the dry cell and the side contact is connected to the negative terminal of the dry cell. When the bottom contact of the bulb is connected to the negative terminal of the dry cell and the side contact is connected to the positive terminal of the dry cell. Use the Learning points section to wrap up this section on connection of dry cells, making sure that your learners understand which parts of the bulb have the contact points. Write a chalkboard summary on connection of dry cells and let the learners copy the summary in their science notebooks. Give learners time to do practice with various connections (under your supervision) to enable them to further understand how to make correct connections. Let them draw their setups and indicate in which connections the bulb lit up and in which ones the bulb did not.

Number of cells and brightness of the bulb

Activity 7.9: *Learner's book page 116*

Organize learners in multi-ability groups and provide each group with the required materials. Guide them to connect dry cells, a torch bulb and connecting wires as shown in the Learner's Book. Can the learners recognize that the bulb will light? Let them observe the brightness of the bulb. Ask them, "What do you think we could do to increase its brightness? Let them brainstorm in their groups and share their ideas on how they think the brightness of the bulb can be increased. Can they recognize that setting more dry cells in series increases the brightness of the bulb? Write their ideas on the chalkboard. Guide them to add a dry cell, one at a time, to the connection and observe the brightness of the bulb. (Expected observation: The bulb lights brighter as the dry cells are added into the connection.) Allow them time to

draw each setup in their exercise books and note beside each set up whether the bulb is brighter than the previous setup or dimmer. Use the Learning points section to conclude the lesson by emphasizing on the main points of the lesson, that is, as one adds dry cells to the connection, the bulb lights brighter. Write a chalkboard summary on increasing the brightness of the bulb by increasing the number of dry cells in series connection and let the learners copy the summary in their science notebooks.

Safety precautions when dealing with electricity

Activity 7.10: *Learner's book page 117*

Organize learners in multi-ability pairs and ask them to study the pictures provided in the Learner's Book. Ask them to share their ideas on what the boy in the picture is doing and how electricity is used as depicted in the picture. Can your learners recognize that the boy in the picture is warming himself using an electric heater and that electricity is used in the picture to power and generate heat in the electric heater? Let the learners discuss and share their thoughts and ideas on how electricity is used in their homes. Ask them to discuss and share the devices that use of electricity in their homes. Explain to them that when using electricity we have to be careful not to harm ourselves and others around us. Ask them, "What harm can electricity cause?" Give them time to brainstorm and respond. Explain to them that electricity can be dangerous. It can cause shocks, burns and even death. Go through the safety rules when using electricity outlined in the Learner's Book with your learners. Use the Learning points section to conclude the lesson by emphasizing the importance of observing safety precautions when using electricity. Write a chalkboard summary on dangers of electricity and safety precautions when using electricity and let the learners copy the summary in their science notebooks.

Answers to check your progress 7.3

Refer to learners book pages 118

1. Arrangement D will light brighter than the rest.
2. Shock, burn and even death
3. Risky and dangerous
4. Anywhere or on any equipment which can cause harm dangerous.

7.4: How magnets are made
Activities 7.11, 7.12 and 7.13

Refer to learner's book pages 119-121

Prepare for the lesson by reading the content of the activities in advance and collecting all the teaching and learning items needed for the activities.

Introduction to the lesson

1. Introduce the lesson by asking learners oral questions. For example:
   (a) What is a magnet?
   (b) What are magnets made of?
   (c) Where have you seen magnets?
   (d) Do they come in one size or shape?
   (e) What happens when some pieces of metal are placed near a magnet?
   (f) Do we need magnets?
2. Display and discuss the magnets in the picture in Learner's Book

Activity 7.11: *Learner's book page 119*

Organize learners in multi-ability pairs and ask them to study the pictures provided in the Learner's Book. Can they recognize that the pictures depict magnets? *(Magnets depicted: bar magnet and horse shoe magnet.)* Ask them, "Have you ever played with magnets? What did you do with the magnets?" Give them time to respond. *(Possible responses: They have played with magnets to try and pick different things with them or try and stick the magnets on different surfaces.)* Ask them, "What are magnets used for?" Give learners time to brainstorm and respond. *(Answers will vary.)* Explain to learners that we encounter magnets every day even though we may not be aware of this fact. For example, there are magnets inside our watches and mobile phones, there are magnets on refrigerator doors that help to keep it shut, there magnets in vehicles we use for transport, etc. This, therefore, shows that magnets are useful to us.

Activity 7.12: *Learner's book page 120*

Gather learners around your demonstration table and using a bar magnet, office pin or a needle and staple pins, demonstrate to them how to make a temporary magnet. Give them the opportunity to ask questions about the magnet. Organize learners in multi-ability groups and provide each group with the required materials – a bar magnet, office pin or a needle and staple pins. Ask them to hold the needle

or pin flat on the table and rub one end of the magnet along the pin or needle from the eye to the tip continuously in one direction. Let them continue rubbing quickly as many times as possible. Have them bring the needle close to staple pins and make observations of what happens. Guide them to make valid conclusions on making magnets. Use the Learning points section to conclude the lesson on making temporary magnets. Emphasize the fact that rubbing should be done in one direction strokes. Write a chalkboard summary and let the learners copy the summary in their science notebooks.

Activity 7.13: *Learner's book page 120*

Gather learners around your demonstration table and demonstrate to them how to make an electromagnet. Give them the opportunity to ask questions about the electromagnet.

Organize learners in multi-ability groups and provide each group with the required materials and guide them to make their own electromagnet as guided in the Learner's Book.

Caution them that the ends of the wires may get hot when they touch the terminals of the battery. Ask them to be careful when taping them. Guide them to make observations and valid conclusions on making electromagnets. Use the Learning points section to conclude the lesson making electromagnets. Explain to them that this is a temporary magnet and when the dry cell is disconnected, the nail losses magnetic force. Tell them that magnets have energy which push or pull objects and therefore can do work. Tell them that when more dry cells are added the magnet becomes stronger. Give the learners short notes on what has been learnt to write in their science notebooks

Ask the learners oral questions on the content covered. For example:

(a) What happened when the pin was rubbing continuously on the magnet

(b) What happens to the coiled nail when current is disconnected?

(c) What happens when dry cells are added to the electro magnet?

Have them answers questions in Check you progress 7.4 in the Learner's Book.

Answer to check your progress 7.4

Refer to learners book page 122

1. A. – stronger
2. B. It picks up staple pins.

3. (a) Rubbing a needle or pin in one direction with a magnet.

   (b) Coiling a connecting wire connected to a dry cell or dry cells around a nail.

4. (a) True (b) True

5. Assess learners' drawing for correctness and labelling.

7.5: Grouping materials using magnets

Refer to learner's book pages 122

Prepare for the lesson by reading the content of the activities in advance and collecting all the teaching and learning items needed for the activities.

Activity 7.14: *Learner's book page 122*

Gather learners around your demonstration table and demonstrate to how to test whether an object is magnetic or not. Give them the opportunity to ask and answer questions about the magnetism. Organize learners in multi-ability groups and provide each group with the required materials. Guide them through the activity as outline in the Learner's Book. Guide them in making observations and in making valid conclusions from their observations .Guide learners in filling the table like the one shown in the Learner's Book.

Materials attracted by the magnet	**Materials not attracted by the magnet**
1. Spoon	1. Rubber
2. Office pins	2. Aluminium foil
3. Scissors,	3. Copper coin
4. Iron nail	4. Silver coin
5. Steel wool	5. Pencil
6. Iron fillings	6. Pen
	7. Paper
	8. Stick
	9. Plastic plate
	10.Wood

Conclude the lesson by emphasizing on the main points of the lesson as outlined in the Learning points section in the Learner's Book. Explain to learners that the objects attracted by a magnet called magnetic materials whereas those which are

not attracted by a magnet are called nonmagnetic materials. Give the learners short notes on what has been learnt to write in their science notebooks.

Lesson assessment

Teacher to ask the learners oral questions on the content covered such as: List the materials which were attracted by the magnet List the materials not attracted by the magnet.What is common for the materials attracted by the magnet? sk learners to answer the questions in Check your progress 7.5 in the Learner's book.

Answers to check your progress 7.5

Refer to learner's book Page 123

Magnetic metals objects	Nonmagnetic metal objects
Silver coin, office pins, staple pins, iron nail, spoon and paper clip	Paper, rubber, stick, pencil, eraser, socks, book and clothes peg

7.6: Magnetic poles

Activity 7.15, 7.16

Refer to learner's book page 123-125

Prepare for the lesson by reading the content of the activities in advance and collecting all the teaching and learning items needed for the activites

Activity 7.15: *Learner's book page 123*

Demonstrate to the learners how to determine the poles of a magnet using a bar magnet, paper and iron filings. Put some iron filings on a white paper and move the magnet back and forth on the paper. Ask the learners to make observations and record in the science notebooks. Gently tap the paper and let the learners see the pattern of the magnetic fields forming. Alternatively, you can place the magnet underneath a paper with iron filings and gently tap to allow the pattern to form. Guide the learners in making observations and in making valid conclusions. Conclude the lesson by emphasizing on the main points of the lesson, that is, the iron filings are attracted to the poles of the magnet and that the middle part of the magnet did not attract iron filings. Explain to the learners that when a magnet is cut into small pieces, the poles are not destroyed. Give the learners short notes on what has been learnt to write in their science notebooks.

Activity 7.16: *Learners book page 124*

Gather learners around your demonstration table and demonstrate to them how magnetic poles behave close to each other. Give them the opportunity to ask and answer questions. Organize them in multi-ability groups and provide each group two bar magnets. Guide them through the activity as outline in the Learner's Book. Guide them in making observations and in making valid conclusions from their observations. Have them record their observations in the following table.

Poles	**They pull each other**	**They push each other**
North + North		✓
South + South		✓
North + South	✓	
South + North	✓	

Use the Learning points section in the Learner's Book to emphasize the main points of the lesson, that is, like poles of a magnet repel and unlike poles attract each other. Give the learners short notes on what has been learnt to write in their science notebooks.

Answers to check your progress 7.6

Refer to learner's book Pages 125

1. C – Iron nail
2. Books, wood, pen, paper chalk
3. Repelled
4. Check learners' drawings to ensure that they have drawn a bar magnet and correctly labelled the poles.
5. (a) True (b) False (c) False

7.7: Finding the strength of magnets

Refer to learner's book page 126-127

Activity 7.17: *Learner's book page 126*

Demonstrate the activity to your learners by placing iron fillings on a paper and pass a magnet at the bottom of the paper. Guide the learners to repeat the activity using a tin plate and then using an aluminium plate. Guide the learners in making observations and in making valid conclusions. Conclude the lesson by emphasizing on the main points of the lesson as outlined in the Learning points section. Explain to learners that the iron fillings on the paper and the aluminium plate moved to the direction the magnet is moved. The magnet did not have any effect on the iron filings on the tin plate. Magnetic force can only pass through a material which not magnetic.

Answers to check your progress 7.7

Refer to learners book pages 126

1. B. The iron filings moved in the direction of the magnet.
2. Magnetic forces in the magnet attracted the iron fillings preventing the iron fillings from moving.
3. (a) True (b) True (c) False

UNIT 8 Earth, gravity and simple machines

Refer to learner's book pages 128 - 141

Learn about	Key inquiry questions
Learners should understand about the Earth and gravity by constructing a sphere based on evidence of pictures of the Earth from space. They should explore the idea that the centre of the Earth has similar properties to a magnet called gravity and discuss weightlessness experienced by astronauts as they move away from the Earth. Children should learn about gravity as a force generated by the Earth by dropping objects and observing the time it takes for them to fall, explain why objects fall down instead of going up, and that 'down' is towards the centre of the Earth. They should discuss what is necessary to overcome the force of gravity by birds, aeroplanes and rockets. Children should learn how they might reduce the force of gravity by investigating fixed pulleys and inclined planes to make work easier by overcoming and reducing the effect of gravity as a competing force.	• What does the earth look like? • Why do objects fall down instead of going up? • How do aeroplanes overcome the force of gravity? • How do we construct a simple pulley? • How we use a simple pulley? • How do we make an inclined plane? • How do we use a simple inclined plane?

Learning outcomes		
Knowledge and understanding	**Skills**	**Attitudes**
• Describe the shape of the earth and discuss the concept of gravity	• Investigate how earth's rotation causes seasonal changes	• Appreciate the use of pulleys as inclined plane to reduce gravity. • Appreciate the earth and space with all the seasonal changes
Contribution to the competencies: Critical thinking: understanding the shape of the earth and concept of gravity Co-operation and Communication: group work		
Links to other subjects: Mathematics: Shape Arts: Modelling		

Introduction to the Unit

The earth is not flat. Instead it is round in shape. It is a big sphere like a football and it spins about its own axis, which is an imaginary line that passes through north and south poles of the earth. Through group discussions and modelling the shape of the earth, learners will explore the implications of the fact that the Earth is spherical. By working with the models they will reconcile the intuitive perception of a flat Earth with the formal statement that it is in fact a sphere.

Cross-cutting issues

1. Environmental awareness and sustainability

Acquiring knowledge about the earth, gravity and simple machines enables learners to know and understand the world around them. It will also enable them to understand how simple machines work to improve their lives, thus endeavour to use those that promote sustainability and protection of the environment. Sustainability is important as it ensures that people have and will continue to have energy resources that protect human health and the environment.

2. *Peace and values of education*

Throughout the unit, learners are actively involved in discussing issues as a group and in pairs. Learners should be made aware of the need to accommodate everyone's ideas and opinions. Through the discussions, they will at times agree or disagree on issues at hand. They should be made to embrace the views of others and treat them as a learning process. Any form of intolerance should be highly condemned.

3. *Life skills*

The knowledge of the earth, gravity and simple machines is important in life. This unit will equip learners with knowledge that they can apply in real life to solve problems, for example, in creating or assembling simple machines that would work to improve their lives and that of others in their community.

Core competencies

1. Cooperation

Encourage learners to work as a team through group discussions and in pair work. Allow learners to freely interact with one another. Let them associate with one's culture and abilities through resources sharing and exchange of ideas in relation to the earth, gravity and simple machines. The principle of cooperation should be active listening to understand but not listening to respond. All learners should be given equal opportunities.

2. Communication

During group discussions and pair work, encourage learners to share their opinions, suggestions and ideas freely. This way they will build on their language command as well as ability to participate in discussions. Ask them questions in relation to the earth, gravity and simple machines and give them a chance to attempt answering in the simplest way possible. This way, they will build on their confidence. Allow some room for learners to make mistakes and then correct them in a nice, positive way lest they will feel demoralised.

3. Critical and creative thinking

Use probing questions during the lessons to elicit critical thinking in learners, for example, let them investigate how gravity or simple machines work. Help them develop a thinking culture as they try to relate the unit with the questions given to them. These questions should however trigger the idea of what they should expect from the unit. Use videos, pictures and photographs to make learners discuss the activities therein. Ask learners to come up with diagrams that illustrate learning aspects. This encourages creativity.

4. Culture and identity

Make learners to research on ways in which they can use the acquired knowledge on earth, gravity and simple machines acquired from the unit in improving the living conditions of their communities. The greatness of a nation lays in the ability of its people to integrate skills and knowledge with national development and growth. Learners should know that knowledge and culture are mutually inclusive.

Meaning of new words

- **Air resistance:** a force that is caused by air. The force acts in the opposite direction to an object moving through the air.
- **Astronaut:** a person who is trained to travel in a spacecraft.
- **Earth:** the planet on which we live.
- **Free-fall:** downward movement under the force of gravity only.
- **Globe:** a spherical representation of the earth.
- **Gravity:** the force that attracts a body towards the centre of the earth.
- **Inclined plane:** a flat supporting surface tilted at an angle, with one end higher than the other, used as an aid for raising or lowering a load.
- **Rotate:** move in a circle round an axis or centre.
- **Simple machine:** any of the basic mechanical devices for applying a force, such as an inclined plane, wedge, or lever.
- **Sphere:** a round solid figure, or its surface, with every point on its surface equidistant from its centre.
- **Streamlined body:** a shape that lowers the friction drag between a fluid, like air and water, and an object moving through that fluid.
- **Weightlessness:** the state of apparently not being acted on by gravity.

8.1: How the earth looks like

Refer to learner's book pages 128-129

Activity 8.1

Refer to learner's book pages 128

Organize learners in multi-ability pairs. Ask them, "What do you think is the shape

of the earth?" Let them discuss and share their ideas on what they think is the shape of the earth and if they think the earth moves. Your learners probably know that Earth is spherical. Tell them, "It is said that the Earth we live on is a ground ball, spinning in space. Does anyone know what this means?" Allow the class to brainstorm and record their ideas in their science notebooks. This should take about 5 to 7 minute. List their responses on the chalkboard be referred to during this and the next activity.

Activity 8.2

Refer to learner's book pages 128

Hold up a soccer ball for the learners to see. Ask them to tell you what shape the ball is. ***(Expected answer: Round)*** Roll the ball on the table like the earth would rotate on its axis. Ask the learners to tell you if they think the earth moves like the ball. Some of your learners may probably know that the earth rotates. Ask them to tell you other things that are in the shape of a ball. Encourage your learners to think of the earth as in that shape. Now hold up the globe and ask your learners to tell you what they think a globe is and what it has in common with the ball. ***(Expected answer: They are both round in shape.)*** Initiate a discussion of a globe as a model of Earth. Rotate the globe and guide learners to come to a conclusion that fust as the globe rotates the earth rotates. Write a chalkboard summary on the shape of the earth and let the learners copy the summary in their science notebooks.

Guide learners in multi-ability groups to use papier mache or clay or plasticin.

8.2: The force of gravity
Activity 8.3-8.4

Refer to learner's book pages 129-130

Activity 8.3

Find out what your learners know about gravity. Ask, "What is gravity? Where is gravity? What does gravity do?" Give them time to discuss in groups and explain their ideas. Record their ideas on the chalkboard, so that they can return to them later. Hold up a pencil and ask the learners to predict what will happen to it if you let go of it. Ask them, "Which direction will the pencil go? What makes it go in that direction?" Let them brainstorm and respond. Let go of the pencil and have the learner make an observation. Were their predictions right? Now ask them to pick materials such as an eraser, a book,, a stone, a feather and let them drop to find out what happens. Discuss with the learners how the earth is similar to a magnet.

Explain to your learners that a force called force of gravity of the earth causes the objects to fall to the ground. Ask them, "Do you think gravity ever changes? Why or Why not? (Expected answer: Gravity does not change on Earth, it remains constant.) Ask them, "Do you think we need gravity? Why or why not? (Without gravity we would not stay on Earth; it affects motion.) Define gravity for your learners as the force of attraction that exists between objects. A force is a push or a pull that acts on an object. Use the Learning points section to wrap up the lesson. Write a chalkboard summary on force of gravity and let the learners copy the summary in their science notebooks

Activity 8.4

In pairs, guide the learner to carry out the activity as outlined in the Learner's Book. Guide them to determine the heavier of the two objects and predict which one will fall to the ground before the other. Let them use different objects, observe and record their observations. Use the Learning points section to wrap up the lesson. Write a chalkboard summary and let the learners copy the summary in their science notebooks

8.3 Effects of Gravity in Space

Activity 8.5

Refer to Learners' Book page 131

Ask the learners in multi-ability groups to look at the picture in the Learner's Book. Can they identify that the picture depicts astronauts? Tell them that astronauts appear to bounce around in their spacecraft. Ask them, "Why do you think this happens? Is this because there is no gravity in space?" Guide learners to find the meaning of the word weightlessness fro

m a dictionary or online sources. Use the Learning points section to wrap up the lesson. Write a chalkboard summary and let the learners copy the summary in their science notebooks

Answers to check your progress 8.1

Refer to learner's book page 132

1. A. – A force that pulls objects towards the earth.
2. The force of gravity on an object
3. Both fell at the same time.
4. (a) False (b) False (c) True

8.4: Overcoming force of gravity

Refer to learners' book pages 132-133

Activity 8.6

Ask the learners to look at the pictures of a bird and a plane flying and discuss:

What keeps them from falling off the sky? Name other things that are able to fly.

After discussion why a plane and a bird do not fall off the sky, take learners outside the classroom on a windy day and have them fly their kite. Give them time to discuss in groups why the kite does not fall off the sky. Let them explain their ideas. Have learners record their ideas in their exercise books. Use the Learning points section to wrap up on how some bodies overcome the force of gravity. Write a chalkboard summary and let the learners copy the summary in their science notebooks

Answers to check your progress 8.2

Refer to learner's book Pages 134

1. Air resistance
2. Light
3. Quickly
4. (a) True (b) True (c) False

8.5: How to construct a pulley

Refer to Learners' Book 134

Activity 8.7

Guide learners through the activity as outlined in the Learner's Book. Discuss with learners how force of gravity makes working difficult. Ask them, "How would you lift a tank of water into a truck for transport? How would you lift a heavy container onto the back of a lorry? How would you overcome force of gravity to make work easier? Guide the learners to discuss and conclude that they can use simple machines such as pulleys to make work easier.

Use the Learning points section to introduce learners to the concept of simple machines and simple pulleys. Write a chalkboard summary and let the learners copy the summary in their science notebooks.

Activity 8.8

Organise learners into multi-ability groups. Guide them through the activity as outlined in the Learner's Book. Let them fix a nail onto the piece of timber and bend the nail up using the hammer. Have them fix the timber to the block of wood and place it on the working table. Instruct them to slide the pulley onto the nail and fill a tin can with soil. Let them tie the can using a rope and pass the rope over the pulley.Have them make observation as they pull the other end of the rope downwards. Can they recognise that the can of soil is lifted up? Can they explain how and why this happened? Use the Learning points section to wrap up making of a pulley with your learners. Write a chalkboard summary and let the learners copy the summary in their science notebooks.

8.6 How to use a pulley

Refer to learner's book page 136

Activity 8.9

Refer to Learner's book pages 136-137

After your learners have constructed the pulley, have them use the pulley. Ask them to place the pulley on the working table. Instruct them to lift one load using only their hand. Let them discuss and share if they think it does feel heavy. Instruct then to tie the load onto one end of the pulley and pull the rope on the other end downwards. Let them observe and discuss. Ask them to tell you if the load feels heavier or lighter than lifting it with only the hand. (Expected answer: The load is lighter.) Let them repeat the activity with other loads. Let them visit the assembly ground and lift the flag up by pulling the rope downwards. Let them make and record their observations. Using the Learning points section, guide learners to conclude that pulleys help to make work easier. Write a chalkboard summary and let the learners copy the summary in their science notebooks.

Answers to check your progress 8.3

Refer to Learner's Book Pages 137

1. C
2. Force of gravity and friction
3. The groove
4. (a) True (b) True (c) False

8. 7: Making an inclined plane

Refer to learner's book page 137

Prepare for the lesson by reading the content of the activities in advance and collecting all the required teaching and learning materials

Activity 8.10

Refer to learner's book page 137

Guide the learner in pairs to study the picture provided in the Learner's Book. Can they identify the simple machine being used? Ask them to discuss and tell you if climbing a wall would be easier than climbing the wall without using the ladder. *(Expected answer: Using a ladder would be easier.)* Ask learners to name other things that work like a ladder. Caution learners that a ladder should be strong enough to withstand the weight of the person using it. Use the Learning points section to introduce learners to inclined planes. Write a chalkboard summary and let the learners copy the summary in their science notebooks.

Activity 8.11

Refer to learner's book page 138

Guide learners to discuss how they would lift the carton of books onto the table. Let them try lifting the box using only their hands and then try lifting using a plant places against the end of the table. Have them compare and tell you which one was easier to do. Use the Learning points section to summarise main points on inclined planes. Write a chalkboard summary and let the learners copy the summary in their science notebook

8. 8: How to use a simple inclined plane

Refer to learners Book page 139

Activity 8.12

Refer to learner's book page 139

Ask the learners to study the pictures provided in the Learner's Book and determine which one would be easier between climbing a hill straight up and using the winding road and between using steep or gentle staircase to go up a tall building? *(Expected answer: Using a winding road and using a gentle staircase.)* Ask them to discuss and name some places in the school where such machines are found. Discuss with learners using staircase and winding hills as inclined planes.

Activity 8.13

Refer to learner's book page 140

Organise for your learners to visit a construction site to observe how ladders are used to climb walls. Guide learners to name other places where a ladder can be used. Ask them to find other machines that work the same way as inclined planes around their homes and in the community. Once you and your learners are back in class, use the Learning points section to summarise main points on inclined planes. Explain to learners that machines do not reduce the amount of work done. They make work easier. Write a chalkboard summary and let the learners copy the summary in their science notebooks.

Answers to check your progress 8.4

Refer to Learner's Book Pages 137

1. A - A flat surface raised at an angle
2. B - Clothe line
3. B. Slide
4. (a) A stair case (b) Moving up floors in a building
5. (a) False (b) False (c) True (d) False