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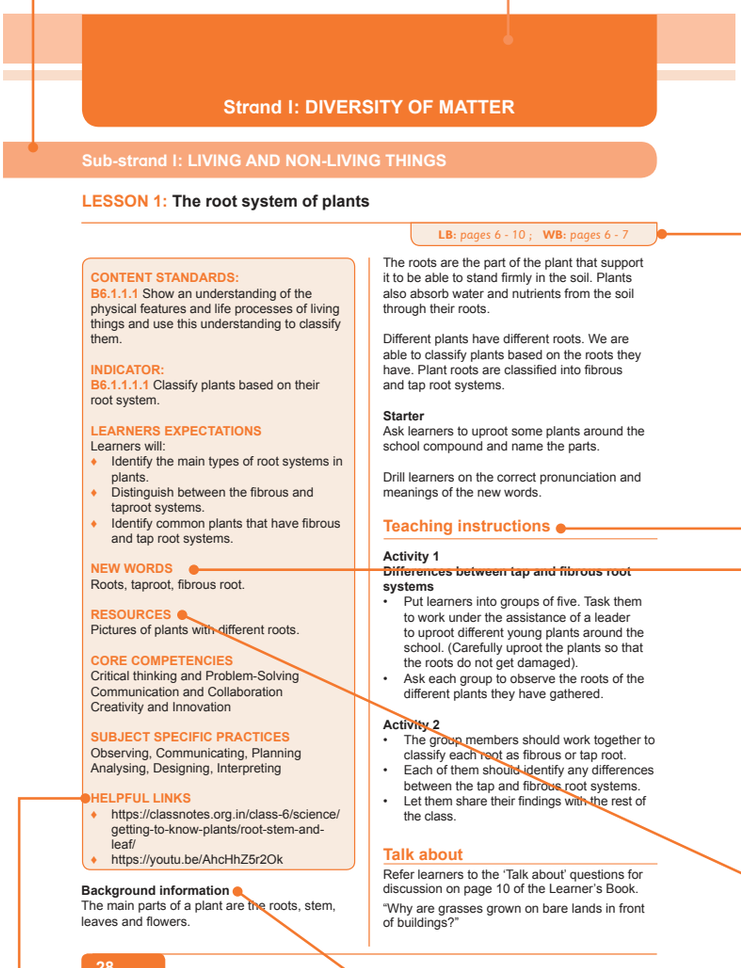
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Structure of the Teacher's Guide

The concise Teacher's Guide is organized under the following headings and features.

Sub-strand
NaCCA, Ministry of Education 2019 curriculum Sub-strand covered.

Strand
The relevant NaCCA, Ministry of Education 2019 curriculum Strand covered is in the top bar.



Strand I: DIVERSITY OF MATTER

Sub-strand I: LIVING AND NON-LIVING THINGS

LESSON 1: **The root system of plants**

LB: *pages 6 - 10* ; WB: *pages 6 - 7*

CONTENT STANDARDS:
B6.1.1.1 Show an understanding of the physical features and life processes of living things and use this understanding to classify them.

INDICATOR:
B6.1.1.1.1 Classify plants based on their root system.

LEARNERS EXPECTATIONS
Learners will:
- Identify the main types of root systems in plants.
- Distinguish between the fibrous and taproot systems.
- Identify common plants that have fibrous and tap root systems.

NEW WORDS
Roots, taproot, fibrous root.

RESOURCES
Pictures of plants with different roots.

CORE COMPETENCIES
Critical thinking and Problem-Solving
Communication and Collaboration
Creativity and Innovation

SUBJECT SPECIFIC PRACTICES
Observing, Communicating, Planning
Analysing, Designing, Interpreting

HELPFUL LINKS
- https://classnotes.org.in/class-6/science/getting-to-know-plants/root-stem-and-leaf/
- https://youtu.be/AhcHhZ5r2Ok

Background information
The main parts of a plant are the roots, stem, leaves and flowers.

The roots are the part of the plant that support it to be able to stand firmly in the soil. Plants also absorb water and nutrients from the soil through their roots.

Different plants have different roots. We are able to classify plants based on the roots they have. Plant roots are classified into fibrous and tap root systems.

Starter
Ask learners to uproot some plants around the school compound and name the parts.

Drill learners on the correct pronunciation and meanings of the new words.

Teaching instructions

Activity 1
Differences between tap and fibrous root systems
- Put learners into groups of five. Task them to work under the assistance of a leader to uproot different young plants around the school. (Carefully uproot the plants so that the roots do not get damaged).
- Ask each group to observe the roots of the different plants they have gathered.

Activity 2
- The group members should work together to classify each root as fibrous or tap root.
- Each of them should identify any differences between the tap and fibrous root systems.
- Let them share their findings with the rest of the class.

Talk about

Refer learners to the 'Talk about' questions for discussion on page 10 of the Learner's Book.

"Why are grasses grown on bare lands in front of buildings?"

28

Page reference
You will find the Learner's Book and Workbook page references on the top right/ left for each lesson.

Teaching instructions
You will find all activities you are expected to perform under each lesson here. References are made to the Learner's Book where neccesary.

New words
Every lesson in the series identifies key words that learners are expected to know and use appropriately. These are relevant to the lesson.

Resources
Helps to aid preparation. The series identifies all the relevant resources necessary to deliver a successful lesson. Resources identified are mostly "NO COST" or "LOW COST" materials that teachers/facilitators can easily acquire to make their lessons more meaningful and enjoyable.

Helpful links
Comprehensive site of helpful links for educational or teaching tips and ideas are provided under some lessons. These are internet links to text, pictures and videos that you will use during the lessons. Download them ahead of the lesson.

Background information
Refers to the details that identify and describe the significance and historical value of the lesson topic. It is a vital element, as it provides relevant, factual details that are related to a specific topic.

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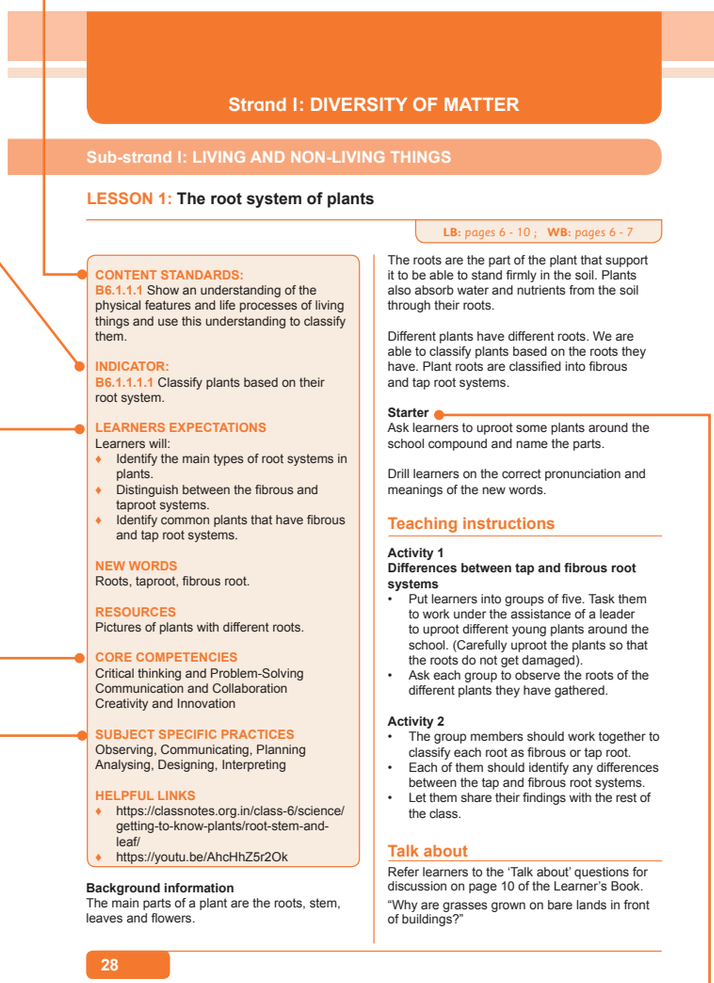
Indicator
This feature indicates the specific things that learners need to know and be able to demonstrate in order to achieve the content standards. Lessons are generated from these indicators.

Content standards
This feature indicates the broad expectations under the strands that learners are expected to achieve in the course of completing that grade level.

Learning Expectations
are provided to help both teachers/facilitators and learners identify what learners are required to know, understand and do in order to achieve the learning indicator(s).

Core competencies
The universal core competencies as stated under each sub-strand in the curriculum is outlined here.

Subject specific practices
This is the specific methods or practices which are used to teach a particular lesson under the sub-strand.



Strand I: DIVERSITY OF MATTER

Sub-strand I: LIVING AND NON-LIVING THINGS

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"Why are grasses grown on bare lands in front of buildings?"

28

Starter
Starters help in preparing learners for new skills, methods or concepts, reinforcing previous steps necessary for this new learning/ lesson.

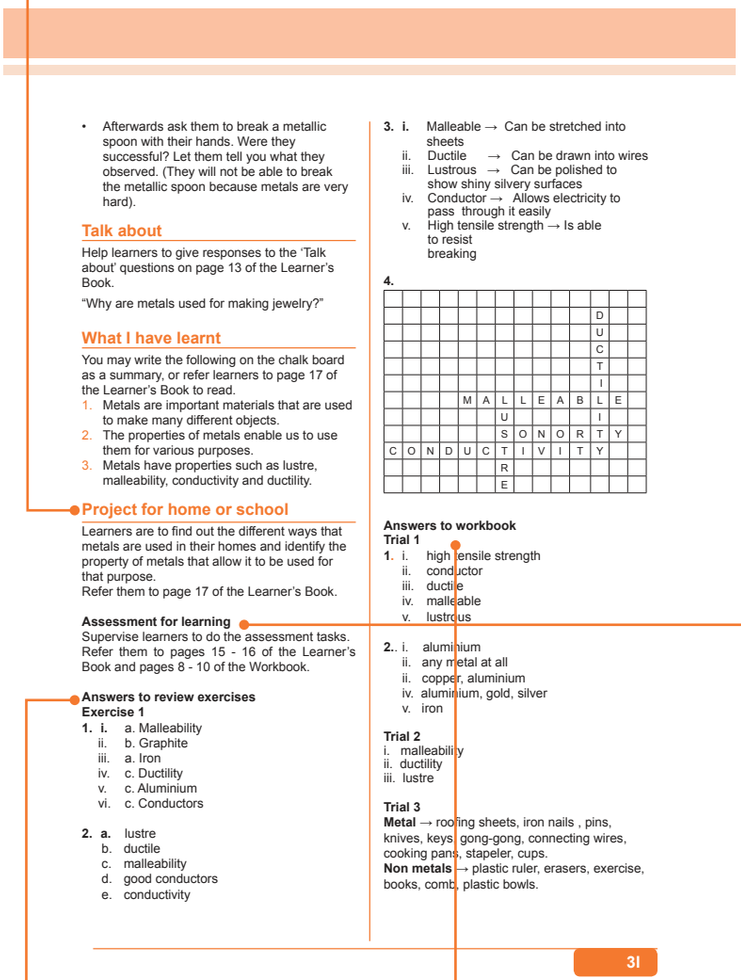
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Project for home or school

In every lesson, an exploration of the concepts learnt in the classroom is further extended to the home. The series suggests relevant home activities that help learners to augment and consolidate what has been learnt in the classroom and its real life application where neccesary.



- Afterwards ask them to break a metallic spoon with their hands. Were they successful? Let them tell you what they observed. (They will not be able to break the metallic spoon because metals are very hard).

Talk about

Help learners to give responses to the 'Talk about' questions on page 13 of the Learner's Book.

"Why are metals used for making jewelry?"

What I have learnt

You may write the following on the chalk board as a summary, or refer learners to page 17 of the Learner's Book to read.

1. Metals are important materials that are used to make many different objects.
2. The properties of metals enable us to use them for various purposes.
3. Metals have properties such as lustre, malleability, conductivity and ductility.

Project for home or school

Learners are to find out the different ways that metals are used in their homes and identify the property of metals that allow it to be used for that purpose.
Refer them to page 17 of the Learner's Book.

Assessment for learning
Supervise learners to do the assessment tasks. Refer them to pages 15 - 16 of the Learner's Book and pages 8 - 10 of the Workbook.

Answers to review exercises
Exercise 1

1. i. a. Malleability
ii. b. Graphite
iii. a. Iron
iv. c. Ductility
v. c. Aluminium
vi. c. Conductors

2. a. lustre
b. ductile
c. malleability
d. good conductors
e. conductivity

3. i. Malleable → Can be stretched into sheets
ii. Ductile → Can be drawn into wires
iii. Lustrous → Can be polished to show shiny silvery surfaces
iv. Conductor → Allows electricity to pass through it easily
v. High tensile strength → Is able to resist breaking

4.

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Answers to workbook
Trial 1

1. i. high tensile strength
ii. conductor
iii. ductile
iv. malleable
v. lustrous

2.. i. aluminium
ii. any metal at all
ii. copper, aluminium
iv. aluminium, gold, silver
v. iron

Trial 2
i. malleability
ii. ductility
iii. lustre

Trial 3
Metal → roofing sheets, iron nails , pins, knives, keys, gong-gong, connecting wires, cooking pans, stapeler, cups.
Non metals → plastic ruler, erasers, exercise, books, comb, plastic bowls.

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Assesment for learning

The feature directs teachers/ facilitators in checking learners' understanding of the lesson indicator(s) by way of assessing them. References are made to "Exercises" in the Learner's Book and Trials in the Workbook.

Answers

Expected answers are provided for all exercises under every lesson in the Learner's Book and Trials in the Workbook. Where answers are to vary from one learner to the other, it is mentioned.

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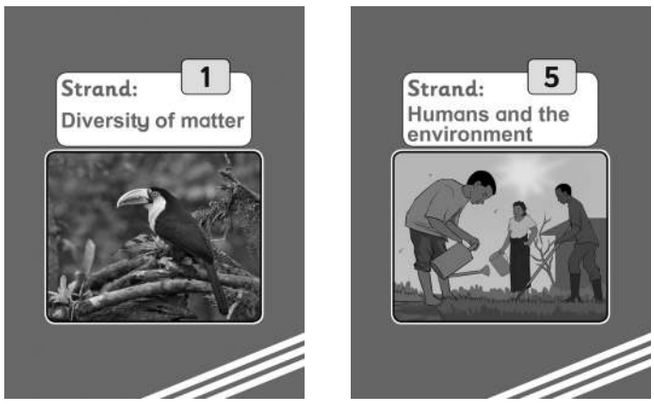
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Organisation and structure of the Learner's Book

The user-friendly Learner's Book tackles the new standard-based Science curiculum features and criteria with a clear and logical structure that incorporates the following features.

Strand Opener

There are five "strands" in the Learner's Book – one for each of the Science curriculum. This precedes the beginning of contents under each strand.

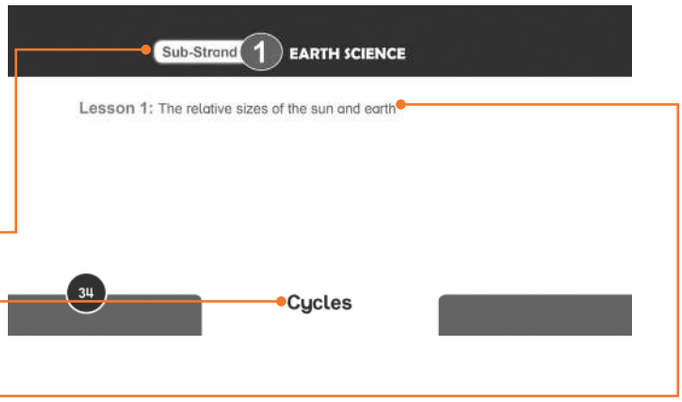


Header and footer labels

Strand: This feature indicates the particular strand from which the lessons are developed.

Sub-strand: These are larger groups of related science topics to be studied under each strand.

Lesson: This feature specifies the lesson number under a sub-strand. The lessons are derived from the indicators.



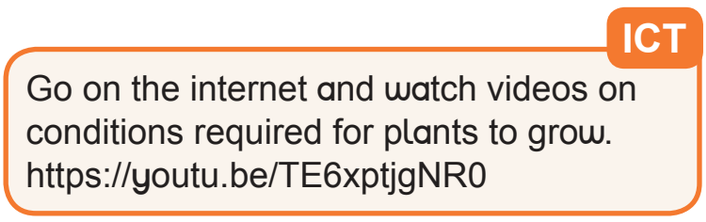
New words

- build subject-specific vocabulary gradually, giving learners the confidence to understand it clearly and apply it in context and through different exercises.



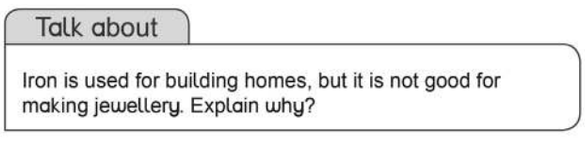
ICT boxes

- include research activities
- emphasise the core competencies.



Talk about

- Learners are expected to discuss questions either in groups or in pairs. It is a critical thinking section that also helps their communication and collaborative skills.



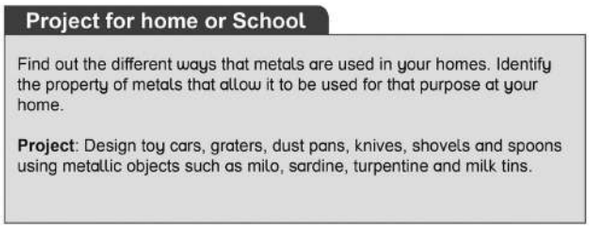
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Project for home or school

- It helps consolidate what learners have already learnt in class. You are expected to direct learners on what they are to do either at home or in school.



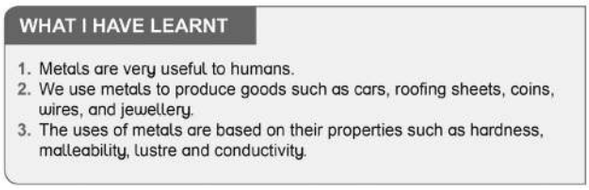
Project for home or School

Find out the different ways that metals are used in your homes. Identify the property of metals that allow it to be used for that purpose at your home.

Project: Design toy cars, graters, dust pans, knives, shovels and spoons using metallic objects such as milo, sardine, turpentine and milk tins.

What I have learnt

- helps summarise what have been learnt under each lesson
- through questioning the facilitator assesses what the learners have learnt.

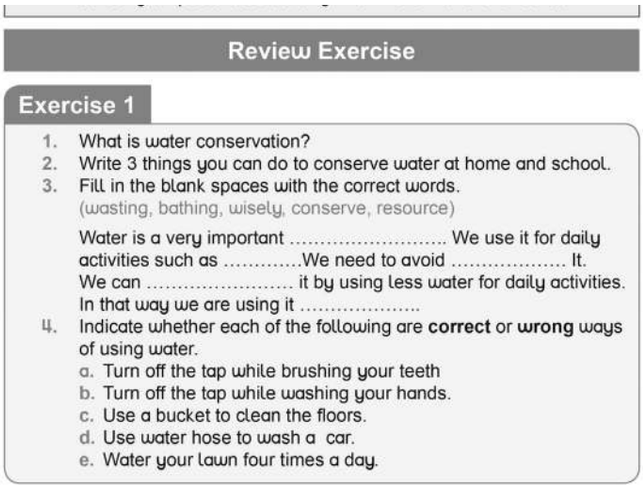


WHAT I HAVE LEARNT

1. Metals are very useful to humans.
2. We use metals to produce goods such as cars, roofing sheets, coins, wires, and jewellery.
3. The uses of metals are based on their properties such as hardness, malleability, lustre and conductivity.

Review Exercise

- Learners practice and consolidate what they have been taught. This provides an opportunity for all learners to strengthen their newly acquired knowledge.



Review Exercise

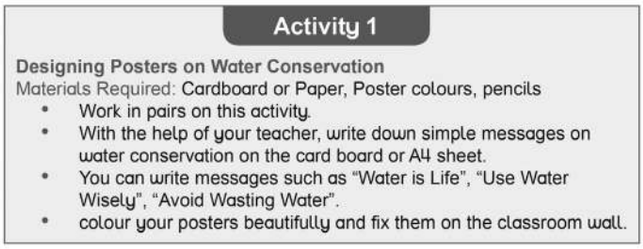
Exercise 1

1. What is water conservation?
2. Write 3 things you can do to conserve water at home and school.
3. Fill in the blank spaces with the correct words.
   (wasting, bathing, wisely, conserve, resource)

   Water is a very important ..... We use it for daily activities such as .....We need to avoid ..... It. We can ..... it by using less water for daily activities. In that way we are using it .....
4. Indicate whether each of the following are **correct** or **wrong** ways of using water.
   a. Turn off the tap while brushing your teeth
   b. Turn off the tap while washing your hands.
   c. Use a bucket to clean the floors.
   d. Use water hose to wash a car.
   e. Water your lawn four times a day.

Activities

- incorporate accurate and current individual, pair and group work activities that help learners to explore and practise what they have learnt
- incorporate exercises that allow learners to answer questions about what they have learnt and consolidate learning
- address the syllabus content standards and core competencies
- are representative of the indicators and exemplars
- have instructions and text that are consistent and clearly presented to learners
- promote problem solving and subject understanding.



Activity 1

Designing Posters on Water Conservation

Materials Required: Cardboard or Paper, Poster colours, pencils

- Work in pairs on this activity.
- With the help of your teacher, write down simple messages on water conservation on the card board or A4 sheet.
- You can write messages such as "Water is Life", "Use Water Wisely", "Avoid Wasting Water".
- colour your posters beautifully and fix them on the classroom wall.

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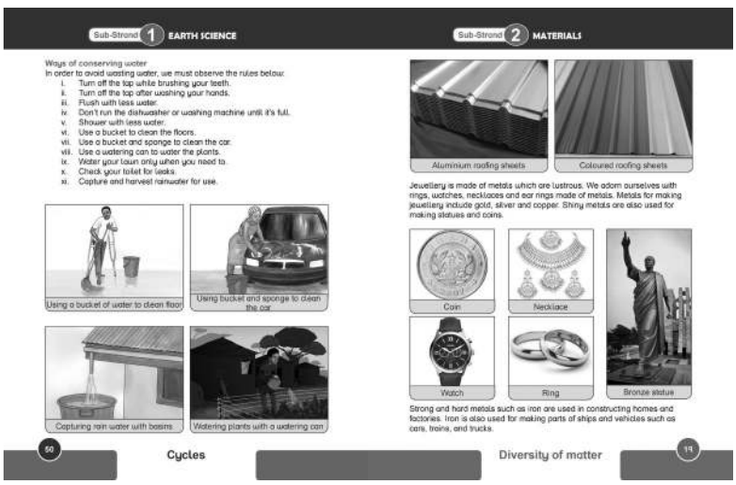
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Text and content

- use language that is appropriate to the level, age, knowledge and background of the learners
- are representative of Ghana's diversity
- have a good gender balance and portray no gender stereotypes.

Illustrations and photos

- are high-quality and representative of Ghana's diversity
- balance the text on every page and add to learners' understanding of the content
- have captions and labels that are simple, relevant, appropriate, and clear
- reflect a variety of learners (including learners with special needs)
- show no gender stereotypes.



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INTRODUCTION

Science is such a broad topic that it is broken down into disciplines or branches based on the particular area of study. Learn about the different branches of science from these introductions. Then, get more detailed information about each science.

The objective of this Teacher's Guide is to make teaching and learning more interactive, practical, useful and to bring out the ingenuity of teacher professionalism in the teacher/facilitator to produce well-equipped learners for national development.

This Teacher's Guide has been carefully designed to help teachers/facilitators teach effectively using the Learner's Book and its accompanying Workbook.

The Teacher's Guide helps teachers/facilitators to prepare adequately for each lesson by suggesting the following:

- Expected outcomes of the lesson
- The subject specific practices and core competencies to be developed in the lesson
- The pedagogical approaches to be used for the lesson
- The resources to be used in teaching the lesson
- The main points of the lesson
- Ideas or tasks that stimulate critical thinking among learners.

It is expected that after carefully studying the Teachers' Guide, teachers/facilitators will be able to:

1. Know the provisions in the Learner's Book in terms of Aims, Values, Core Competences and School Time Allocations.
2. Know the recommended teaching and assessment approaches for each lesson.
3. Understand the structure and scope of sequence of the science curriculum.
4. Prepare schemes of learning for a given academic year, term or week.
5. Select and design appropriate assessment tasks for a given lesson.

Ultimately, the Teacher's Guide will contribute tremendously in ensuring the smooth implementation of the new standards-based science curriculum for primary Schools.

Role of the Teacher/Facilitator in the effective use of the Learner's Book

The Curriculum encourages the creation of a learning-centred classroom with the opportunity for learners to engage in meaningful "hands-on" activities that bring home to the learner what they are learning in school and what they know from outside of school.

The teacher as a facilitator needs to create a learning environment that supports:

- The creation of learning-centred classrooms through the use of creative approaches to teaching and learning as strategies to ensuring learner empowerment and independent learning.
- The positioning of inclusion and equity at the centre of quality teaching and learning.
- The use of differentiation and scaffolding as teaching and learning strategies for ensuring that no learner is left behind.
- The use of Information and Communications Technology (ICT) as a pedagogical tool.
- The identification of subject specific instructional expectations needed for making learning in the subject relevant to learners.
- The integration of assessment for learning, as learning and of learning into the teaching and learning process and as an accountability strategy.
- Using questioning techniques that promote deeper learning.

Rationale for Primary Science

Science forms an integral part of our everyday activities and it is a universal truth that development is hinged on Science. Science and technology is the backbone of social, economic, political, and physical development of a country. It is a never-ending creative process, which serves to promote discovery and understanding. It consists of a body of knowledge which attempts to explain and interpret phenomena and experiences. Science has changed our lives and it is vital to Ghana's future development. To provide quality Science education, teachers/

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facilitators must facilitate learning in the Science classroom. This will provide the foundations for discovering and understanding the world around us and lay the grounds for Science and Science-related studies at higher levels of education. Learners should be encouraged to understand how Science can be used to explain what is occurring, predict how things will behave and analyse causes and origins of things in our environment. The Science curriculum has considered the desired outcomes of education for learners at the basic level. Science is also concerned with the development of attitudes and therefore it is important for all citizens to be scientifically and technologically literate for sustainable development. Science therefore ought to be taught using hands-on and minds-on approaches which learners will find as fun and adopt Science as a culture.

Philosophy

Teaching philosophy
Ghana believes that an effective Science education which is needed for sustainable development should be inquiry-based. Thus Science education must provide learners with opportunities to expand, change, enhance and modify the ways in which they view the world. It should be pivoted on learner-centred teaching and learning approaches that engage learners physically and cognitively in the knowledge-acquiring process, in a rich and rigorous inquiry-driven environment.

Learning philosophy
Science Learning is an active contextualized process of constructing knowledge based on learners' experiences rather than acquiring it. Learners are information constructors who operate as researchers. Teachers/facilitators serve as facilitators by providing the enabling environment that promotes the construction of learners' own knowledge based on their previous experiences. This makes learning more relevant to the learner and leads to the development of critical thinkers and problem solvers.

Instructional Guidelines

1. Guide and facilitate learning by generating discourse among learners and challenging them to accept and share responsibility for their own learning based on their unique individual differences.
2. Select Science content, adapt and plan lessons to meet the interests, knowledge, understanding, abilities, and experiences of learners.
3. Work together as colleagues within and across disciplines and grade levels to develop communities of Science learners who exhibit the skills of scientific inquiry and the attitudes and social values conducive to Science learning.
4. Use multiple methods and systematically gather data about learners' understanding and ability, to guide Science teaching and learning with arrangements to provide feedback to both learners and parents.
5. Design and manage learning environments that provide students with the time, space, and resources needed for learning Science.

Class management

Most teachers/facilitators in Ghana teach large classes. Such classes are in the range of 40 to 100 learners or more. The teachers/facilitators based on their professional experience over the years have developed skills in classroom methodology. Here are a few reminders about whole class, group, pair and individual work that could be helpful with large classes.

Whole class teaching
Much of your teaching, especially when your class is large, will involve you standing at the front of the class explaining and listening to your learners. You can set out facts and concepts which everyone can understand. However, your class will vary in ability. More able learners should be given additional tasks to stretch their capabilities while those who find understanding more difficult should be given the time and attention they need.

When you introduce a topic make sure you use learners' existing knowledge and build upon it. The basic information for your lesson is in the text. If you are going to ask learners to read for themselves (at home or in class or to read out loud), work out during your lesson planning which words will be difficult for them to understand and explain these first. Make sure that all your learners have understood your explanation and give time to those having difficulty as well as by talking and listening you

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will find other activities can be very valuable during whole-class teaching, for example:

Group work
Class teaching is large group work but sometimes there are advantages in working in pairs or groups of four to six learners: some children make more progress when working in a group of the same ability. On other occasions more able learners can help those who are not quite so quick at understanding. Groups of friends and groups working on different topics are other possible divisions that you could make.

For group work to be successful some thought must be given to the organization of class furniture. In most of our classrooms we still see rows of desks with several children to each desk. The classrooms are also often crowded so that it is not easy to move the desks around. Whatever the situation, some kind of group can be organized. At its most basic, the group will have to be learners at one desk. It might be possible for those at one desk to turn around to face those at the desk behind.

There are many advantages in allowing a number of children to consider a topic, work jointly and bring their findings back to the whole class: each group will think in a slightly different way and have different experiences to share. Sometimes learners are better able to discuss sensitive areas in same-sex groups. Such work encourages co-operation and mutual support. Individual groups can study a picture together, or write a poem or discuss a topic like pollution in their village. You need to ensure that there is follow-up to group work so that work is not done in isolation but is instead considered by the class as a whole.

Pair work
Learners are often instructed to work in pairs – either with their desk mate, or with a partner. This is an ideal opportunity for learners to assist each other, and for them to assess each other. Working with a desk mate offers the least classroom disturbance. The learners are already seated side-by-side. They ask and answer questions during Picture talk, and they discuss the readings before they write comprehension answers individually.

Working with a partner that you have allocated to the learner means that you can pair a slower learner with a faster learner, so that they can help one another. You may also choose to pair learners of similar abilities together, so that they can proceed more quickly with the work, while you assist the slower pairs.

Learner self-study
There will be times when you want the class to work as individuals to allow them to become familiar with material you have given them and to allow you to work with Learners of different abilities. It is worth bearing in mind that while there is a need for learners to learn how to read and study on their own, there are also dangers in this approach. It is essential that the material they read is understandable to them, and that your attention is still focused on the class to ensure that all learners are using the time to read and not misbehave. Use additional material at different levels to ensure that some learners do not finish more quickly than others.

Teaching tip
One of the most important skills in classroom management is the ability to ensure your learners are occupied for the whole lesson. If a group has finished its task and has nothing else to do it is likely to become disruptive. Break up your lesson and make sure it has several different parts:
- full class work
- individual work
- practical activities

Pedagogy and Assessment

Creative and learning-centred pedagogies for Science

1. ***Activity-based learning, hands-on, creative, participatory method of learning.***
   - Science teachers/facilitators should devise activities to suit the age group and skills of the learners.
   - There should be variety in activities. Sorting of items into groups, creation of posters, hands-on activities. separating samples of given mixtures.
   - Activities should not only help gather knowledge, but apply and evaluate knowledge, e.g. designing and building objects from common materials.

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Excerpt
More Information

2. ***Demonstrations***
   - The teacher/facilitator retains the formal authority role by showing learners what they need to know, e.g. demonstrating how to construct an electronic circuit.

3. ***Inquiry-based learning***
   - Teachers/facilitators design an investigation toward answering questions, e.g. How is soap produced within the local community?
   - Learners carry out an investigation – gather data (by asking their parents, people in the community).
   - Develops information processing and problem-solving skills, e.g. learning about the steps/processes involved in soap making).
   - Makes use of resources beyond classroom/school, e.g. visiting local production sites.

4. ***Group work (think-pair-share, collaborative learning, problem-based learning, team-based learning/ discussions)***
   - Collaborative learning highlights the contributions of individual group members, and leads to dialogue and consensus building on topics without a clear right and wrong answer, e.g. placing learners into groups to discuss the physical features that enables various organisms to live in the sea, land or air.

5. ***Project-based learning***
   - Project-based learning is a teaching method in which learners gain knowledge and skills by working for an extended period of time, e.g. reading and recording the school/home's electricity consumption over a month.
   - This focuses on investigating and responding to an authentic, engaging and complex question, problem, or challenge, e.g. how to solve the problem of poor sanitary conditions in the school.

Other approaches for teaching Science learning

- ICT-based learning
- Engaging learners in meaningful learning
- Organisation of field trips and nature walks Use of concept maps, mind maps and future's wheel Invitation of professionals to make class presentations
- Changing the learning setting
- Implementation of a reward system
- Use of educational games, songs and ice-breakers.

Use of ICT

The use of ICT is firmly incorporated in the Learner's Book During science lessons, learners need to be exposed to the various ICT tools around them.

Some schools in urban areas have access to computers in school or in libraries. Rural areas will become linked in the future. You should learn how to use a computer as soon as you are able to do so. They open up the world as your resource. The internet can provide as much additional material as you will ever need. Once your learners have the chance to use a computer they too will have access to a world of information. This can be done through effective use of the following ICT tools:

- Laptop or desktop computers
- Smartphones
- Tablets
- CD players
- Projectors
- Calculators
- Radios
- Cameras
- Television sets
- Computer and related software, such as Microsoft Office packages (Word, PowerPoint and Excel).

ICTs are a useful communication technology that can by and large be used to enhance the quality of teaching and learning in schools. Internet systems have made the world a globalized one. It is for this that Professor Ali Mazrui describes globalization as "the villagization of the world" hence, the world being a "global village" (Marshall McLuhan and Quentin Fiore, 1968). This means all parts of the world are being brought together by the internet and other electronic communication interconnections. That is, more information has become accessible anywhere in the world by way of interconnectedness and interdependency. You can communicate to anybody anywhere in the world from the comfort of your room, car and many more places. In

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