

K-6

Primary Science and Technology

# Resources



## Teachers' Guide

# Resources

MODULE 1: K – 2

MODULE 2: 3– 4

MODULE 3: 5– 6

## Preface

The development of learning outcomes for the core curriculum in OECS primary and lower secondary schools is an essential part of the harmonization of OECS educational systems. The curriculum harmonization process commenced seven years ago with discussions between the OECS Education Reform Unit (OERU) and educational personnel in all member countries (See *Eastern Caribbean Education Reform Project: Initiative on curriculum and remediation – Design Mission report, February 1998*).

The initiative in Primary Secondary Science and Technology commenced in 2001, with a meeting of science and technology educators in St. Vincent and the Grenadines. Time was spent initially on defining science and technology, mainly because the primary curriculum concentrated on science only. A working definition has been developed and has been used consistently throughout the development of the programme.

Draft learning outcomes were developed and circulated for comments throughout the curriculum units in the OECS. Subsequent meetings of the working group were held in St. Kitts and Nevis, St. Lucia and Antigua and Barbuda. At each of these meetings teacher educators, teachers and principals formed part of the discussion groups. After the learning outcomes were adopted by the curriculum officers, instructional modules to serve as teachers' guides were planned and developed by members of the working groups. The learning outcomes and modules were all reviewed and edited by the two consultants who worked through all phases of the project.

Time did not permit a formal piloting of the learning outcomes and modules. Since in most cases the same curriculum officer worked on the lower secondary curriculum, also, there is the possibility of the primary curriculum benefiting from the experience gained in the piloting of the lower secondary programme.

The purpose of developing the learning outcomes and instructional modules is to ensure that all children in OECS primary schools attain an acceptable level of knowledge, skills and attitudes associated with science and technology. Each member country retains the right and responsibility for integrating these outcomes into the national primary science and technology curriculum. As usual, teachers will continue to use their initiative and resourcefulness in the implementation of the programme through the use of indigenous resources creating relevance.

The OERU is extremely grateful for the contribution made by all persons and institutions that have been involved in this developmental exercise. First, OERU expresses thanks to the Canadian International Development Agency (CIDA) for the high level of interest shown and the funding provided for the Eastern Caribbean Education Reform Project (ECERP). The Ministries and Departments of Education have contributed resource personnel, accommodation, refreshment, ground transportation, and some materials for workshops. Most important, however, have been the high level of cooperation and commitment to the reform effort displayed by both the administrative and professional sections of Ministries of Education.

The following science education professionals have made significant contribution over the four-year period.

Country	Participant	Designation
Anguilla	Mr. Worrell Brooks	Education Officer, Science
	Mrs. Maria Webster	Secondary School Teacher
Antigua and Barbuda	Mr. Earl Skerritt	Science Coordinator
	Ms. Kendra Thomas	Primary School Teacher
	Ms. Celia Frederick	Secondary School Teacher
	Ms. Gracelyn Ireland	Primary School Teacher
British Virgin Islands	Ms. Beverlie Brathwaite	Education Officer, Science
Dominica	Mr. Frank Newton	Education Officer Science
	Mr. Gerald Corbette	Lecturer, Dominica State College
Grenada	Mr. Jervis Viechweg	Curriculum Officer, Science
	Ms. Janis Henry	Lecturer, T. A. Marryshow Com. College
Montserrat	Mr. Gregory Julius	Primary school Principal

St. Kitts And Nevis	Mr. Hilton Clarke  Dr. Lincoln Carty	Curriculum Officer, Science Former Curriculum Officer, Science
St. Lucia	Mr. Winston Blanchard  Ms. Imelda Polius	Curriculum Officer, Science Former Primary School Teacher
St. Vincent and the Grenadines	Mrs. Arlette Keane-Browne  Mrs. Amaala Muhammad  Mr. Kenroy Johnson	Former Curriculum Officer Curriculum Officer, Science Principal, Secondary School

The OERU also expresses gratitude to the dozens of teachers, principals and students who have participated in discussions and consultations.

The actual planning and subsequent developmental process for the learning outcomes and Teacher's Guide became the responsibility of Dr. Cheryl Remy, former Senior Lecturer at Sir Arthur Lewis Community College, St. Lucia and Professor Winston King, Senior Lecturer, School of Education, UWI, to whom the OERU is very grateful. As a team, Dr. Remy and Professor King have encouraged workshop participants and module writers to think and to create ideas as the work progressed.

The staff at OERU together contributed in no small measure to these modules. Ms. Deborah Alphonse, Accounts/Administrative Assistant, Ms. Natasha Deterville, now Secretary to the Director of Economic Affairs in the OECS, and Ms. Cleotha Randolph, Documentation Officer, worked tirelessly arranging workshops and reproducing materials. Ms. Natalie Compton of Nagio Creations competently designed the layout of the modules and learning outcomes for printing and electronic reproduction.

Dr. Henry Hinds, formerly Curriculum Specialist at OERU, was responsible for the curriculum project. Mrs. Lorna Callender and Ms. Candia Alleyne, both former Heads of OERU, have supported the project organizationally and morally. Mr. Johnson Cenac, ECERP Officer, made significant contributions in various ways and at various times throughout the development of this work.

The Primary Science and Technology modules provide an excellent example of the fusion of talent, creativity, rigorous science and technology and cooperation to develop a valuable resource for teachers.

The OERU hopes that principals and teachers will continue to play their roles in making the outcomes and modules come to life in classrooms throughout the OECS. The commitment and effort surely will contribute to the enhancement of knowledge, and skills and the development of positive attitude towards science and technology.

Henry Hinds, Head, OERU

August, 2006

**Matter and Materials**

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## **RATIONALE**

By examining the Earth's resources students will not only learn of the importance of resources but also of their classification. Resources may be grouped as renewable or non renewable.

The resources of our Earth are very important to our survival and provide a base for our technological activity. As Caribbean people, we depend on our resources as we continue to grow as developing nations. Sustainability and protection must be practised by everyone. A study of resources is intended to help students use resources wisely.

## **INTRODUCTION**

The work on resources is structured to enable teachers to enhance the learning process in the classroom. Students will have the opportunity to engage in hands-on activities involving the use of scientific process skills and attitudes while developing inquiry and problem-solving techniques. Students will be made aware of the role of technology in our world and its effect on our lives. Students will also develop their inventiveness and creativity through a number of well-structured activities as they work on a study of resources.

**THE EXPERIENCES IN THESE MODULES WILL HELP THE STUDENT TO DEVELOP THE FOLLOWING MAJOR IDEAS**

**EARTH'S RESOURCES**

- *There are many things that are necessary for human survival.*
- *The sources of these things are called resources.*
- *These resources include the Earth's air, water, rocks and soil.*
- *Resources may be classified as 'renewable' and 'non-renewable'.*
- *Resources may be protected by different means.*

**TECHNOLOGY**

- Technological methods involves the use of problem solving, technological processes and resources to find solutions to people's wants and needs.
- Technology is a human activity.
- Individuals can take part in Technological activity.
- Technology involves the uses of materials, energy, tools/machines and information.
- Technological activity include Biotechnology, Production Technology and Transportation.
- Technology changes over time.
- Technology is neither good nor bad, but the way we use it can have positive or negative effects on our lives.
- The use of technology has side effects.

**SCIENCE TECHNOLOGY, SOCIETY AND THE ENVIRONMENT**

- Science and Technology affect human life, the society and the environment.
- The impact of Science and Technology can be positive or negative, unplanned or planned, immediate or delayed.
- There should be sustainable use of resources and efforts should be made to minimize ecological disturbances.
- People's values, beliefs and attitudes influence Scientific and Technological activity and use.

MODULE 1  
EARTH'S RESOURCES  
GRADES K - 2

## **GENERAL OBJECTIVES**

The students should be able to:

1. Realize that there are many materials on earth that humans use to make different objects for specific purposes.
2. Understand that if objects/materials are not properly disposed of they will pollute the land.
3. Realize that air and water are important to humans.
4. Realize that air and water can become polluted.
5. Realize that they can contribute to a clean environment.
6. Construct devices to clean the air.
7. Appreciate that people develop means of protecting themselves from air pollution.

## **SPECIFIC OBJECTIVES**

The students should be able to:

1. Identify and name some objects found in their environment
2. Classify these objects according to:-
  - shape
  - colour
  - texture
  - size
  - composition (metal, wood, plastic, paper, etc.)
  - living and non-living
  - natural and human made.
3. Record data using pictographs and/or bar graphs.
4. Identify items of litter around the school.
5. Group the litter according to:-

- size
  - colour
  - material made of (bottles, cans, paper, plastic, food waste)
  - recyclable and non-recyclable.
6. Explain the dangers of litter (on a simple scale e.g. attracting animals with diseases, broken glass causing injury, etc.).
  7. Discuss how the problem of litter in schools could be avoided.
  8. Organize and participate in a clean-up project.
  9. Construct a toy using discarded materials.
  10. Use sand to make sand sculpture and collage.

## ***Air***

Students should be able to:

1. Infer that air is all around us.
2. State properties of clean air (tasteless, colourless, odourless).
3. Describe conditions of air at different times (hot, cold, humid, etc.).
4. Identify at least two air pollutants found in a particular area.
5. Discuss how pollutants affect people's activities.
6. Construct a trap for collecting dust particles from air.
7. Compare the amount of pollution found in different areas using the constructed air trap.

## ***Water***

Students should be able to:

1. State the properties of water.
2. State different uses of water.
3. List places where water can be found.
4. Infer that rain is water.

(This section can be tied in with weather and rain and the water cycle)

**LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY EXPECTED AT  
GRADES K - 2**

**ATTITUDES:**

**Students should be encouraged to:**

<b>Curiosity:</b>	<ul style="list-style-type: none"> <li>✓ Ask questions about objects and events.</li> <li>✓ Find out more about events and objects on their own.</li> </ul>
<b>Inventiveness:</b>	<ul style="list-style-type: none"> <li>✓ Suggest new ways of doing things.</li> </ul>
<b>Respect For Evidence</b>	<ul style="list-style-type: none"> <li>✓ Explain their results and conclusions.</li> <li>✓ Listen to other students' results and explanations.</li> </ul>
<b>Persistence</b>	<ul style="list-style-type: none"> <li>✓ Complete activities.</li> <li>✓ Persist at tasks.</li> </ul>
<b>Respect For Living Things</b>	<ul style="list-style-type: none"> <li>✓ Show sensitivity to living things.</li> </ul>
<b>Cooperation</b>	<ul style="list-style-type: none"> <li>✓ Share with others.</li> <li>✓ Work together with others.</li> </ul>
<b>Concern For Safety</b>	<ul style="list-style-type: none"> <li>✓ Observe safety instructions.</li> </ul>

**SKILLS:**

**In developing their skills of inquiry, problem solving and design, the students are expected to:**

<b>Observing</b>	<ul style="list-style-type: none"> <li>✓ Use as many senses as are appropriate and safe to gather information.</li> <li>✓ Identify differences and similarities between objects and events.</li> <li>✓ Identify sequence in events.</li> </ul>
<b>Measuring</b>	<ul style="list-style-type: none"> <li>✓ Use simple measuring instruments or models of measuring instruments. At first use comparative terms such as bigger, smaller and later use actual figures.</li> </ul>
<b>Manipulating</b>	<ul style="list-style-type: none"> <li>✓ Set up simple experiments to compare results.</li> <li>✓ Manipulate simple equipment.</li> </ul>
<b>Recording</b>	<ul style="list-style-type: none"> <li>✓ Use pictures and charts to report results.</li> <li>✓ Fill out simple tables to report results.</li> </ul>
<b>Classifying</b>	<ul style="list-style-type: none"> <li>✓ Group objects according to one or two criteria.</li> </ul>
<b>Communicating</b>	<ul style="list-style-type: none"> <li>✓ Talk freely about their activities and the ideas they have, with or without making a written record.</li> <li>✓ Use appropriate vocabulary to describe their observations.</li> <li>✓ Listen to others' ideas and look at their results.</li> <li>✓ Report events by using demonstrations, role play, simple drawings, paintings and simple sentences.</li> </ul>
<b>Inferring</b>	<ul style="list-style-type: none"> <li>✓ Notice patterns in simple measurements and events.</li> </ul>
<b>Interpreting data</b>	<ul style="list-style-type: none"> <li>✓ Discuss what they find out in response to questions.</li> </ul>
<b>Experimenting</b>	<ul style="list-style-type: none"> <li>✓ Freely ask a variety of questions and suggest how they might be answered.</li> <li>✓ Suggest how they could investigate to find out answers to questions.</li> </ul>
<b>Predicting</b>	<ul style="list-style-type: none"> <li>✓ Attempt to make predictions (even if not based on patterns).</li> </ul>
<b>Problem Solving</b>	<ul style="list-style-type: none"> <li>✓ Suggest solutions to simple problems.</li> </ul>
<b>Designing</b>	<ul style="list-style-type: none"> <li>✓ Construct models either by following instructions or by using their own designs.</li> <li>✓ Select appropriate material to make models and gadgets.</li> </ul>

## TECHNOLOGY

<b>Technological Methods</b>	<ul style="list-style-type: none"><li>✓ Given problems, the children will be able to discuss and make simple gadgets.</li></ul>
<b>Nature Of Technology</b>	<ul style="list-style-type: none"><li>✓ Realize that people use natural things and also make other things from them.</li><li>✓ Realize that they can design and make things which may be different from what others make.</li><li>✓ Share information with others.</li><li>✓ Realize that safety is important in using tools and making things.</li></ul>
<b><u>Use Of Technology</u></b>	<ul style="list-style-type: none"><li>✓ Appreciate the use of devices, tools and structures made by humans in the home and community .</li><li>✓ Appreciate the advantages of using these products.</li><li>✓ Realize that human-made things can pollute the environment.</li></ul>

## UNIT: EARTH'S RESOURCES (GRADE K)

### DURATION: 8 Lessons

### OBJECTIVES

The students should be able to:

1. Identify and name some objects found in the environment.
2. Classify objects according to
  - shape
  - colour
  - texture
  - size
  - composition (metal, wood, plastic, paper, etc.)
  - living and non-living.
3. Identify situations that indicate the presence of air.
4. Identify evidence of dust in the air.
5. Discuss how water is used in the home.

### PROCESS SKILLS

Observing  
Classifying  
Communicating  
Inferring

### ATTITUDES

Respect for living things  
Respect for the environment  
Integrity in observing

### MATERIALS

Objects of different colours, shapes and sizes found in the environment  
(e.g. stoppers, bottles, shells, leaves, etc.)

living things around us

pictures

paper, glue, Bristol board, etc.

## **CONTENT SUMMARY**

### **1. Observing and Classifying Things in the Environment**

- Many objects can be found in the environment; e.g. stones, rocks, leaves, bottles, bottle caps, wood, etc.
- Living things are also found in the environment.
- We can use our senses to describe objects found in our environment in terms of colour, texture, smell, shape, etc.

### **2. Living things in our environment**

- Things found around us are either living or non- living things.
- Living things can take in food, grow, reproduce (make more of their kind) and they die.

### **3. Air in our environment**

- Air is all around us. You cannot touch air, but you can feel it on your cheeks when the wind blows. We feel it when we breathe, we see leaves move, etc.
- Air is not always clean. There are particles of dust and many other particles in the air.
- Air can be unhealthy sometimes.

### **4. Water in our environment**

- We use water for many purposes in our homes, e.g. to bathe, to cook, to clean, to drink, etc.
- A variety of things can be found in our environment.
- Things in our environment are different in texture, appearance, shape, and smell.
- Things in our environment are living or non-living.
- We are surrounded by air.
- Air can be unclean and unhealthy at times.
- Water is important.

## Suggested ACTIVITIES

### *Earth's Resources*

#### 1. Observing and Classifying Things in the Environment

- Take students out in the school's environment to collect objects. Also encourage them to bring objects from their home environment.
- Provide an opportunity for students to describe the objects using the senses. Allow them to investigate, discovering the similarities and differences in various objects.
- Elicit from students different ways to group (or classify) the objects.
- Allow students to classify objects in many ways, e.g. colour, texture (hard, soft, smooth, rough), odour, odourless, etc.

#### 2. Living things in the Environment

- Bring in a live animal to school, or take pupils to a farm if possible; or just observe living things in the environment.
- Ask students to bring in pictures of living things to make a scrapbook.
- Compare living and non-living things by bringing out their specific differences.
- Encourage pupils to regard and respect living things in the environment.
- Discuss how specific living things can be useful to human.

#### 3. Air in the Environment

- Take students outside to feel the air blowing around them.
- Allow them to do breathing exercises emphasizing the intake and releasing of air.
- Allow students to experiment blowing on each other's hands, faces or as teacher feels appropriate.

- Allow students to tell how they know that the wind is blowing.
- Allow students to investigate glass screens, walls and other places where air is most likely to leave particles of dust. Let them suggest where the dust came from.

4. Water in the environment

- Discuss the uses of water in the home and school.

5. Integration with other subjects

Mathematics	- counting and representing data in graphical form
Social Studies	- integrating 'resources' into this area in Social Studies
Art	- drawing, painting and making models
English	- reporting, discussing and listening

## **ASSESSMENT**

1. Observing and Classifying Things in the Environment

- Let students collect and sort their own collection of things in the environment.
- Let students state or draw where different objects may be found in the environment.
- Give reasons why some objects are more common in some areas.

2. Living things in the Environment

- Let students develop a scrapbook on living and non-living things.
- Discuss ways of being sensitive to their pets' needs.
- Students can observe and find out more about their pets on their own and share their findings with the class.

**3.** *Air in the Environment*

- Let students state some areas of the school that might be most and least polluted with dust.
- Let them suggest ways to investigate to check their hypothesis.

**4.** *Water in the environment*

- List uses of water.
- Draw pictures illustrating the uses of water.

## ASSESSMENT CHECKLIST

### *Earth's Resources*

Scoring rubric indicating mastery of concepts, skills and attitudes

- 1 not at all
- 2 partially
- 3 fully

**NAME** .....

<b>CONCEPTS</b>	Scores
Name objects found in the environment	
Describes objects	
Names and describes living things	
Compares and contrasts living and non-living things	
Describes air	
Infers characteristics of air	
<b>PROCESS SKILLS</b>	
Ability to a) observe	
b) classify	
c) collect material	
d) communicate	
e) infer	
<b>ATTITUDES/GROUP SKILLS</b>	
a) Shows interest and curiosity	
b) Shows respect for living things	
c) Shows respect for the environment	
d) Participates in discussions	

## UNIT: EARTH'S RESOURCES (GRADE 1)

**DURATION: 9 Lessons**

### OBJECTIVES

The students should be able to:

1. Infer that objects in the environment may be natural or made by people.
2. Identify items of litter around the school.
3. Group the litter according to
  - a. size
  - b. colour
  - c. material made of (glass, metal, paper, plastic).
4. Explain the dangers of litter (e.g. attracting animals with diseases, broken glass causing injury).
5. Describe conditions of air at different times (hot, humid, cold).
6. Identify at least two air pollutants found in a particular area.
7. Discuss how pollutants affect people's activities.
8. State the properties of water .
9. Infer that rain is water.
10. List places where water can be found.

### PROCESS SKILLS

Observing  
Classifying  
Communicating  
Designing  
Manipulating  
Inferring  
Problem solving

### ATTITUDES

preservation of the environment  
Inventiveness  
Critical thinking

## **MATERIALS**

Objects in the environment

Discarded materials from home and school

Objects with different scents

Other environmental factors

## **CONTENT SUMMARY**

### **Natural and Human-made materials and Litter**

- Objects in the environment are natural or are made by people.
- Objects may be made of different materials such as wood, metal, plastic, paper, glass or cloth.
- Litter in the environment is made up of various kinds of materials. Litter can be classified according to the material from which it is made.
- Some waste materials are “environmentally friendly” which means that they can be broken down (decomposed) and absorbed by the natural environment.
- Recycling means taking useful materials from waste and making new products from them. For example, toys and ornaments can be made from discarded materials.
- Recycling enables us to reduce the amount of garbage we produce.

### **Air as a resource**

- Air is always in motion. Air can be hot or cold. The air around you makes you feel hot, cold or sticky.
- We breathe in air; therefore, air should be kept clean.
- Air can be polluted with various pollutants in the atmosphere.
- Some pollutants in the air are smoke, dust, chemicals, fumes from exhaust, germs, etc.

### **Water as a resource**

- Water can be found in rivers, ponds, streams, pools, sea, cisterns, and reservoirs.
- Water may be clean or unclean.
- Rain is water falling back to the earth.
- Water has different properties (e.g. it is colourless, it has no taste, it has no smell, it flows, etc.) .

## **STUDENT ACTIVITIES**

### *Natural and Human-made materials and Litter*

- Allow **students** to collect a variety of objects; observe and discuss the materials used to make various objects.
- Discuss the terms, ' natural' and 'human-made'.
- Enable students to classify objects in terms of natural and human-made.
- Allow students to examine their lunch–packs and also that of their peers to observe the natural and human-made materials found in the lunch boxes.
- Let students observe and collect (if possible) the litter on the school compound. (Safety: Exercise discretion – avoid garbage cans etc. Allow students to wear gloves or cover their hands with plastic bags. Let them wash their hands after handling litter).
- Classify objects of litter under the various headings.
- Further classify human-made objects made from glass, plastic, paper, etc.
- Discuss how human-made materials can affect the environment.
- Discuss the term, 'recycle'. Help students to guess the meaning of recycle by helping them to see the word "cycle" in "recycle" and "bicycle" Encourage pupils to find out things which are recycled at home, in school or in the environment.

- Let students brainstorm to suggest various ways they can engage in the recycling process.
- Let students to use discarded juice boxes and other objects to create toys, paper-bag puppets, collages, etc.

## **Air**

- Use various strong scents, spray, perfume, disinfectant, mosquito coil (lit), etc. to enable children to conclude that air is not always pure. Discuss various substances that can make the air unclean and discuss the effect on human
- Elicit from students the need to keep air clean since we also breathe in air.
- Allow students to observe exhaust from vehicles, smoke from whatever sources available, dust, and anything that can cause air to be unclean and discuss the effect on human.
- Take students to observe the movement of leaves, dust, etc on playground or elsewhere, fluttering flags, or any other examples to infer air in motion.

## **Water**

- Take students out to observe bodies of water or show them pictures of different places where water can be found.
- Let students collect rainwater. Let them describe/draw what they think happens to the rainwater after it rains.
- Experiment to list properties of water, e.g. give students plastic cups – one with water and two or three of the following: vinegar, oil, alcohol, coloured juice, milk. Allow them to touch, smell\*, pour, taste<sup>#</sup>

**Safety\***: show students how to use their hands to waft the fumes towards their nostrils for smelling.

**Safety<sup>#</sup>**: Tell students not to taste anything without an adult present. Some things look like water, but may be poisonous.

Ask students “Which is water?” From this they use words to describe the properties of water.

- Show students samples of water (e.g. with mud, leaves, etc.)  
Discuss that water can be clean and unclean.

## **ASSESSMENT**

### **Natural and Human-made materials and Litter**

- Given the illustration of objects, students should be able to classify them as natural or human-made.
- Given the name of an object, students should be able to state if the object is natural or human-made.
- Given an object, e.g. a shoebox, students should be able to state one way by which it can be recycled.

### **Air as a resource**

- Given a list of various scents, students should be able to identify the scents which may be harmful in the environment.

### **Water as a resource**

Let students:

- List the properties of water.
- State ways by which water can become unclean.
- Illustrate places where water can be found.

### **Design and make:**

The ACTIVITY where students make an object from discarded materials could be assessed on criteria such as:

Inventiveness, cooperation with others, neatness, persistence, etc.

**ASSESSMENT CHECKLIST**

- Scoring rubric
- 1 poor
  - 2 fair
  - 3 good
  - 4 very good

**NAME** .....

<b>CONCEPTS</b>		
Describes	a) human-made material	
	b) natural material	
Define litter		
Operationally define 'environmentally friendly'		
Operationally define 'recycle'		
Recognize that recycling is an important process		
Recognize that air can be polluted.		
State pollutants of air familiar to their environment		
State places where water can be found		
Recognize that water can be pure or impure		
<b>PROCESS SKILLS</b>		
<b>Ability to</b>	a) classify	
	b) collect materials	
	c) use materials in novel ways	
	d) communicate	
	e) create	
	f) infer	
	g) illustrate	
<b>ATTITUDES/GROUP SKILLS</b>		
	a) Stewardship of the environment	
	b) Curiosity	
	c) Critical thinking	
	d) Inventiveness	

## UNIT: EARTH'S RESOURCES (GRADE 2)

### DURATION: 8 Lessons

### OBJECTIVES

Students should be able to:

- Explain the dangers of litter.
- Discuss how the problems of litter in schools could be avoided.
- Organize and participate in a clean-up project.
- Identify at least two air pollutants found in a particular area.
- Discuss how pollutants affect people's activities.
- Construct a trap for collecting dust from the air.
- Compare the amount of pollution found in different areas using the constructed air trap.
- Identify and compare devices developed to protect workers from air pollution.

### PROCESS SKILLS

Observing  
Classifying  
Communicating  
Inferring  
Designing  
Problem solving  
Manipulating  
Hypothesizing

### ATTITUDES

Curiosity  
Concern for safety  
Stewardship of the environment  
Inventiveness  
Creativity

### MATERIALS

Markers

Paper Bristol board

Bunsen burner

Discarded material from the environment

Beakers

Pyrex

## CONTENT SUMMARY

- Litter is unhealthy. It is degrading to the environment.
- Litter can cause diseases, flooding, injury, an increase of pests (rats, flies, cockroaches, etc.).
- There are many ways by which we can solve the litter problem in our school.
- We can embark on:
  - a) clean-up projects
  - b) recycling projects
  - c) litter awareness campaigns, etc.
  
- Air will have pollutants according to the environment in any particular area.
  - Exhaust from vehicles will most likely pollute a busy city.
  - Smoke from burning land or smoke from making charcoal is most likely to pollute a rural area or a farming community.
  - Dust will pollute the air during construction, demolition, etc.
- Most pollutants can cause health problems, especially to babies, older people and those with breathing problems such as asthma.

There are also some airborne diseases which can affect us. One of the most common is influenza.
- We can investigate the air around us by constructing devices for collecting dust particles in the air.
- Water is a liquid
- The state of water can change when exposed to heat or cold.

## SUGGESTED ACTIVITIES

- Help students to observe and study the litter problem in the class or school as the need arises. Let them fill in recording sheets to assess the litter in the area chosen.
- Encourage and enable students to devise a plan for a clean-up project.
- Supervise and let students execute their plan.
- Encourage students to embark on an awareness campaign for school. Help pupils make signs, slogans, rhymes and jingles for a litter-free environment.
- Let groups of students devise ways they can recycle some discarded material.
- Allow students to investigate their community and report on litter collection, indiscriminate dumping of garbage, careless littering, etc.
- Encourage students to state ways by which they think that the problem can be alleviated.
- Invite resource personnel to speak to students about garbage handling and disposal.
- Discuss how the relevant authorities handle litter collection and disposal.
- Visit landfill area or other dumping sites. Observe and discuss methods used.
- Review how air can be unclean. List air pollutants.
- Allow students to brainstorm to state some of the jobs where workers may work in polluted air, e.g. construction sites, industrial sites, on farms where burning or chemical use takes place.
- Discuss ways people have developed to protect the worker from dust pollution in some work places. Examine a variety of masks and discuss how they work.

- Discuss the health problems, which are most likely to occur due to polluted air. (asthma, flu, etc.)
- Enable students to construct simple devices to trap particles in the air.
- Let students suggest how they could compare air pollution in different areas. Help them to set up their experiments. Observe, record and discuss findings.
- Investigate properties of water:

Experiment with water, demonstrating freezing and evaporation.

## **ASSESSMENT**

### Service Learning

1. As students work on their clean-up campaign they can be asked to
  - Design a poster to put up in your school or community to make people know that littering is unhealthy.
  - Write a poem or rhyme of about 4 lines about littering.

They can be assessed on various skills and attitudes such as:

Ability to communicate ideas, Creativity, Persistence, Cooperation

Drawing

- a) Draw a picture, showing how people's activities can result in air pollution.
- b) Draw a picture of sanitary workers at work disposing garbage. Write sentences to explain your picture.

### Written

1. Write a paragraph giving three reasons why we must not litter.
2. Write a paragraph telling ways by which you can help solve the litter problem in your neighbourhood.
3. Name two illnesses which may be caused by polluted air.

**Objective Type Questions can be based on the following:**

- a) Name the relevant authorities for garbage disposal on their island.
- b) Given a list of activities, students should be able to identify the activities which will result in pollution.
- c) Given a list of pollutants, students should be able to identify those which can affect the air.
- d) Students should be able to complete flow charts showing the changes in the states of water.

**ASSESSMENT CHECKLIST**

Checklist	1	poor
	2	fair
	3	good
	4	very good

Name -----

<b>CONCEPT</b>	
Understands that humans' activities can pollute the environment	
State how pollution can affect our health	
State how some machinery and manufacturing can pollute the environment	
State properties of water	
Understand that heat or cold can change the states of water	
<b>PROCESS SKILLS</b>	
Ability to:	
Communicate	
Infer	
Solve problems	
Design effectively	
Manipulate materials effectively	
Observe	
<b>ATTITUDES</b>	
Co-operates with others	
Accepts responsibility	
Follows procedures safely	
Shows concern for the environment	
Presents work neatly	
Shows creativity	
Shows initiative	

## Module 2

### Earth's resources

#### Grades 3 - 4

## **GENERAL OBJECTIVES**

The students should be able to:

1. Understand the concept of resources using soils, air and water as examples.
2. Investigate the physical properties of soil, water and air.

## **SPECIFIC OBJECTIVES**

### **Soils**

The students should be able to:-

1. Identify and name some of the Earth's resources (to include air, water, rocks, and soils).
2. Classify resources as renewable and non-renewable.
3. Collect and classify rocks.
4. Illustrate how rocks and soils are related.
5. Describe some uses of rocks to the environment (e.g. protecting the coastline, preventing/reducing erosion, etc.).
6. Investigate how people use rocks for different purposes (e.g. extraction of minerals, building, etc.).
7. Design and make ornaments from rocks (e.g. paper weights).
8. Classify soils as sand, clay and loam.
9. Distinguish between various soils on the basis of physical properties (colour, texture, structure, components, etc.).

## **Air**

The students should be able to:

1. List the properties of air.
2. List and discuss ways in which air is important to people (cross reference with Energy).
3. Infer the presence of air by the resistance it offers.
4. Observe and describe the force exerted by air.
5. Infer that air exerts a force which can bring about movement of objects.
6. Demonstrate that air has mass.
7. Observe the effects of air on falling objects.
8. Design and construct an object to show how air affects the rate of fall.
9. Compare their designs with the designs of others.

## **Water**

The students should be able to:

1. Describe the water cycle (*cross reference - Earth's Weather.*)
2. Identify ways in which it is important to human beings (include transportation, recreation).
3. Compare the rate of evaporation of water under different conditions.
4. Account for the differences observed in # 3.
5. Infer that weather affects evaporation of water in nature.
6. Classify samples of water as hard and soft by their ability to form lather with soap.
7. Classify substances as soluble or insoluble by their ability to dissolve in water.
8. Identify the use of water as a solvent in everyday life.

**LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY EXPECTED AT  
GRADES 3 - 4**

**ATTITUDES:**

**Students should be encouraged to:**

<b>Curiosity:</b>	<ul style="list-style-type: none"> <li>✓ Ask questions about objects and events.</li> <li>✓ Find out more about events and objects on their own.</li> </ul>
<b>Inventiveness:</b>	<ul style="list-style-type: none"> <li>✓ Suggest new ways of doing things.</li> <li>✓ Use equipment in novel ways.</li> </ul>
<b>Respect For Evidence</b>	<ul style="list-style-type: none"> <li>✓ Explain their results and conclusions using some evidence.</li> <li>✓ Listen to other students' results and explanations.</li> <li>✓ Begin to recognize when conclusions do not fit the evidence.</li> </ul>
<b>Persistence</b>	<ul style="list-style-type: none"> <li>✓ Complete activities.</li> <li>✓ Persist at tasks.</li> </ul>
<b>Respect For Living Things</b>	<ul style="list-style-type: none"> <li>✓ Show sensitivity to living things.</li> </ul>
<b>Cooperation</b>	<ul style="list-style-type: none"> <li>✓ Share with others.</li> <li>✓ Work together with others.</li> <li>✓ Accept responsibilities.</li> </ul>
<b>Concern For Safety</b>	<ul style="list-style-type: none"> <li>✓ Observe safety instructions.</li> </ul>

<b>SKILLS:</b>	<b>In developing their skills of inquiry, problem solving and design, the students are expected to:</b>
<b>Observing</b>	<ul style="list-style-type: none"> <li>✓ Use as many senses as are appropriate and safe to gather information.</li> <li>✓ Identify differences and similarities between objects and events.</li> <li>✓ Identify sequence in events.</li> </ul>
<b>Measuring</b>	<ul style="list-style-type: none"> <li>✓ Use simple measuring instruments or models of measuring instruments. At first use comparative terms such as bigger, smaller and later use actual figures.</li> </ul>
<b>Manipulating</b>	<ul style="list-style-type: none"> <li>✓ Set up simple experiments to compare results.</li> <li>✓ Manipulate simple equipment.</li> </ul>
<b>Recording</b>	<ul style="list-style-type: none"> <li>✓ Use pictures and charts to report results.</li> <li>✓ Fill out simple tables to report results.</li> </ul>
<b>Classifying</b>	<ul style="list-style-type: none"> <li>✓ Group objects according to several criteria.</li> </ul>
<b>Communicating</b>	<ul style="list-style-type: none"> <li>✓ Talk freely about their activities and the ideas they have, with or without making a written record.</li> <li>✓ Use appropriate vocabulary to describe their observations.</li> <li>✓ Listen to others' ideas and look at their results.</li> <li>✓ Report events by using demonstrations, role play, simple drawings, paintings and paragraphs.</li> <li>✓ Use bar graphs, pictures, tables and charts to report results.</li> <li>✓ Use books and other sources to find information.</li> </ul>

**SKILLS CONT'D**

<b>Inferring</b>	<ul style="list-style-type: none"> <li>✓ Notice patterns and relationships in simple measurements and events.</li> </ul>
<b>Interpreting data</b>	<ul style="list-style-type: none"> <li>✓ Discuss what they find out in response to questions.</li> <li>✓ Compare their findings with their predictions.</li> <li>✓ Notice changes when one variable is changed.</li> </ul>
<b>Experimenting</b>	<ul style="list-style-type: none"> <li>✓ Freely ask a variety of questions and suggest how they might be answered.</li> <li>✓ Suggest how they could investigate to find out answers to questions.</li> <li>✓ Have some idea of the variable that has to be changed or what different things are to be compared in an investigation.</li> <li>✓ Suggest equipment, materials and procedure for conducting investigations.</li> </ul>
<b>Predicting</b>	<ul style="list-style-type: none"> <li>✓ Attempt to use evidence in making predictions.</li> </ul>
<b>Hypothesizing</b>	<ul style="list-style-type: none"> <li>✓ Attempt to explain things that are consistent with evidence.</li> <li>✓ Suggest how something may have happened.</li> </ul>
<b>Problem Solving</b>	<ul style="list-style-type: none"> <li>✓ Suggest solutions to simple problems.</li> </ul>
<b>Designing</b>	<ul style="list-style-type: none"> <li>✓ Construct models either by following.</li> <li>✓ instructions or by using their own designs.</li> <li>✓ Select appropriate material to make models and gadgets.</li> <li>✓ Formulate problems, do appropriate research, and devise solutions.</li> <li>✓ Select appropriate material to make models and gadgets.</li> <li>✓ Evaluate their own designs using simple criteria.</li> </ul>

## TECHNOLOGY

<p><b>Technological Methods</b></p>	<ul style="list-style-type: none"> <li>✓ Students will be able to formulate problems, do appropriate research and devise solutions (e.g. construct gadgets).</li> </ul>
<p><b>Nature Of Technology</b></p>	<ul style="list-style-type: none"> <li>✓ Look at past inventions in their historical context.</li> <li>✓ Understand that products are replicable.</li> <li>✓ Understand that others may be working on the same idea.</li> <li>✓ Realize that <i>they can use scientific knowledge in doing technology</i> and that technology helps to develop reliable scientific information.</li> <li>✓ Understand the importance of precision and safety in developing new products.</li> <li>✓ Understand that technology is novel and creative.</li> <li>✓ Understand that if the people in a country are creative and innovative, their country can progress.</li> <li>✓ Understand that people use processes involving living things (Biotechnology) and materials (Production Technology) to satisfy their needs.</li> </ul>
<p><b><u>Use Of Technology</u></b></p>	<ul style="list-style-type: none"> <li>✓ Appreciate the use of devices, tools and structures made by humans in the home and community.</li> <li>✓ Appreciate the advantages of using these products.</li> <li>✓ Realize that human-made things can pollute the environment.</li> <li>✓ Look at advantages and disadvantages to help them make decisions of what is the best technology that can be used in a particular situation.</li> <li>✓ Realize that people may abuse and misuse technology</li> <li>✓ Understand that technology may have unintended consequences.</li> </ul>

**UNIT:            EARTH RESOURCES (GRADE 3)**

**DURATION:       6 Lessons**

**OBJECTIVES:**

The students should be able to:-

1. Identify and name some of the Earth's resources (to include air, water, rocks, and soils).
2. Collect and classify rocks.
3. Describe some uses of rocks to the environment (e.g. protecting the coastline, preventing/reducing erosion, etc.).
4. Investigate how people use rocks for different purposes (e.g. extraction of minerals, building, etc.).
5. Design and make ornaments from rocks (e.g. paper weights).

**SCIENCE PROCESSES**

Communicating

Inquiring

Observing

Classifying

**TEACHING STRATEGIES**

Demonstration

Pictorial presentation

Inquiry learning

Discovery learning

Question and answer

## MATERIALS

Flash cards showing pictures of rocks

Rocks and minerals

Shells or other decorative item

Glue

Magnifying glass

Hard tile e.g. porcelain

## CONTENT SUMMARY

### SOIL

- **Natural resources** are **materials** found on Earth that are used by people. They include water, air, rocks, soil, forest, fish, and minerals.
  
- **The Earth's crust is made of rocks.**
- **Rocks** are solids made up of one or more substances called minerals. Rocks are continually changing. They may fall apart, dissolve, melt or change into other rocks. Different conditions, such as temperature and friction, affect the formation of rocks.

*(Optional)*

- *Rocks are classified according to how they were formed. There are three main groups of rocks: **igneous, metamorphic and sedimentary.***
- *The word **igneous** means made from fire or heat. These rocks are molten from heat deep within the Earth. Eventually they cool. Examples are granite and basalt*

- **Sedimentary rocks** are formed as a result of wearing away or weathering action of rain, wind, air, sun and running water. Broken bits of rock get washed into lakes and streams which eventually deposit them at the bottom of oceans. The sediments get buried and more layers form on top of them. Over many years, the layers form rocks. Sometimes, animals and plants get covered up by the rock and so form fossils. Most of the Earth's rocks are sedimentary rocks. Examples are Shale and Sandstone.
  
- **Metamorphic rocks** are rocks that were once igneous or sedimentary and have changed as a result of movement of the Earth's crust. These are the least common of the three types of rocks. Examples are marble and slate

**Uses of rocks in the Environment:**

- Large rocks protect the shoreline from high waves.

**Uses of rocks by Humans:**

- Obtaining valuable minerals.
- Making buildings, bridges and roads.
- Quarries are excavated to obtain building e.g. cement and gravel.
- Jewellery.
- Gardening and landscaping.
- Decoration.

## **SUGGESTED ACTIVITIES**

### *Activity 1. Uses of Natural Resources*

Ask students to name some of our natural resources.

Allow them to observe and record how natural resources, such as land, air and water are used in and around their school (or homes).

From their observations let them explain which resource seems to be in use most of all.

### *Activity 2. Observing and Classifying Rocks*

Ask students to bring a variety of rocks. Encourage them to keep notes on where the rocks came from.

Have magnifying glasses available so that students can examine their rocks. They might be able to see specks of different minerals.

Let students draw up a table to note and compare the characteristics of their rocks. They should examine texture (rough, smooth, grainy, etc.), lustre, (shiny, dull, sparkle), colour and appearance (e.g. whether they can see layers and different colours), whether the rocks are attracted to a magnet etc.

Let students, look for similarities and differences in rocks (e.g. colour, shapes, sizes, texture (soft or hard), the presence of minerals and crystals. Students should group similar rocks together.

(If possible, teacher can name some of the types of rock, but this should not be the focus at this level.)

*Activity 3. Examining the properties of rocks (hardness)*

The teacher can ask students how they can tell which of the rocks in their collection was the hardest. Teacher gets students to try to scratch each rock with the other to create a hardness scale.

\*Note a harder rock will scratch a softer rock.

In discussion students can infer that rocks are made of minerals. They can relate the properties of rocks to their uses, e.g. granite is hard; it is used for building, while marble because of its beauty it is used to carve statues.

*Activity 4: Formation of rocks (Optional)*

Teacher invites students to hypothesize about how rocks are formed – where do they come from? Teacher uses charts or computer animations to show children a simple version of how different types of rock are formed.

*Activity 5: Making ornaments – paper weights*

Find medium sized smooth rocks. Glue on shells or other small objects. Students can suggest other ornaments that can be made from rocks.

Students can also suggest other ornaments that can be made from rocks.

## ASSESSMENT

### Sample questions

Multiple Choice. Choose the best answer.

1. Which of the following is **NOT** one of the three groups of rocks

Granite  
Igneous  
Metamorphic  
Sedimentary

2. These rocks were formed as a result of weathering action of air or water

Granite  
Igneous  
Metamorphic  
Sedimentary

3. The name for these rocks means heat or fire

Granite  
Igneous  
Metamorphic  
Sedimentary

4. Students can be asked to investigate how rocks are being used for specific purposes in the community.

Sample answers

Granite  
Sedimentary

Igneous

building, protecting the coastline, the construction of roads.

## **AIR**

### **OBJECTIVES**

Students should be able to:

1. List the properties of air.
2. List and discuss ways in which air is important to people.
3. Infer the presence of air by the resistance it offers.
4. Infer that air exerts a force which can bring about movement of objects.

### **PROCESS SKILLS**

Observing

Communicating

Inferring

### **TEACHING STRATEGIES**

Experimenting

Co-operative Learning

### **MATERIALS**

*Activity #1: Weather Report*

- Crayons/markers
- Drawing paper
- 

*Activity #2: Can Air Take Up Space?*

- A small bottle
- A large bowl of water

*Activity #3: Can air be compressed?*

- A bicycle pump

*Activity #2: Can we hear moving air?*

- Balloons

*Activity #3: Does air offer resistance?*

- Paper bag/ Plastic bag/Balloon

## CONTENT SUMMARY

### What is Air?

- Air is matter. It therefore takes up space and has weight. It is a mixture of gases. A sea of air surrounds us. When we walk, we push air aside.
- We cannot see air, but we can feel and hear moving air. Wind is air that is moving and may be described as strong, calm or gentle. A wind that blows hard is a **strong wind**; when the air is still, there is a **calm** and a **breeze** when there is just a slight movement.
- Air causes things to move. For example when the wind is blowing, clothes on the line move; a flag on a pole moves in the **breeze** (slight movement of air). During a hurricane we can feel and hear moving air. The strong winds of a hurricane can do considerable damage – they can uproot trees and damage houses. Wind also moves boats and windmills.

### **What are the properties of air?**

- Air is not only matter and a gas but air fills up containers that we think are empty. Air has no definite shape; air is much lighter than the same volume of liquid or solid but it can also exert great pressure; air can be compressed (squeezed).

### **Is air important to us?**

- It is important for a variety of reasons

- Breathing

Remember, air is a mixture of gases. We need oxygen, one of the many gases in air, to keep us alive. We breathe in all gases.

However, oxygen is the only gas that our bodies need. When oxygen, enters the lungs and is transported by the blood to all parts of the body it combines with food (glucose) in the cells to produce energy. It is this energy that keeps us going.

- For burning

Air is needed to keep a fire going.

- Talking, Singing and Making Music

We also need air so that we can talk and sing, and to blow into wind instruments, for example, trumpets.

- Giving hollow objects shape

A flat tyre can be made to work again by inflating it; air-filled balloons are used to decorate homes for parties; the rubber suckers used to hold towels in the homes make use of air pressure to keep them in place. Air is useful in baking – air in the dough causes it to rise.

- Dispersal of seeds

Air/wind helps to disperse or scatter seeds. This is useful because it increases the chances of germination of the seeds.

- Breeze

During the day, cool breeze comes in from the sea and cools the land. Rain clouds can be blown away by the wind and allow the sun to shine and warm the land.

- Help to keep things afloat

Heavy steel ships float because they are hollow. Aeroplanes are able to remain airborne. One of the reasons for this is the **streamlined\*** shape of the aircraft. The aircraft, like a bird, is narrow at the front. This reduces the resistance or drag as the air flows over its surface.

The shape of the helmets worn by professional cyclists also play an important role. Why do the cyclists hunch over their bicycles in a race?

**Streamlined\*** - a smooth even shape that offers least resistance through air or water

## **SUGGESTED ACTIVITIES**

### 1. Weather Report - A Windy Day

Instructions

1. Let students talk about what happens on windy days.
2. Then let them draw and colour pictures to illustrate their ideas.

### 2. Air Can Take Up Space

Instructions

1. Push a bottle under water and let it fill up.
2. Observe what happens

What takes the place of the air in the bottle?

What evidence do we see that the air is being replaced?

3. Air Can Be Compressed

Instructions

1. Put your hand over the end of a small bicycle pump
2. Push the handle down

Can the handle reach right down? Why ?

4. We can hear moving air

Instructions

1. Blow the balloons, then tie the end.
2. Untie and release the air slowly.

Can you hear the air as it escapes?

5. Air does offer resistance

Instructions

1. Blow into the paper/plastic bag or balloon.
2. Loosely tie the neck of the bag.
3. Push down on the bag.

What do you notice?

**Safety Precautions : Be careful when students are using plastic bags**

## ASSESSMENT

### 1. Journal

Keep a record of your observations that you made about the effect of air on things for one week.

Day	Wind Description - Strong/Calm/ Gentle	Effect on things

1. Discuss **three** ways in which air is important to us.

### Student Checklist

Circle the number that best describes how you think you did.

1. Fair
2. Good
3. Excellent

<b>Activity</b>	<b><i>Fair</i> – I can do better.</b>	<b><i>Good</i> – I was good at this.</b>	<b><i>Excellent</i> – I did very well.</b>

## **WATER**

**DURATION: 3 Lessons**

### **OBJECTIVES**

Students should be able to:

1. Describe the water cycle.
2. Identify ways in which water is important to human beings.
3. Compare the rate of evaporation of water under different conditions.

### **PROCESS SKILLS**

Observing

Communicating

Making and using models

Planning and Designing

Experimenting

### **TEACHING STRATEGIES**

Project Approach

Guided Discovery

Experimenting (Deductive Inquiry)

Cooperative Learning

### **MATERIALS**

Activity 1. Making a model of the water cycle

Cross reference – The Earth's weather.

Activity 2. Comparing rates of evaporation using different conditions

Cross reference - The Earth's Weather.

Materials- varied based on what students choose.

Suggestions- empty cans, plastic cups, or beakers if available.

Activity 3: The importance of water to people

Paper for making booklets, pictures, crayons, etc

## **CONTENT SUMMARY**

For objectives 1 and 3 cross-reference with activities in 'The Earth's Weather'.

### **Importance of Water to Humans**

- The water cycle ensures that there is always water on the earth.
- Water is important to all living things. It is important to humans because 2/3 of our body weight is water. We also depend on water for transportation and recreation. Here are some ways water is important to humans.
  - Recreation- people go to beaches and pools to swim and have fun. Without water, people cannot swim.
  - Transportation- people use ferries to travel from island to island. Barges travel from continent to continent or island to island.
  - Chemical reactions- our bodies need water to carry out daily functions, such as digesting foods and flushing our body organs.
  - Prevent dehydration- the body is mainly water and without it cells would die. A person could survive for a month without food but only a few days without water.
  - Water is important in farming foods crops that we eat. Plants need the water to grow, and we eat the plants or their fruits.
  - Households use water to clean, bathe and cook. Water is important in keeping our bodies clean.
  - Water is important in putting out fires.

## **SUGGESTED ACTIVITIES**

### Activity 1. Making a model of the water cycle

*Cross reference – The Earth's Weather*

### Activity 2. Comparing rates of evaporation using different conditions

*Cross reference – The Earth's Weather*

### Activity 3: The importance of water to people

Students compile individual booklets on the importance of water to people. The teacher gives guidelines for what is to be included in the booklets. The students can be asked to integrate Language Arts skills, Mathematics skills, Drawing, etc. in their booklets. For example, students can:

- collect or take pictures, create drawings, etc.,
- write poems or stories
- figure out a way to measure how much water they use per day for a particular task such as washing dishes, brushing their teeth, etc. and include these measurements in their booklets.

## **ASSESSMENT**

Sample Questions:

1. List three ways in which water is important to humans.
2. Water placed in the sun evaporates faster than that placed in the shade. Why?

Journal Entries-

1. Students make a journal entry about the various types of rocks found in their country. Include uses of rocks and any dangers to the environment resulting from rock usage.

2. Students recall the ways in which they find water important in their lives.
3. Students present results of the evaporation experiment into the journal.

The students' booklets can be assessed for: Content, Communication skills, Mathematics skills, Creativity, Curiosity etc

## **REFERENCES**

[www.rocksforkids.com](http://www.rocksforkids.com)

## UNIT: THE EARTH RESOURCES (GRADE 4)

### DURATION : 5 Lessons

### OBJECTIVES

Students should be able to:

1. Classify resources as renewable or nonrenewable.
2. Illustrate how rocks and soils are related.
3. Classify soils as sand, clay and loam.
4. Distinguish between various soils on the basis of physical properties (colour, texture, structure, components, etc.).

### PROCESS SKILLS

Communicating

Inquiring

### TEACHING STRATEGIES

Demonstration

Inquiry learning

Discovery learning

Question and answer

### MATERIALS

Magazines with pictures of natural resources

Different types of soils (sandy soil, and clay soil, loamy soil)

Magnifying glasses

Teacher prepared work sheets

Goggles

Soil from the school garden

Jar with a cover

Water

## CONTENT SUMMARY

### Classifying Natural Resources

- Natural resources are substances found on the earth that are used by people.
- The Earth's resources are classified as **renewable** or **nonrenewable**.
- Renewable resources are replaced in nature and will not run out. Examples of renewable resources are water, sun, wind, plants.
- Nonrenewable resources cannot be replaced in a person's lifetime; they will some day run out. Examples of nonrenewable resources are: natural gas, coal, and petroleum.
- We can even have shortages of renewable resources if we do not use them wisely

### Soil

- Soil is formed as a result of physical or chemical weathering of rocks. Rocks may be broken down physically by wind, rain and organisms or chemically by acid rain and oxygen in the air.
- There are three main types of soil. They are: clay, sand and loam. **Clay** soils have very small particles, the space between the particles are small and this traps water; these soils are usually waterlogged in the wet season. **Sandy** soils have large particles with large air spaces which allow water to drain through quickly making the soil dry. **Loamy** soil is excellent for plant growth because it has medium-sized particles with medium-sized air spaces that keep the right amount of water in the soil.

The table below shows properties associated with different soil types:

	<b>Sandy</b>	<b>Clay</b>	<b>Loam</b>
Colour	Light	Medium	Dark
Texture	Rough	Smooth	Medium
Components	Large sand particles	Small clay particles	Mixture of clay and sand
Size of particles	Large	Small	Medium

## **SUGGESTED ACTIVITIES**

### **Classifying Natural Resources**

#### *Activity 1: How are our basic Natural Resources used?*

Allow students to examine picture books or magazines to find out the names of different resources.

Allow students to survey their school grounds (or use as a homework activity) and see how many ways we use air, water, and land. Allow students to discuss freely. They can represent their findings in the form of a chart.

They should also be able to conclude that air, water, and land (rocks and soil) are three natural resources that we cannot do without.

#### *Activity 2: Renewable and non-renewable resources*

Students review the water cycle and discuss how water replaces itself in nature.

Students identify other resources such as the sun, and the air, that will not run out.

Students discuss how people use petroleum and where petroleum comes from. Students consider what would happen if we used up all the available petroleum. Would the petroleum be replaced quickly?

Students view magazines with examples of drought and discuss water shortages and infer that we still need to be careful with renewable resources.

Activity 3: Examining different kinds of soils

Prepare parcels of clay, sand and loam. Allow students to look at and touch the three different types of soil. They should then examine the soils under a hand lens. They can examine the colour, texture, structure and components.

To examine the components of loam, allow them to spread it thinly on a sheet of paper or a paper plate and use another paper or paper plate to separate out the different components they find.

They can then choose characteristics to classify the different components they find in soil (e.g. living things, non living, once living, different sized particles)

Activity 4: What type of soil is present in our schoolyard?

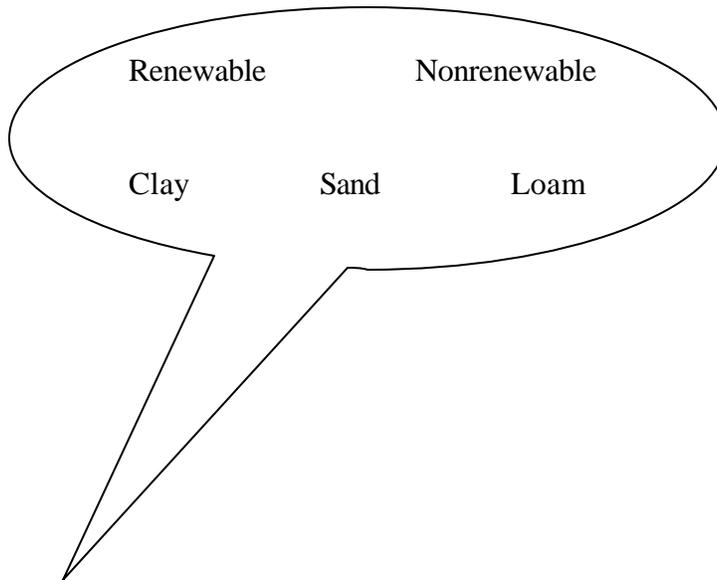
Half fill the bottle with soil from the school garden/yard. Continue to fill the bottle almost completely with water. Shake until mixed thoroughly. Allow mixture to settle overnight. Observe the layers of soil present.

The large particles that sink to the bottom are sand particles, if this layer is much larger than the others, then you have sandy soil. If there are lots of small particles and small amounts of large particles then you have clay soil. If there are mostly medium sized particles with lots of material floating on top of the water then you have a loam.

## ASSESSMENT

### Sample questions

1. Fill in the blanks using the words provided:



- a. \_\_\_\_\_ resources are Earth's resources that are able to replace themselves.
  - b. This type of soil is waterlogged \_\_\_\_\_
  - c. This is excellent for gardening since it has medium sized air spaces. \_\_\_\_\_
  - d. The gas that we use for cooking is a \_\_\_\_\_ resource.
  - e. These are Earth's resources that are not able to replace themselves. \_\_\_\_\_.
2. Allow students to make picture cards to show how we use air, land and water. Challenge them to show examples of how all three are linked together.

## **AIR**

**DURATION: 4 Lessons**

### **OBJECTIVES**

The students should be able to:

1. Observe and describe the force exerted by air.
2. Demonstrate that air has mass.
3. Infer that air exerts pressure.
4. Observe the effects of air on falling objects.
5. Design and construct an object to show how air affects the rate of fall.
6. Compare their designs with the designs of others.

### **PROCESS SKILLS**

Observing

Inferring

Communicating

Experimenting

### **TEACHING STRATEGIES**

Co-operative Learning

Experimenting

Pictorial Demonstration

### **MATERIALS**

*Activity #1: Does Air Have Mass?*

- Two balloons (same size)
- Length of stick (straight)/ ruler
- Strong thread

*Activity # 2: Investigating air pressure*

- Sheets of paper
- A can of milk or juice
- A can opener
- 

*Activity #3: Exploring the Effect of Air on the Rate of Fall – Group Activity*

- Pen
- Sheets of paper
- Feathers

## CONTENT SUMMARY

- Air is a valuable resource.
- Air exerts pressure.
- Air offers resistance to falling objects.

### The Pressure of Air

- You have already learnt that air is made up of gases. A gas is a state of matter and so has mass. Air exerts a force or pressure on objects. We are surrounded by air, which exerts a force on us.
- **Air pressure** is the weight of the atmosphere, or the amount of 'push' in the air.
- Our bodies are not crushed by air pressure because we exert high-pressure from inside us. The air inside an empty' plastic bottle balances the air outside.

### Air Pressure at Work

#### Using a rubber sucker

If you pushed a rubber sucker against a flat surface and you squeezed most of the air from under the sucker, you would find it hard to pull the sucker away from the surface, because the pressure of the trapped air has dropped as the air spread to fill a larger space.

The difference in air pressure – low pressure underneath the rubber sucker, and high pressure outside it – holds the sucker firmly against the glass.

Rubber suckers are used to hold towels, in kitchens and bathrooms.

### **Pouring liquids**

When you punch holes in a can of evaporated milk the liquid flows freely through one of the holes. If you had punched only one hole, would the milk flow? Why?

### **Effects of Air on Falling Objects**

*(Cross reference – Forces, Motion and Structures)*

Air resistance slows down falling objects.

The shape of the object affects the air **resistance\***. When leaves fall, they float and drift because of air resistance.

**Resistance\*** - a force which opposes motion

## **SUGGESTED ACTIVITIES**

### *1. Does Air Have Mass?*

#### Instructions:

1. Mark the centre of the stick/ruler.
2. Tie a piece of thread tightly at the centre mark.
3. Blow some air into one of the balloons and knot it. Then tie it to one end of the stick/ruler with a piece of thread.
4. Do not blow the other balloon. Tie it to the other end of the stick/ruler.
5. You have now made a balance. (Be sure that the balloons are tied tightly so that they do not shift.)

6. Now hold the balance up by the thread.
7. Write down your observations.
8. Explain what happens.

## 2. *Finding out about Air Pressure*

### (a) Instructions:

1. Hold two sheets of paper three inches apart. Then allow a student to blow between the two sheets.
2. What happens?
3. Discuss your observation.

### (b) Instructions:

1. Use the opener to cut a small opening on one side of the can.
2. Try pouring out the liquid. What happens?
3. Cut another small hole opposite the first one.
4. Try pouring the liquid. What happens?
5. Explain.

## 3. Exploring Effect of Air on the Rate of fall of an object

### Instructions:

#### Group 1

1. One student will drop a pen and the other a sheet of paper, simultaneously, two metres above the floor.
2. Record your observations.

#### Group 2

1. Another student will drop a sheet of paper while the other will drop a feather, simultaneously, two metres above the floor.
2. Record your observations.

**The groups will compare and discuss their findings.**

Teacher can challenge students to use identical sheets of paper to investigate what happens when different variables are changed e.g. the shape of the paper, the height from which the paper is dropped, the mass of the paper etc.

Students can then compete to design from identical size of newspaper sheets, the slowest falling object/ the fastest falling object, etc.

Teacher asks students to think of everyday occurrences where objects are designed to increase or decrease air resistance. For example, parachutes are slowed down by air resistance, racing cyclists wear a special type of helmet to reduce air resistance.

## **ASSESSMENT**

**Sample questions:**

1. What is the atmosphere made of?
2. What do we call the pressure caused by air around us?
3. Summarise the effect of air on a falling object.

**Sample answers:**

1. *The atmosphere is made of a mixture of gases.*
2. *The pressure caused by the air around us is called atmospheric pressure.*
3. *Air slows down the motion of falling objects.*

## **WATER**

### **DURATION: 2 Lessons**

### **OBJECTIVES:**

The students should be able to:

1. Classify substances as soluble or insoluble by their ability to dissolve in water.
2. Classify samples of water as hard and soft by their ability to form lather with soap.
3. Identify situations where water is useful because of its solvent properties.

### **PROCESS SKILLS**

Observing

Communicating

Classifying

Planning and Designing

Experimenting

Inferring

### **TEACHING STRATEGIES**

Project Approach

Guided Discovery

Experimenting (Deductive Inquiry)

Cooperative Learning

## MATERIALS

### Soluble or not?

- Transparent plastic cups or other suitable containers, water
- Samples of soluble substances (salt, sugar, Kool Aid)
- Samples of insoluble substances (sand, wood chips, flour, leaves, chalk)
- Spoons/ spatulas.

### Hard and Soft Water

- Hard water (river, sea, or spring)
- Soft water (rain, distilled, drinking)
- Soap solution (soap without softeners. **Note: it is important to use soap and not detergents**)
- Container (beakers, plastic cups, etc.)

## CONTENT SUMMARY

- Water is an important solvent.
- Water has the ability to dissolve many substances. Substances that dissolve in water are **soluble** in water, while those that do not dissolve in water are **insoluble** in water. Sugar and Kool aid are examples of soluble substances in water, while sand is insoluble in water.
- Sometimes water has substances dissolved in it that make it **hard**. **Hard water** does not form a lather easily with **soap**, for example spring water. **Soft water**, like rain or distilled water, lather forms easily with soap.
- We use the solvent properties of water in cooking, and, in cleaning.

## **SUGGESTED ACTIVITIES**

### **Properties of water:**

#### ***Activity #1: Soluble or not?***

Group work (4-5 students per group)

#### **Procedure:**

Students will:

1. Place water into their containers.
2. Add different substances to each container and stir.
3. Make observations.
4. Classify substances as soluble or insoluble.
5. Find examples in their everyday life where solubility in water is an advantage/disadvantage.

### **Hard and Soft Water**

Group work (5-6 students per group)

#### Materials:

Samples of hard and soft water, soap solution and container

#### Procedure:

Students will:

1. Place samples of hard and soft water into different containers.
2. Add equal amounts of soap solution into each container.
3. Shake each container for an equal amount of time.
4. Make observations (check for lather and how much)
5. State which water is hard and which is soft.

## ASSESSMENT

1. Teacher can assess students' practical work, for example, for observing, classifying, manipulation, inferring, communication, etc.

<b>Skills</b>	<b>Poor</b>	<b>Fair</b>	<b>Good</b>	<b>Excellent</b>
Observing				
Measuring				
Manipulating				
Recording				
Classifying				
Communicating				
Experimenting				
Designing				
Problem Solving				
Inferring				

2. Teachers can let students compile a scrap book about the solvent properties of water they come across in their everyday lives.

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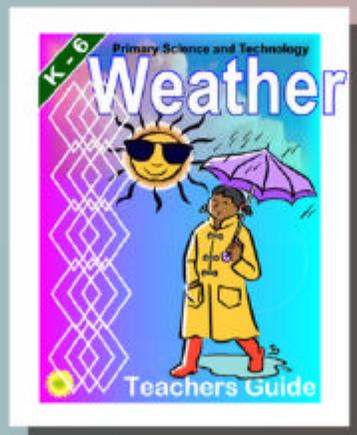
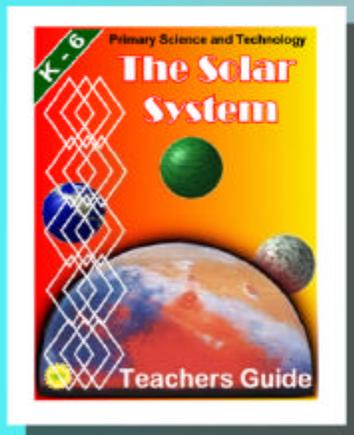
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