Module 6: Sample Lesson Plans in Science

Users:

All personnel at the school level

Objectives of this Module:
Module 6 provides CL and teachers with sample lesson plans for challenging topics in Science. These sample lesson plans can be used or modified for SBI/CBI demonstration lessons.

All the sample lesson plans are in accordance with the Ministry of Education (MOE) Teaching Syllabus for Integrated Science (Primary 4-6).

The module also provides concise explanations of what challenging topics are at the beginning of the module.

The module has sample lesson plans on some selected topics. Sample lesson plans have been prepared on topics such as; “Properties of Soil” and “Characteristics of Water and Other Liquids”, looking at Lesson Overview, Lesson Plan, Teaching Hints, Use of Chalkboard and English as a Teaching Tool. On the other hand, the other topics; “Rusting”, “Production of Sound” and “Properties of Air” are covered by Lesson Plan and English as a Teaching Tool only. Below is a brief explanation about them.

Lesson Overview consists of introduction, objectives of the topic and the lesson and R.P.K. “Introduction” illustrates the importance and relevance of the lesson to real life. All the “objectives” are taken from the syllabus. “R.P.K.” states relevant previous knowledge that pupils are expected to have.

Lesson Plan (sometimes also called lesson notes) is a written down approach to the teaching of a particular topic. This written down approach is sequential and directs the teacher in his/her teaching activities. A well-planned lesson helps the teacher to teach with confidence. The format of the lesson plan is the same as the standard lesson plan that GES approves.

The sample lesson plans on “Properties of Soil” and “Characteristics of Water and Other Liquids” also contain “lesson plan with teaching hints” on the next page of the standard lesson plan. The lesson plan with teaching hints is the same as the standard lesson plan on the previous page except for the speech blobs (rounded rectangular shapes) on the lesson plan. The speech blobs suggest where each of the teaching hints can be used.

Teaching Hints provide suggested teaching approaches. It is designed that each of the teaching hints elaborates how to deliver a particular teaching activity (e.g. Introduction, Activity 1,2…) in the development of a lesson. Because many of these teaching activities are linked with the core points of the lesson, successful delivery of the teaching activity should lead to a sound understanding of the core points.

The teaching hints deal mainly with general teaching approaches and questioning skills for particular teaching activities. The general teaching approaches describe how the teacher can lead pupils to the core points through the activities. When the activity is an experiment, the teaching approach explains how to conduct the experiment, paying special attention to the process skills of Science. The questioning skills should also help the teacher to lead pupils to reach a good understanding of the core points. It is recommended that teachers develop better teaching approaches and questions for the lesson and other lessons once they get the ideas that the teaching hints discuss presented.

Use of Chalkboard shows a suggested chalkboard plan. Well-organised chalkboard helps pupils
understand what they are learning in the lesson. Teachers need to consider how to use and organise the chalkboard. This part can help them consider and improve upon the way they plan the use of the chalkboard.

The section *English as a Teaching Tool* suggests effective use of English language in the Science lessons. The section gives examples of English that can be used in particular activities. By using the actual content of the sample lessons, it helps pupils to understand Science content better. It should be noted that a section of Module 4 highlights the use of English language as a teaching tool for other subjects, with a general and rather theoretical explanation of the use of it.

**Appendix** provides more ideas and activities for challenging topics in Science.

**Developing Lesson Plans by CL and teachers**

CL and teachers must be encouraged to develop their lesson plans. Once CL and teachers have become familiar with the sample lesson plans and their teaching and learning strategies, it is strongly recommended that CL and teachers start creating their own original lesson plans of challenging topics. CL and teachers have opportunities to develop lesson plans of challenging topics when preparing their SBI/CBI. Besides, CL can improve lesson plans when discussing the challenging topics with other CLs in CL Sourcebook Training.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of Challenging Topics</td>
<td>4</td>
</tr>
<tr>
<td>Sample Lesson Plans</td>
<td>6</td>
</tr>
<tr>
<td>Lesson 1: Primary 5 Properties of Soil</td>
<td>7</td>
</tr>
<tr>
<td>1. Lesson Overview</td>
<td>7</td>
</tr>
<tr>
<td>2. Lesson Plan</td>
<td>9</td>
</tr>
<tr>
<td>3. Teaching Hints</td>
<td>12</td>
</tr>
<tr>
<td>4. The Use of Chalkboard</td>
<td>18</td>
</tr>
<tr>
<td>5. English as a Teaching Tool</td>
<td>19</td>
</tr>
<tr>
<td>Lesson 2: Primary 4 Characteristics of Water and Other Liquids</td>
<td>21</td>
</tr>
<tr>
<td>1. Lesson Overview</td>
<td>21</td>
</tr>
<tr>
<td>2. Lesson Plan</td>
<td>23</td>
</tr>
<tr>
<td>3. Teaching Hints</td>
<td>27</td>
</tr>
<tr>
<td>4. The Use of Chalkboard</td>
<td>30</td>
</tr>
<tr>
<td>5. English as a Teaching Tool</td>
<td>31</td>
</tr>
<tr>
<td>Lesson 3: Primary 6 Rusting (Characteristics of Metals and Non-metals)</td>
<td>32</td>
</tr>
<tr>
<td>1. Lesson Plan</td>
<td>32</td>
</tr>
<tr>
<td>2. English as a Teaching Tool</td>
<td>34</td>
</tr>
<tr>
<td>Lesson 4: Primary 6 Production of Sound (Energy)</td>
<td>36</td>
</tr>
<tr>
<td>1. Lesson Plan</td>
<td>36</td>
</tr>
<tr>
<td>2. English as a Teaching Tool</td>
<td>39</td>
</tr>
<tr>
<td>Lesson 5: Primary 4 Properties of Air</td>
<td>40</td>
</tr>
<tr>
<td>1. Lesson Plan</td>
<td>40</td>
</tr>
<tr>
<td>2. English as a Teaching Tool</td>
<td>42</td>
</tr>
<tr>
<td>Appendix - Some Ideas for Challenging Topics</td>
<td>43</td>
</tr>
<tr>
<td>1. How Does Light Travel?</td>
<td>43</td>
</tr>
<tr>
<td>2. Making a Magnet</td>
<td>44</td>
</tr>
<tr>
<td>3. The Law of Reflection</td>
<td>45</td>
</tr>
<tr>
<td>4. Simple Electrical Circuit Board</td>
<td>46</td>
</tr>
<tr>
<td>5. Electrical Circuits with Bulbs in Series</td>
<td>47</td>
</tr>
<tr>
<td>6. Electrical Circuits with Cells in Series</td>
<td>48</td>
</tr>
<tr>
<td>7. Electrical Circuits with Cells in Parallel</td>
<td>49</td>
</tr>
<tr>
<td>8. Electrical Circuits with Bulbs in Parallel</td>
<td>50</td>
</tr>
<tr>
<td>9. Earthquake Model –Movement of the Plates of the Earth</td>
<td>51</td>
</tr>
<tr>
<td>10. Improvisation of Distillation Apparatus</td>
<td>52</td>
</tr>
<tr>
<td>Bibliography</td>
<td>54</td>
</tr>
</tbody>
</table>
Identification of Challenging Topics

Introduction

There are topics that some teachers find difficult to teach. They call such topics challenging topics. Some teachers claim that the topics require subject teachers or specialists to teach them. However, with adequate preparation, teaching these topics should not be problematic. It is a matter of preparation. A little bit of extra effort and time to prepare a lesson makes a big difference and helps teachers to improve their lesson greatly.

This section provides some useful information about challenging topics for CLs and teachers. It also helps to identify challenging topics.

Preferred Topics

It is important to examine topics that teachers prefer to teach. When we understand why we prefer certain things, it becomes easier to see why we do not prefer other things. The preferred topics and the reasons for preferring those topics can help us to see why some topics are regarded as challenging.

Teachers in Primary schools seem to prefer teaching some topics in Science. Some examples are:

- Food, Plants, Animals, the Family and the Community

There are some reasons why primary school teachers prefer teaching the topics listed above to others. They are shown below.

- The topics present real and familiar things.
- There are relevant curriculum materials and teaching/learning materials to use in lesson delivery.
- Local teaching and learning materials could be used.
- Teachers have interest in teaching topics they are conversant with.
- The topics lend themselves to the use of the activity method of teaching.

Challenging Topics in Science

The following are some examples of challenging topics in Science. These are based on opinions gathered from serving teachers at the primary school level.

- Earthquakes, Formation of Clouds, Forces, Electrical Circuits, Constraints to Healthy Living;
- HIV/AIDS, Body Framework of Mammals, Magnets and non-magnets, Reflection of Light, Dispersal of Fruit and Seed, Pollination and Fertilization in Plants

It seems that the reasons why teachers perceive some topics as challenging vary from teacher to teacher. However, some typical reasons are identifiable. For example, one of the reasons is that challenging topics are seen to be abstract because they are not seen in real life situations. Another reason can be that challenging topics lack relevant curriculum materials that teachers can use as resource materials. The following are some of the reasons some teachers gave for regarding certain topics as challenging.

- Difficulty in getting Science and Environmental Studies experts to support teachers to teach the challenging topics.
- Lack of relevant teaching/learning materials to teach the challenging topics.
- Inadequate funds for purchasing some teaching/learning materials e.g. consumable materials.
- Some teachers' level of interest in Science and Environmental Studies.
- The problem of teachers who lack content knowledge in Science and skills to handle Science and Environmental Studies.
- Inadequate preparation by the teachers.
Inadequate practical lessons in pre-service training at colleges due to the emphasis on passing of examination.

Summary
The challenging topics are seen to be abstract in nature. Besides, there are no teaching/learning materials and relevant curriculum materials to support teachers to teach such topics. Some teachers use inappropriate teaching methodology, and large class size makes the use of the activity method of teaching difficult.

These problems can be overcome by adopting good strategies in the teaching/learning processes.

The fundamental principle that underlies the INSET programme is that teachers learn effectively through sharing implementation and discussion of a lesson with their colleagues. Thus, the CL and teachers should utilise the opportunities for lesson implementation and post-lesson discussion at SBI/CBI and CL Sourcebook Training to treat challenging topics.
Sample Lesson Plans

Lesson 1: Properties of Soil (Primary 5)
1. Lesson Overview
2. Lesson Plan
3. Teaching Hints
4. The Use of Chalkboard
5. English as a Teaching Tool

Lesson 2: Characteristics of Water and Other Liquids (Primary 4)
1. Lesson Overview
2. Lesson Plan
3. Teaching Hints
4. The Use of Chalkboard
5. English as a Teaching Tool

Lesson 3: Rusting (Primary 6)
1. Lesson Plan
2. English as a Teaching Tool

Lesson 4: Production of Sound (Primary 6)
1. Lesson Plan
2. English as a Teaching Tool

Lesson 5: Properties of Air (Primary 4)
1. Lesson Plan
2. English as a Teaching Tool
Lesson 1: Primary 5  Properties of Soil

1. Lesson Overview

Introduction

Soils are very common in our environment. Pupils see different kinds of soil on their way to school. Many pupils have played with soil at some stage in their growth/development, touching and feeling them with their hands. Some of them know that soils support plants and can be used in building houses and roads (taught in Primary 4). From these experiences, it is obvious that soils are reasonably familiar things to the pupils; however, many pupils do not pay particular attention to its characteristics. It is important to know about the characteristics of soil because it often determines which soil is more preferable for a specific use. For example, some particular kinds of soil are useful for growing certain types of crops. Having a good understanding of the characteristics of soil is very helpful for farming.

In this lesson on Properties of Soil, pupils are expected to observe and classify different types of soil. They are to consider the uses of soil in our everyday life, and then explore which soils are best for various crops.

The teacher can organise group activities depending on the class size and the nature of the activities.

The teacher should move around in the class when pupils are working on the activities, spending ample time with them and paying attention to them.

General Objectives of the Topic (Soil in Primary 5)

The pupil will

- acquire basic knowledge about soil.
- acquire skills in controlling soil erosion.
- understand the importance of soil in crop production.

Specific Objectives of the Lesson (Properties of Soil)

By the end of the lesson, pupils will be able to:

- determine at least two differences among loamy, sandy and clayey soils.
- demonstrate the water holding capacity of loamy, sandy and clayey soils.

This topic (properties of soil) is found in Unit 2 of the primary 5 syllabus. It deals with how a sample of soil can retain water or allow water to pass through it. The units that pupils learn before and after this unit are shown in Table 1. The table also indicates the place of the topic, Properties of Soil, in bold.

Table 1: Class and Unit That This Topic Can Be Found

<table>
<thead>
<tr>
<th>Class</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary 4</td>
<td>Unit 1: Composition and uses of soil</td>
</tr>
<tr>
<td>Primary 5</td>
<td>Unit 1: Types of soil</td>
</tr>
<tr>
<td></td>
<td><strong>Unit 2: Properties of soil</strong></td>
</tr>
<tr>
<td></td>
<td>Unit 3: Soil erosion – causes, effects and control</td>
</tr>
<tr>
<td>Primary 6</td>
<td>Unit 1: Land degradation</td>
</tr>
<tr>
<td></td>
<td>Unit 2: Soil fertility</td>
</tr>
</tbody>
</table>
Relevant Previous Knowledge (R.P.K.)

Pupils are familiar with the type of soil in the school garden.

In Primary 4, pupils have already learnt the following:

- Soil is made up of particles of stone and other materials like dead plants, animals and air.
- Soil supports plants.
- Soil is useful in crop production.
- It can also be used in building houses and roads.
- Soil can be used in making pots, bowls and ovens.

In Primary 5 in previous lessons, pupils have already learnt the following.

- Soil can be grouped into sandy, clayey and loamy.

However, a teacher should not assume that all pupils in the class have a good understanding of the above because they have previously learnt them. It is always important to pay enough attention to the individual needs of the pupils.
2. Lesson Plan

**PROPERTIES OF SOIL**

**WEEDENDING:**

**SUBJECT:** Integrated Science

**CLASS:** Primary 5

**REFERENCES:**
1. Primary Integrated Science Syllabus pp. 38-39
2. Primary Integrated Science Pupils’ Book (Gyang, et al.) pp. 48-49

<table>
<thead>
<tr>
<th>DAY/DATE/ DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K./ OBJECTIVES</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINTS</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday 2\textsuperscript{nd} of Oct 2007</td>
<td>Types of Soil, Properties of Soil</td>
<td>Pupils are familiar with the type of soil in the school garden.</td>
<td>Short talk or discussion about real life experiences related to water holding capacity. (e.g.: erosion of sports grounds of the school)</td>
<td>loamy, sandy and clayey soils</td>
<td>CORE POINT 1:</td>
<td>ORAL QUESTIONS: What type of soil is in the school garden? What type of soil is on the school compound? What is the colour of the soil in the school garden?</td>
</tr>
<tr>
<td>60 MINS</td>
<td></td>
<td>OBJECTIVES: By the end of the lesson pupil will be able to:</td>
<td>Through question and answer method, pupils state the types of soil near their houses and in the school garden.</td>
<td>funnels, cotton wool, empty transparent plastic containers, water, cups and sticks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACTIVITY 1: Pupils touch/feel and describe the soil samples in terms of colour, texture and particle size, and record their observations in a table.</td>
<td></td>
<td>CORE POINT 2: Different soils allow water to drain through them at different rates. Sandy soil allows water to pass through it easily. Loamy soil allows water to pass through it better than clayey soil.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACTIVITY 2: Using the same type of soil samples, pupils find out if the different types of soil allow water to pass through them at the same rate.</td>
<td></td>
<td>APPLICATION: Loamy soil is suitable for growing tomatoes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Let the group leaders read out their observations and discuss their groups’ findings with the class. For the instructions, refer to worksheet or teaching approach on an attached paper.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CLOSURE: Discuss with pupils which soil type will be best for planting tomatoes in the school garden or their gardens at home (Note that different kinds of plants also determine suitable soil type.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson Plan with Hints

The lesson plan below shows speech blobs (rounded rectangular shapes) that indicate hints for teaching the various stages. The hints for teaching deal with specific skills for less on delivery and they are explained in detail in the following pages. The position of each speech blob suggests where each one of the hints can be used. Also refer to the same less on plan on the previous page.

<table>
<thead>
<tr>
<th>DAY/DATE/DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K./ OBJECTIVE S</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINT S</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday 2nd of Oct. 2007</td>
<td>Types of Soil. Properties of Soil.</td>
<td>Pupils are familiar with the type of soil in the school garden.</td>
<td>SHORT TALK OR DISCUSSION ABOUT REAL LIFE EXPERIENCES RELATED TO WATER HOLDING CAPACITY. (E.G. DRAINAGE OF SPORTS GROUNDS OF THE SCHOOL)</td>
<td>Hints for Introduction</td>
<td>Sandy soil has larger particles and is brownish in colour. It feels very rough between the fingers. Clayey soil has smaller particles and is blackish brownish in colour depending on its location. It feels very smooth and has medium size particles. Loamy soil is dark in colour. Its particle size is smaller than sandy soil particles, but not as small as clay soil particles.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>By the end of the lesson pupil will be able to:</td>
<td>THROUGH QUESTION AND ANSWER METHOD, PUPILS state the types of soil near their houses and in the school garden.</td>
<td>Hints for Activity 1</td>
<td>Different soils allow water to drain through them at different rates. Sandy soil allows water to pass through it easily. Loamy soil allows water to pass through it better than clayey soil.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>determine two differences in loamy, sandy and clayey soils.</td>
<td>ACTIVITY 1:</td>
<td>Hints for Activity 2</td>
<td>APPLICATION: Loamy soil is suitable for growing tomatoes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DEMONSTRATE THE WATER HOLDING CAPACITY OF LOAMY, SANDY AND CLAYEY SOILS.</td>
<td>PUPILS touch/feel and describe the soil samples in terms of colour, texture, and particle size and record their observations in a table.</td>
<td>Hints for Activity 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ACTIVITY 2:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>USING THE SAME TYPE OF SOIL SAMPLES, PUPILS find out if the different types of soil allow water to pass through them at the same rate.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LET THE GROUP LEADERS READ OUT THEIR OBSERVATIONS AND DISCUSS THEIR GROUPS’ FINDINGS WITH THE CLASS. FOR THE INSTRUCTIONS, REFER TO WORKSHEET OR TEACHING APPROACH ON AN ATTACHED PAPER.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CLOSURE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DISCUSS WITH THE PUPILS WHICH SOIL TYPE WILL BE BEST FOR PLANTING TOMATOES IN THE SCHOOL GARDEN OR THEIR GARDENS AT HOME (NOTE THAT DIFFERENT KINDS OF PLANTS ALSO DETERMINE THE MOST SUITABLE SOIL TYPE).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ORAL QUESTIONS:**
What type of soil is in the school garden? What type of soil is on the school compound? What is the colour of the soil in the school garden?

**WRITTEN QUESTIONS:**
There are 3 main types of soil. Which soil type will dry up more quickly and why? Which soil would be best for growing crops in the school garden and why?
Worksheet for activity 2

**Experiment:** To Investigate How Different Soils Hold Water

**What you need:** three pieces of cloth, three samples of soil, three sieves, three equal quantities of water, three containers, a clock or timer.

**Step 1** Put a piece of cloth in a sieve. Do the same with two other sieves.
**Step 2** Put each sieve at the mouth of a container.
**Step 3** Label the sieves A, B and C.
**Step 4** Put some sand on sieve A.
**Step 5** Put the same quantity of clay on sieve B.
**Step 6** Put the same quantity of loam on sieve C.
**Step 7** Pour the same amount of water onto each sieve.
**Step 8** Note the time. After 3 minutes, observe which type of set-up has most water in the sieve and which type of set-up has most water in the container.
**Step 9** Record your findings in the table below.

---

### Results of the Experiment

<table>
<thead>
<tr>
<th>Type of Soil</th>
<th>What happened to the water after 3 minutes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>Loam</td>
<td></td>
</tr>
</tbody>
</table>
3. Teaching Hints

The discussion that follows is the suggested teaching approaches for presenting the lesson whose lesson plan can be found on the previous pages.

**Hints for Introduction**

**Questioning Skills for Introduction**
In the introduction, a teacher can use any (or all) of the approaches below.

a) questions that review pupils’ R.P.K.

Examples

T) “Name the types of soil you know?”
T) “How many types of soil are there in the school?”
T) “Name the types of soil in the school garden.”
T) “What types of soil are there in the school garden?”

b) questions that relate the lesson to real life situations.

Example

T) “Which soil/land is the best for farming?”

Note: Different crops do well in different soils so any soil type mentioned should be supported with the appropriate crops. e.g. sandy soil – shallot/onions; humus- pepper.

**Hints for Activity 1**

Activity 1 is linked with Core Point 1. Hints for Activity 1 lead to a good understanding of Core Point 1.

**Core Point 1** (of Activity 1): Sandy soil has larger particles and is brownish in colour. It feels very rough between the fingers. Clayey soil has smaller particles and is whitish in colour. It feels very smooth and has small size particles. Loamy soil has particles with a mixture of sizes and is black in colour.

**Approach to Activity 1 (for Core Point 1)**:

An approach to Activity 1 is shown below as an example.

1. Three soil samples (sandy, clayey and loamy soils) are needed for this activity and they can be obtained from the school garden and the neighborhood.
2. In groups, pupils examine the samples carefully.
3. Pupils touch/feel and describe the colour, particle size and texture of the three samples of soils.
4. Pupils record their observations in Table 2.
5. Discuss pupils’ observations and classify the soil types according to the size of particles and texture.
### Table 2: Properties of Soil Types

<table>
<thead>
<tr>
<th>Type of soil</th>
<th>Colour</th>
<th>Size of particles</th>
<th>Feel or texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clayey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loamy</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Questioning Skills for Activity 1

In Activity 1, pupils have opportunity to make their own observations. A teacher should use questions that elicit the observations pupils have made. (See Module 4 General Pedagogy: 2.5 “Questioning Skills” for further explanation.)

Examples

T) “What is the colour of this soil?”
T) “How does it feel when you touch the soil?”
T) “How will you describe the texture of clay?”
T) “How big is the size of the soil particles?”
T) “How different is sand from clay?”

### Hints for Activity 2

Activity 2 is linked with Core Point 2. Hints for Activity 2 lead to a good understanding of Core Point 2.

**Core Point 2** (of Activity 2): Different soils do not allow water to drain through them at the same rate. Sandy soil allows water to pass through it easily. Loamy soil allows water to pass through it better than clayey soil.

### Approach to Activity 2 (for Core Point 2)

An approach to Activity 2 is shown below as an example.

1. Using the soil samples, pupils find out if the different types of soil allow water to pass through them at the same rate.
2. Let pupils predict what would happen to the water in the three types of soils (Pupils can be asked to write it down).
3. Pupils or group leaders present their predictions to the class. (Teacher writes them on chalkboard.)
4. Carry out the experiment (Either teacher-led demonstration or group activity, depending on availability of the apparatus and time).
5. As a group, pupils record the results on the board or in their exercise books.
6. Pupils share the results with members of other groups.
7. Discuss them in class, comparing them with the predictions pupils made before the experiment.
Preparation of Teaching and Learning Materials for the lesson

Resources:

- 3 different transparent containers of equal size (beakers/plastic bottles/glasses)
- Samples of sandy, clayey and loamy soils (which are locally available.)
- Filter paper/a piece of paper/cotton wool
- 3 funnels
- A clock/stop watch/wrist-watch

Steps to follow:

1. Fold the filter paper as shown.

When filter paper is not available, we can improvise it. Instead of filter paper, we can use cotton wool or a piece of tissue from toilet roll.
2. Set up the apparatus.

When funnels and beakers are not available, other materials can be used, catering for the same purpose. A teacher can improvise them. One example, which uses empty plastic bottles, is shown below.
**Questioning Skills for Activity 2 (Core Point 2)**

In Activity 2, pupils are given the opportunity to carry out an experiment that focuses on discovery. This activity allows a teacher to use a variety of questions, including high order questions, such as analysis, synthesis and application questions.

The teacher can also highlight some of the process skills in this activity, asking questions that are related to process skills. Examples of these questions and process skills are shown below. (See Module 4: 2.3 Good Practices (Science), Generic Process Skills and Science for further explanation.)

Examples

<table>
<thead>
<tr>
<th>Question</th>
<th>Process Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What is likely to happen?”</td>
<td>Predicting</td>
</tr>
<tr>
<td>“Which type of soil is likely to hold water the longest?”</td>
<td>Predicting</td>
</tr>
<tr>
<td>“Why will the clayey soil hold water longest?”</td>
<td>Hypothesising</td>
</tr>
<tr>
<td>“How will you group the soils?”</td>
<td>Classifying</td>
</tr>
<tr>
<td>“What will you need to make this experiment fair?”</td>
<td>Handling apparatus</td>
</tr>
<tr>
<td>“How would you do it?”</td>
<td>Designing</td>
</tr>
<tr>
<td>“What will you measure?”</td>
<td>Measuring</td>
</tr>
</tbody>
</table>

**Hints for Closure**

Closure is linked with Application.

**Application:** Loamy soil is suitable for growing tomatoes.

**Approach to Closure**

An approach to closure is shown below as an example.

1. Having obtained the findings that pupils got from Activity 2, pupils discuss the soil type that retains water most.
2. A teacher asks which soil is best for growing crops.
3. The teacher guides the pupils through the information to discover that crops need just sufficient amount of water. It should neither be too little nor too much.
4. Through a discussion on which soil is best for growing crops, let pupils synthesise both the information that they obtained from the activity and the information their teacher has just given.
5. After pupils come to a conclusion, teacher asks if the type of soil in the school garden is suitable for growing crops.
6. Encourage pupils to suggest the types of soil that would be best or suitable for planting a local crop.
**Questioning Skills for Closure and Application**

A teacher can use the following questions for summing up the lesson. Examples:

<table>
<thead>
<tr>
<th>Question</th>
<th>Process Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>“What have you found?”</td>
<td>Evaluating</td>
</tr>
<tr>
<td>“How do you compare the results?”</td>
<td>Discussing</td>
</tr>
<tr>
<td>“What might be said about the relationship between water holding capacity and size of particles of soil?”</td>
<td>Generalising</td>
</tr>
<tr>
<td>“How will you tell your friends about today’s finding?”</td>
<td>Communicating</td>
</tr>
</tbody>
</table>

**Related Information**

The smaller the particles of soil, the greater the total surface area of the particles on which the water can collect. The farther apart the particles, the more easily water passes through.

Clayey soil has very small particles and holds water better than sandy and loamy soils, but it tends to become waterlogged and develops cracks when dry.

Sandy soil holds little water because it has large spaces between its particles.

Loamy soil holds water well. It does not become waterlogged. Humus also increases the water holding ability of soils.

“The ability of soil to hold back water is called the water holding (retention) capacity of the soil.”
4. The Use of Chalkboard
A sample layout of chalkboard writing is shown below.

3rd/May/06
Properties of Soil

Types of soil we can find in the school garden.
Examples: Sand, clay, loam and so on.

Activity 1: Properties of Soil

<table>
<thead>
<tr>
<th>Types of soil</th>
<th>Colour</th>
<th>Size of particles</th>
<th>Feel or texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clayey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loamy</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sandy soil has larger particles and is brownish in colour. It feels very rough between the fingers. Clayey soil has smaller particles and is whitish or brownish in colour depending on its location. It feels very smooth and has medium size particles. Loamy soil is dark in colour. Its particle size is smaller than sandy soil particles, but not as small as clay soil particles.

Activity 2: Which soil allows water to pass through it more easily?

Materials (TLMs): loamy, sandy and clayey soils, cotton wool, funnels and beakers (or empty transparent plastic containers), water, cups, sticks

Aim: To find out if the different types of soil allow water to pass through them at the same rate.

Set-up:

Predictions:

Group A: Clay allows water to pass through it faster than others.
Group B: There is no difference. They are all the same.
Group C: Water passes through sand at the fastest rate.
Group D: Different soils do not allow water to drain through them at the same rate.

Table: Results of the Experiment

<table>
<thead>
<tr>
<th>Type of Soil</th>
<th>What happened to the water after 3 minutes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>Loamy</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion (of activity 2):
Allow water to pass through them at different rates. Sandy soil allows water to pass through it easily. Loamy soil allows water to pass through it better than clayey soil.

Application and Conclusion:
Clayey soil retains water most while loamy soil holds sufficient water for plant growth.
Loamy soil is suitable for growing tomatoes.

Exercise:
5. English as a Teaching Tool

(a) Activity 1: In the first activity of this lesson, the pupils have to describe the feel or texture of the three soil samples. The pupils will be able to describe the soils in their local language. The teacher can help the pupils to learn some English words to describe the differences.

The following descriptive words will be helpful:

<table>
<thead>
<tr>
<th></th>
<th>clay</th>
<th>sand</th>
<th>loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>small grains</td>
<td>bigger grains</td>
<td></td>
<td>crumbly</td>
</tr>
<tr>
<td>smooth</td>
<td>rough</td>
<td></td>
<td>loose</td>
</tr>
<tr>
<td>sticky (grains stick together)</td>
<td>You can pour it</td>
<td></td>
<td>a mixture of textures</td>
</tr>
<tr>
<td>You can make it into a ball</td>
<td>It runs through your fingers</td>
<td></td>
<td>bigger and smaller pieces together</td>
</tr>
</tbody>
</table>

(b) Activity 2: In this lesson the pupils are asked to write down what they think will happen before they do the experiment. After the teacher has explained the experiment she should give the pupils some ideas and some words to help them. For example the teacher can say:

“Do you think it will be the same for each type of soil? What will be different? Will the water pass through one type of soil quickly and move through another type of soil more slowly? Now I want you to write down some sentences to say what you think will happen in this experiment. Here are some words that you can use in your writing” e.g. Fast, slowly, quickly, holds, doesn’t hold.

Encourage the pupils to explain their ideas fully using the following sentence structures:

- I think ........ because ........
- First it will ........ and then it will ........
- In the sand I saw ........ but in the clay I saw ... |

It is important for the teacher to give clear instructions for the pupils to follow, using phrases which they have heard before so that they become familiar with what they are expected to do.

For example:
- Give a clear title which tells the pupils what they are going to be studying.
- Tell the pupils what equipment is needed for the experiment.
- Make the instructions brief, in simple steps and in clear English.

Each of these points will also provide a list of vocabulary items to help pupils with their writing.
The experiment could be written on the blackboard for the pupils to copy into their exercise book (see below).

Experiment: To Investigate How Different Soils Hold Water

What you need: three pieces of cloth, three samples of soil, three sieves, three equal quantities of water, three containers, a clock or timer.

Step 1 Put a piece of cloth in a sieve. Do the same with two other sieves.
Step 2 Put each sieve at the mouth of a container.
Step 3 Label the sieves A, B and C.
Step 4 Put some sand on sieve A.
Step 5 Put the same quantity of clay on sieve B.
Step 6 Put the same quantity of loam on sieve C.
Step 7 Pour the same amount of water onto each sieve.
Step 8 Note the time. After 3 minutes, observe which type of set-up has most water in the sieve and which type of set-up has most water in the container.
Step 9 Record your findings in the table below.

Table 3: Results of the Experiment

<table>
<thead>
<tr>
<th>Type of Soil</th>
<th>What happened to the water after 3 minutes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>Loam</td>
<td></td>
</tr>
</tbody>
</table>
Lesson 2: Primary 4  Characteristics of Water and Other Liquids

1. Lesson Overview

Introduction

Water is the most common liquid in the world. We drink it, wash in it and do many things with it. In many ways water controls our lives. It determines where we can live and whether we can grow crops for food and also determines which weather we have. All living things use water—plants, animals and people. About 2/3 (70%) of the human body is made up of water. The body needs about 2 litres of water every day. It replaces the water that is lost through sweat, urine and breathing. Water is more important than food (you can survive between 5 to 10 days only without water but can do for 50 to 60 days even without food if you have water). Water is a compound with chemical formula $\text{H}_2\text{O}$ (2 Hydrogen atoms and 1 Oxygen atom).

General Objectives of the topic (Water in primary 4)

The pupil will:

− recognise various sources of water.
− relate water to other liquids.
− appreciate the importance of water.
− understand the dangers associated with polluting water bodies.

Specific Objectives of the lesson (Characteristics of water and other liquids)

By the end of the lesson, pupils will be able to:

− identify water from other liquids.
− compare water to some other liquids.

This topic (Characteristics of Water and other Liquids) is found in Unit 2 of the primary 4 syllabus. The units that pupils learn before and after this unit are shown in Table 4. The table also indicates the place of the topic, Characteristics of Water and other Liquids, in bold.

Table 4: Class and Unit That This Topic Can Be Found

<table>
<thead>
<tr>
<th>Class</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary 4</td>
<td>Unit 1: Sources of water</td>
</tr>
<tr>
<td></td>
<td><strong>Unit 2: Characteristics of water and other liquids</strong></td>
</tr>
<tr>
<td></td>
<td>Unit 3: Uses of water</td>
</tr>
<tr>
<td></td>
<td>Unit 4: Water pollution</td>
</tr>
<tr>
<td>Primary 5</td>
<td>Unit 1: Purification of water</td>
</tr>
<tr>
<td></td>
<td>Unit 2: Water as a solvent</td>
</tr>
<tr>
<td></td>
<td>Unit 3: Water cycle</td>
</tr>
</tbody>
</table>
Relevant Previous Knowledge (R.P.K.)

Pupils use water and other liquids (e.g. kerosene and fruit juice) in their everyday activities.

In Primary 4, pupils have learnt that:

- Water may be obtained from rivers, taps, wells, lakes, lagoons, streams, rain and the sea.
- Water may contain different kinds of impurities.

However, the teacher should not assume that all pupils in the class have a good understanding of the above. It is always important to pay enough attention to individual needs of pupils.
2. Lesson Plan

**CARACTERISTICS O F WATER AND OTHER LIQUID S**

**WE EDENDING :**
**SUBJECT:** Integrated Science  
**CLASS:** Primary 4

<table>
<thead>
<tr>
<th>DAY/DATE/DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K./ OBJECTIVE S</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>CORE POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday 1st Oct. 2007</td>
<td>Water and Other Liquids</td>
<td>Pupils use water and other liquids in their everyday activities. <strong>OBJECTIVES:</strong> By the end of the lesson, pupil will be able to:  - identify water from other liquids.  - state at least 2 differences between water and other liquids.</td>
<td><strong>INTRODUCTIO N:</strong> Lesson is introduced through Q and A, for example, “What kind of liquid do you use in making stew?” “Do all liquids have taste, smell and colour?”</td>
<td><strong>EVALUATION/EXERCISE:</strong> State 2 differences between water and cooking oil. Which liquid has colour: kerosene or orange juice? Water flows more slowly than cooking oil. True or False?</td>
</tr>
<tr>
<td>30 MINS</td>
<td>Characteristic s of Water and Other Liquids</td>
<td><strong>ACTIVITY 1</strong> Group activity In groups, pupils compare the liquids, looking at the differences in colour, smell and texture (thick/thin). Complete the table.</td>
<td><strong>TEACHER/LEARNER ACTIVITIES</strong></td>
<td>Water, orange juice, kerosene, cooking oil, e.g. palm oil in transparent bottles with lids</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Colour</th>
<th>Smell</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With colour</td>
<td>Without colour</td>
<td>With smell</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Juice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ACTIVITY 2: Demonstration

The teacher and pupils use TLMS to demonstrate an activity to find out which liquid pours more easily than others.

Procedure:
1. Obtain two identical plastic bottles and place a funnel on each.
2. Mark each bottle equally.
3. Measure some water and pour it into one of the bottles through the funnel.
4. Time it and check how long it takes to reach the mark.
5. Repeat the activity with the cooking oil.
6. Copy and complete the table.

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Time it takes to reach the mark (In seconds)</th>
<th>Does it flow fast or slow?</th>
<th>How does it feel between your fingers?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fast</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CLOSURE:
Summarise the lesson and ask pupils the following question, “You got water from a borehole in your neighborhood. How would the water be different from water from a river or muddy pond?”

CORE POINT 2:
Some liquids flow more slowly than others. Cooking oil flows more slowly than water.

APPLICATION:
Borehole water is always clean and clearer while water from certain rivers and muddy ponds is dirty and coloured.
Lesson Plan with Hints

The lesson Plan below has speech blobs (rounded rectangular shapes) that show hints for teaching approaches. The hints for teaching approaches deal with specific skills of lesson delivery and they are explained in detail in the following pages. The position of each balloon indicates where each one of the hints can be used. Also refer to the same lesson plan on the previous pages.

<table>
<thead>
<tr>
<th>DAY/DATE/ DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K./ OBJECTIVES</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINTS</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday 1st of Oct. 2007</td>
<td>Water and Other Liquids</td>
<td>R.P.K: Pupils use water and other liquids in their everyday activities.</td>
<td>OBJECTIVES: By the end of the lesson, pupil will be able to: - identify water from other liquids. - state at least 2 differences between water and other liquids.</td>
<td>ACTIVITY 1: Group activity</td>
<td>In groups, pupils compare the liquids, looking at the differences in colour, smell and texture (thick/thin). Complete the table.</td>
<td>CORE POINT 1: Some liquids have colour. (e.g. Orange juice) Others have taste and smell. (e.g. Kerosene) Pure water is colourless, odourless and tasteless.</td>
</tr>
<tr>
<td></td>
<td>30 MINS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>State 2 differences between water and cooking oil.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Which liquid has colour: kerosene or orange juice?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Water flows more slowly than cooking oil. True or False?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Colour</th>
<th>Smell</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With colour</td>
<td>Without colour</td>
<td>With smell</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Juice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## ACTIVITY 2: Demonstration

The teacher and pupils use TMLs to demonstrate an activity to find out which liquid pours more easily than others.

**Procedure:**
1. Obtain two identical plastic bottles and place a funnel on each.
2. Mark each bottle equally.
3. Measure some water and put it into one of the bottles through the funnel.
4. Time it and check how long it takes to reach the mark.
5. Repeat the activity with the cooking oil.
6. Copy and complete the table.

### Table:

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Time it takes to reach the mark (In seconds)</th>
<th>Does it flow fast or slow?</th>
<th>How does it feel between your fingers?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td>Fast, Slow</td>
<td>Thick, Thin</td>
</tr>
<tr>
<td>Cooking Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## CLOSURE:

Summarise the lesson and ask pupils the following question. “You got water from a borehole in your neighborhood. How would the water be different from water from a river or muddy pond?”

---

**Hints for Activity 2**

**CORE POINT 2:**

- Some liquids flow more slowly than others. Cooking oil flows more slowly than water.

---

**Also See “the Use of Chalkboard”.

**APPLICATION:**

Borehole water is always clean and clearer while water from certain rivers and muddy ponds is dirty and coloured.
3. Teaching Hints

**Hints for Activity 1**

Activity 1 is linked with Core Point 1. Hints for Activity 1 lead to a good understanding of Core Point 1.

**Core Point 1** (of Activity 1): Some liquids have colour. Others have taste and smell.

**Approach to Activity 1 (for Core Point 1)**

An approach to Activity 1 is shown below as an example.

Comparing liquids

Materials: 1. Water  2. Kerosene  3. Orange juice  4. Cooking oil (e.g. Palm oil)  5. Transparent bottles with lids

Procedure: Look at the samples of different liquids.

Safety: **Do not taste any liquids until you are told to do so.**

Complete the table below.

**Table 5: Comparing Liquids**

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Colour</th>
<th>Smell</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With colour</td>
<td>Without colour</td>
<td>With smell</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Juice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Questioning Skills for Activity 1**

Examples

T) “Do they have colour or they are colourless?”
T) “Do they smell?”
T) “Do they feel thick or thin?” (After rubbing a little of each between your fingers.)
**Hints for Activity 2**

Activity 2 is linked with Core Point 2. Hints for Activity 2 lead to a good understanding of Core Point 2.

**Core Point 2** (of Activity 2): Some liquids flow more slowly than others. Cooking oil flows more slowly than water. Pure water is colourless, odourless and tasteless.

**Approach to Activity 2 (for Core Point 2)**

An approach to Activity 2 is shown below as an example.

> Before conducting the experiment, pupils can make an assumption or prediction of which liquid flows fastest and slowest, applying the results from Activity 1.

Which liquid pours more easily?

**Materials:** Water, cooking oil (e.g. palm oil), plastic bottles, ruler, marker, stopwatch (a stopwatch/clock/wrist watch) and funnels

**Procedure**

1. Obtain two identical plastic bottles and place a funnel on each.
2. Mark each bottle equally.
3. Measure some water and pour it into one of the bottles through the funnel.
4. Time it and check how long it takes to reach the mark.
5. Repeat the activity with the cooking oil.
6. Copy and complete Table 6.

**Table 6: Which Liquid Flows Faster?**

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Time it takes to reach the mark (In seconds)</th>
<th>Does it flow fast or slow?</th>
<th>How does it feel between your fingers?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fast</td>
<td>Slow</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
When funnels are not available, empty plastic bottles can be used instead. An example of the construction of the apparatus is shown below.

**Questioning Skills for Activity 2**

T) “Why must the bottles be identical?”
T) “Why must the same volume of each liquid be used?”

**Related Information**

Pure water is colourless, odourless (has no smell) and is tasteless. Some other liquids like kerosene, fruit juice and edible oils have colour, smell and taste.

At atmospheric pressure, pure water:

- freezes at 0 °C
- is neutral to litmus.
- boils at 100 °C
- has a maximum density of 1g/cm³ at 4 °C
- is a poor conductor of electricity (but becomes a good conductor when a small amount of an ionic compound is dissolved in it).
- expands between 4 °C and 0 °C and contracts (becomes less in volume) when melting from 0 °C to 4 °C. So usually solid water (ice) floats on liquid water.
- has a high surface tension so that it appears to form a strong skin on its surface.

Water is capable of dissolving many substances and it is therefore referred to as a universal solvent.

**NB:** Dissolved solids, such as salt and sugar raise the boiling point and lower the freezing point of pure water.
4. The Use of Chalkboard

A sample of layout of chalkboard writing is shown below.

23rd June/06
Water and other Liquids

2. Characteristics of water and other liquids

**Activity 1:** Comparing some liquids

Materials: water, kerosene, orange juice, cooking oil, (transparent) and bottles

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Colour</th>
<th>Smell</th>
<th>Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Colourless</td>
<td>No smell</td>
<td>Thin</td>
</tr>
<tr>
<td>Kerosene</td>
<td>Colourless</td>
<td>Has smell</td>
<td>Thin</td>
</tr>
<tr>
<td>Orange Juice</td>
<td>Orange</td>
<td>Has smell</td>
<td>Thin</td>
</tr>
<tr>
<td>Cooking oil</td>
<td>Has colour</td>
<td>Has smell</td>
<td>Thick</td>
</tr>
</tbody>
</table>

Water and other liquids are different. They smell differently. Their colours are different. Their texture (feel) is different.

Some liquids flow more slowly than others.

Pure water is colourless, odourless and tasteless.

**Activity 2: Which liquid pours more easily?**

**Materials:** Water, cooking oil, plastic bottles, ruler, marker, stopwatch and funnels

**Procedure:**
1. Obtain two identical plastic bottles and place a funnel at the mouth of each.
2. Mark each bottle equally.
3. Measure some water and pour into one of the bottles through the funnel.
4. Time how long it takes to reach the mark.
5. Repeat the activity with the cooking oil (palm oil).

**Result:**

<table>
<thead>
<tr>
<th>Liquid</th>
<th>How long does it take to reach the mark</th>
<th>Does it flow faster or slowly?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td>Pure water is colourless, odourless and tasteless.</td>
</tr>
<tr>
<td>Cooking Oil (Palm oil)</td>
<td></td>
<td>Cooking oil flows more slowly than water</td>
</tr>
</tbody>
</table>

**Conclusion**

**Conclusion/today’s summary**

Pure water is colourless, odourless and tasteless.

Water flows faster than cooking oil (palm oil).

**Exercise**
5. **English as a Teaching Tool**

(a) The text in this lesson may be quite difficult for the pupils to read with understanding. If this is so, prepare a simplified version to write on the blackboard for the pupils to read and to copy into their exercise books. For example the first page can be re-written as follows:

> Water and other liquids are different. They smell differently. Their colours are different. Their texture (feel) is different. The activities in this lesson show how the liquids are different. You will need some different liquids – kerosene, palm oil and engine oil.

Write the name of each liquid in the first column.

Make a class chart as shown:

<table>
<thead>
<tr>
<th>Liquid</th>
<th>Does it have colour?</th>
<th>Does it have smell?</th>
<th>Does it have taste?</th>
<th>What is the texture? Is it thick or thin?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the pupils’ standard of English is good the teacher can introduce the new vocabulary linked to vocabulary the pupils have already learned. For example:

- odourless means no smell
- tasteless means no taste
- identical means the same

(b) A simple definition of the vocabulary “thick” and “thin” is given in the pupils’ book as “thick liquids flow or fill more slowly than thin liquids”. The teacher will have to discuss this concept with the pupils after they have observed the experiment because they will already be familiar with the use of this vocabulary in the context of thickness and thinness of a book or a slice of bread, for example.
Lesson 3:  Primary 6  Rusting (Characteristics of Metals and Non-metals)

1. **Lesson Plan**

**WEDENDING :**
**SUBJECT:**Integrated Science
**CLASS:**Primary 4

<table>
<thead>
<tr>
<th>DAY/DATE/ DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K./ OBJECTIVE S/</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINT S</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
</table>
| Thursday 19th of May 2007 | **TOPIC:** Kind of Metals  
**SUB-TOPIC :** Rusting | **R.P.K. :**  
Pupils have seen old roofing sheets that have changed colour to brown.  
**OBJECTIVES:**  
By the end of the lesson, pupil will be able to:  
– mention four examples of rusty objects in the environment.  
– describe the process of rusting by an experiment. | **INTRODUCTION:**  
Let pupils tell the difference in the colour of new and old roofing sheets.  
Expected answer:  
New roofing sheets look silvery and old ones look reddish-brown.  
**ACTIVITY:**  
– Pupils observe the clean nails and steel wool and then predict what will happen if these things are left in an open place for about one week.  
– Pupils examine the old nails and steel wool for any observable changes in colour and texture. Compare them to the clean ones.  
– Pupils give examples of other materials, which look like the old nails in the environment.  
– Pupils verify their predictions by finding out what makes iron and steel look old and brownish in colour by performing an experiment using the procedure below. | iron nails and steel wool | **CORE POINT 1:**  
The nails will change colour. The nails and steel wool will become dirty and look old. The clean nails have their original colour and texture while the old nails and steel wool have changed to a brownish and their surfaces have become rough. Examples of objects are: old vehicles, spoons, some earrings, wires, iron rods, coal pots, etc. | **ORAL QUESTIONS:**  
1. Mention 3 examples of metallic objects.  
2. What will happen if you leave clean nails outside the classroom for three days?  
3. State three differences between the rusty nails and the new ones. |
Continued from the previous page.

<table>
<thead>
<tr>
<th>DAY/DATE/DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K/ OBJECTIVE S</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINT S</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observation of the experiment after a week</td>
<td>PROCEDURE:</td>
<td>water, oil, salt, lemon juice or vinegar, jars, rusty nails and rusty steel wool.</td>
<td>water, oil, salt, lemon juice or vinegar, jars, rusty nails and rusty steel wool.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Pour the same amount of cooled boiled water, oil, vinegar, salt solution and ordinary water into each of the five jars. Leave one jar dry.</td>
<td>PROCEDURE:</td>
<td>water, oil, salt, lemon juice or vinegar, jars, rusty nails and rusty steel wool.</td>
<td>List four examples of objects that are in similar condition like the rusty nails.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Put some new iron nails and some new steel wool into all the six jars.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Leave the set up for about one week or more for further discussion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Observe the nails and the steel wool for one week and record any changes in colour.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Record your observations in a table like the one below.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jar</td>
<td>Steel wool</td>
<td>Iron nail</td>
<td>After a week:</td>
<td>CORE POINT 2:</td>
<td>Rusting is a chemical reaction. It occurs on surfaces of metals. It normally occurs when air and water act on a metal, for example, iron and wears it off to produce a reddish-brown coating known as rust.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. Pupils record the results of their observations in the table.</td>
<td>Painting and oiling can prevent rusting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Teacher and pupils discuss the process of rusting using the rusty nails and steel wool as examples.</td>
<td>APPLICATION:</td>
<td>Spoons are coated to prevent rusting.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Teacher and pupils discuss two ways of preventing rusting.</td>
<td>Old roofing sheets look reddish-brown because of rust.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLOSURE:</td>
<td></td>
<td></td>
<td>Review the lesson through questions and answers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“What are the conditions necessary for rusting?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“Why do old roofing sheets appear reddish-brown?”</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. English as a Teaching Tool

(a) At the beginning of the lesson the pupils are asked to predict what will happen to nails and steel wool if they are left in the open. The pupils can work in groups (e.g. of 4) to discuss their ideas. Each group can explain their prediction to the class. Then they observe the changes in some old nails and steel wool. The pupils may have difficulty explaining their ideas in English. It is important for the teacher to encourage them and give them confidence to try to use their own words. Some pupils will find it helpful to be prompted or to answer a question, which the teacher provides them with some clues. Also, if the teacher needs to correct the pupil she can do so by repeating the pupil’s incorrect sentence in the correct form rather than discouraging the pupil by saying she is wrong. For example:

Ask the pupils to work in groups of 3-4 in which there is a child who is better in English is in each group.

Write some questions based on The Rusty Nail Experiment on the blackboard and ask each group to read out one question.

<table>
<thead>
<tr>
<th>Chalkboard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activity 1</strong></td>
</tr>
<tr>
<td>What is likely to happen to the nails?</td>
</tr>
<tr>
<td>What is likely to happen to the steel wool?</td>
</tr>
<tr>
<td><strong>Activity 2</strong></td>
</tr>
<tr>
<td>What did you observe?</td>
</tr>
<tr>
<td>What happened to the nails?</td>
</tr>
<tr>
<td>What happened to the steel wool?</td>
</tr>
<tr>
<td>Have you seen any rusty metal in the village?</td>
</tr>
</tbody>
</table>

Ask the pupils to think of some words to write on the Chalkboard as a vocabulary list to help them answer the questions about the rusty nail experiment.
(b) You can use a similar method as above to help the pupils complete the tasks in the text book.

<table>
<thead>
<tr>
<th>Chalkboard</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What advice will you give your parents and friends to prevent the rusting of iron buckets at home?</td>
<td>paint</td>
<td>alloy</td>
</tr>
<tr>
<td>How can you prevent rusting?</td>
<td>painting</td>
<td>coating</td>
</tr>
<tr>
<td>Can you use paint, oil or grease to prevent rusting?</td>
<td>air</td>
<td>iron based</td>
</tr>
<tr>
<td>What is an alloy?</td>
<td>water</td>
<td>mixed</td>
</tr>
<tr>
<td>How can zinc be used to stop rusting?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ask the pupils to think of some words to write on the blackboard as a vocabulary list to help them answer the questions about the how to prevent rusting.

(c) The review questions provide a good opportunity for the teacher and pupils to revise and practise the English vocabulary they have learned. Pupils can complete the exercises orally and can write them in their exercise books.

NOTE FOR TEACHERS: The methodology described for this topic can be modified to correspond with the concepts and vocabulary of many other Science lessons.
Lesson 4: Primary 6  

Production of Sound (Energy)

1. Lesson Plan

<table>
<thead>
<tr>
<th>DAY/DATE/ DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K./ OBJECTIVE S</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>CORE POINT S</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>Sound Energy</td>
<td>R.P.K.:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26th of Aug. 2007</td>
<td>Production of Sound</td>
<td>Pupils can beat drums to produce sound.</td>
<td><strong>CORE POINT 1:</strong> Rapid movement of an object back and forth is called vibration. Vibration produces sound.</td>
<td></td>
<td>*Exe. *Sound is produced by ( ).</td>
</tr>
<tr>
<td>60 MINS</td>
<td></td>
<td>Pupils have learnt in P4 that sound is produced when particles of matter vibrate. The degree of sound depends on the strength with which the matter is caused to vibrate.</td>
<td><strong>ACTIVITY 1:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OBJECTIONS: By the end of the lesson, pupil will be able to:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- demonstrate how sound is produced by vibration.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- identify materials that can vibrate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>INTRODUCTION:</strong> Introduce the lesson through questions.</td>
<td>Introduce the lesson through questions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“What kind of music do you like?” “Do you know how musical instruments produce/make sound?”</td>
<td>Call a pupil in front of the class to beat a drum for the other to listen.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Call a pupil in front of the class to be at a drum for the other to listen.</td>
<td>Call a pupil in front of the class to be at a drum for the other to listen.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ACTIVITY 2:</strong> Pupils place rulers at the edges of the tables and tap the free end. Ask pupils the following questions.</td>
<td><strong>ACTIVITY 2:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- “Can you hear any sound from the rulers? ”</td>
<td><strong>ACTIVITY 2:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- “What is making the sound?”</td>
<td><strong>ACTIVITY 2:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- “How do you describe the movement of the ruler?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>OBJECTIVES:</strong> By the end of the lesson, pupil will be able to:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- demonstrate how sound is produced by vibration.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- identify materials that can vibrate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>REFERENCES:</strong> 1. Primary School Integrated Science Syllabus p. 63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Continued from the previous page.

<table>
<thead>
<tr>
<th>DAY/DURATION</th>
<th>TOPIC/ SUB- TOPIC</th>
<th>R.P.K./ OBJECTIVES</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINTS</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>ACTIVITY 3:</strong> The use of bottle as musical instruments.</td>
<td>empty bottles of soft drinks, straws, water and metal spoons</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>CORE POINT 2:</strong> When the amounts of water in the bottles are not the same, the pitch of the sound produced in each bottle will be different, too.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>a) Different ( ) make ( ) sounds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>b) Some sounds are ( ). ( ) and some sounds are ( ).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bottles with different amount of water and air</td>
<td></td>
<td></td>
<td>The smaller the amount of water, the larger the volume of air and the lower the pitch becomes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The larger the amount of water, the smaller the volume of air, the higher the pitch becomes.</td>
</tr>
</tbody>
</table>

- compare the differences in sound produced such as, high pitched sound, low pitched sound, quality of sound and noise.

1. Pour different amounts of water in empty bottles.

2. Hit each bottle with a metal spoon and listen carefully to the sound each bottle makes.

**Use the following words to complete the sentences below:** soft, loud, instrument, bottles, objects, water, different, vibrating objects.

a) Different ( ) make ( ) sounds.

b) Some sounds are ( ). ( ) and some sounds are ( ).
### Activity 4:
1. Put a straw near the mouth of each bottle.

2. Blow some air into the bottles through the straw and adjust the position of the straw so that they can produce sound.

3. Ask pupils which bottle makes high pitched sound by hitting/blowing?

### Closure:
Summarise the major points of the lesson and ask questions.

Why does the trumpet produce a very high pitched sound but the trombone produces a low pitched sound?

### Application:
Trumpet is a musical instrument that makes a very high pitched sound because of the amount of air that vibrates through it.

<table>
<thead>
<tr>
<th>DAY/DATE/DURATION</th>
<th>TOPIC/SUB-TOPIC</th>
<th>R.P.K./OBJECTIVES</th>
<th>TEACHING/LEARNING MATERIALS</th>
<th>TEACHER/LEARNER ACTIVITIES</th>
<th>TLMS</th>
<th>CORE POINTS</th>
<th>EVALUATION/EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. English as a Teaching Tool

(a) This lesson gives the pupils the practical experience of hearing sounds of different kinds and learning how the sounds are made. After completing the sound experiments the teacher completes a table of the results on the blackboard. The teacher should follow the steps below to make best use of the blackboard as a teaching and learning resource. This will also help the pupils to understand how to complete a table of results.

1. Tell the pupils, ‘we are going to make a table of the results of the experiment’.
2. Give the table a title: Production of Sound Experiment.
3. Draw the table and write the heading in the first column: Amount of water in the bottle.
4. Hold up the bottle that made the highest pitch sound and the bottle that made the lowest pitch sound. Ask the pupils to describe how much water was in the two different bottles.
   Write “more water” and “less water” in the first column.
5. Write the headings in the second and third columns, reminding the pupils that these were the different ways they made sound from the bottles.
6. Explain to the pupils that they are going to complete the other spaces in the table.
7. Point to the first empty space and ask the pupils to say which result we put there.
8. The answer is “The pitch of the sound made by hitting the bottle that contained more water.”

Answer: The pitch of the sound made by hitting the bottle that has more water.

<table>
<thead>
<tr>
<th>Production of Sound Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount of water in each bottle</strong></td>
</tr>
<tr>
<td><strong>More water</strong></td>
</tr>
<tr>
<td><strong>Less water</strong></td>
</tr>
</tbody>
</table>

9. Ask the pupils to listen again to the sound made by each bottle and say whether the pitch of the sound made by hitting the bottle that has more water is high or low.
10. Repeat points 7 and 8 for each of the other spaces to complete the table.
Lesson 5: Primary 4 Properties of Air

<table>
<thead>
<tr>
<th>WE EDENDING :</th>
<th>SUBJECT: Integrated Science</th>
<th>REFERENCES:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLASS: Primary 4</td>
<td>1. Primary School Integrated Science Syllabus p . 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DAY/DATE/ DURATION</th>
<th>TOPIC/ SUB-TOPIC</th>
<th>R.P.K. / OBJECTIVES</th>
<th>TEACHING/ LEARNING MATERIALS</th>
<th>TLMS</th>
<th>CORE POINTS</th>
<th>EVALUATION/ EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday 3rd of May 2007</td>
<td>60 MINS</td>
<td>Air</td>
<td>Properties of Air</td>
<td>R.P.K.: Pupils have learnt that air is around us and they have used fans.</td>
<td>OBJECTIVES: By the end of the lesson, pupil will be able to: Show how air supports burning.</td>
<td>INTRODUCTION: Start the lesson with questions that relate the topic to real life. For example, “When you want to cook fast using a coal pot, what would you do to make the fire hotter?” Expected answer: “I will fan it.”</td>
</tr>
</tbody>
</table>
Pupils light second short candles.

7. Pupils cover the lit candle with the cut cover and observe the result.

8. Pupils make assumption of what would happen to the burning candle if it is covered with the cut plastic cover.

**Safety:** Do not put your finger into the flame.

**ACTIVITY 2:**
Let two groups make fire in coal pots. Group A fans the fire. Group B does not fan the fire. Pupils make their observation and draw their conclusion.

**CLOSURE:**
Summarise silent points to end the lesson. Find out also from pupils why there are holes in box irons and lanterns.

<table>
<thead>
<tr>
<th>DAY/DATE/DURATION</th>
<th>TOPIC/SUB-TOPIC</th>
<th>R.P.K/OBJECTIVES</th>
<th>TEACHING/LEARNING MATERIALS/TEACHER/LEARNER ACTIVITIES</th>
<th>TLMS</th>
<th>CORE POINTS</th>
<th>EVALUATION/EXERCISE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pupils light second short candles.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7. Pupils cover the lit candle with the cut cover and observe the result.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8. Pupils make assumption of what would happen to the burning candle if it is covered with the cut plastic cover.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Safety:</strong> Do not put your finger into the flame.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>ACTIVITY 2:</strong> Let two groups make fire in coal pots. Group A fans the fire. Group B does not fan the fire. Pupils make their observation and draw their conclusion.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>CLOSURE:</strong> Summarise silent points to end the lesson. Find out also from pupils why there are holes in box irons and lanterns.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>transparant covers with a side hole (cut plastic bottles etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>fans, coal pots, charcoal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fire that receives more air burns hotter.</td>
<td></td>
<td><strong>CORE POINT 2:</strong> Fire that receives more air burns hotter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>fans, coal pots, charcoal</td>
<td></td>
<td>Why did the fire in the coal pot for group ‘A’ burn hotter?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>There are holes in box irons and lanterns to allow air into them to help burning.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. English as a Teaching Tool

(a) In the first part of this lesson the teacher may simplify the English Language used by saying “air helps charcoal to burn” or “air helps the flame of the candle to burn”. Later in the lesson the teacher should use the correct expression “air supports burning” so that the pupils become familiar with the standard expression which is used in the pupils’ book.

Irregular Vocabulary
plural of “charcoal” is “charcoal”
e.g. Put some more charcoal in the charcoal pot.

Irregular spelling
fan - fanning
stop - stopped

(b) During the part of the lesson when the teacher conducts the experiment she should encourage the pupils to use full sentence construction to explain their ideas and to use higher order thinking. For example:

Qu. Why did this candle continue burning while that candle stopped burning?
Ans. This candle continued to burn because it had air. So it had a fresh supply of oxygen. That candle stopped burning because there was no fresh air. The flame needs oxygen to continue burning.”

(c) At the end of the lesson the teacher can help the pupils to review the concept and to practise their English at the same time by giving a simple exercise as in the pupils’ book.

The exercise can be given: orally or
as a written exercise or
the exercise can be written first and then checked orally or
practised orally and then recorded in writing.

The multiple choice format helps the pupils by giving them the correct sentence structure and spelling.
Appendix - Some Ideas for Challenging Topics -

1. How Does Light Travel?

Materials: Styrofoam, Thread, Candle, Cardboard, Matches, Pins

Procedure:
1. Arrange the three pieces of cardboard together and punch a pinhole through each of them in the middle.
2. Arrange them standing about 50cm apart using the styrofoam as a stand.
3. Pass a thread through all of them in order to place them in alignment on a table, and then remove the thread.
4. Place a lighted candle behind the first piece of cardboard “A”.
5. Observe the candle light from behind the third cardboard “C”. What do you see?
6. Move “B” slightly out of place but keep “A” and “C” in their positions. Observe the candle light from the third cardboard “C”.

Diagram:

Question:
1. When you arrange three cardboards in a line, can you see the light from “C”?
2. When you displace the cardboard “B”, can you observe the light from “C”?
3. How can we see the light again from “C”?
4. Explain how light travels.

Concept Development:
If a pupil discovers and says “Light travels in a straight line.”, hail the effort and let the class applaud it.
2. Making a Magnet

**Materials:** A strong bar magnet, Iron nail(s), Iron filings/office pins, A plastic bowl, A big bowl of water

**Procedure:**
1. Stroke the nail with one end of the magnet as shown in the diagram several times. Stroke in one direction. (Rub the magnet on the nail repeatedly for sometime.)
2. Move the nail through the iron filings/office pins and see if they will stick on it.
3. Find the position of the rising Sun and mark the direction (E) East. Make its opposite direction (W) West. Get the (N) North and (S) South as well.
4. Put the magnetized nail on the plastic bowl and let it float on the bowl of water then leave it for some time. Eventually, it will settle on one position showing the North and South Poles.

**Diagram:**

![Diagram of a bar magnet and a nail]

**Questions:**
1. How can you tell if the nail is magnetised?
2. How will you be able to determine which end of the nail will be the North Pole?
3. The Law of Reflection

**Materials:** Plane mirror, Optical pins, Protractor, Paper

**Procedure:**
1. Draw a horizontal line on a sheet of paper.
2. Construct a perpendicular line to the horizontal line. This is the Normal.
3. Trace an angle of 30° to the perpendicular line and connect it with a line segment.
4. Place a plane mirror upright on the horizontal line with the reflecting surface facing the Normal.
5. Fix two optical pins, “A” and “B”, on the line segment to represent the Incident Ray. The Angle of Incidence is the angle between the Incident Ray and the Normal. (Fig. a)
6. Look into the plane mirror and find the image of “A” and “B”. Fix pins “C” and “D” so that they are in line with the images of “A” and “B”. (Fig. b)
7. Measure the Angle of Reflection and compare it with the Angle of Incidence.
8. Repeat the activity using different angles of Incidence.

**Diagram:**

![Diagram](image-url)
4. Simple Electrical Circuit Board

**Materials:** A piece of wooden board (about 24cm by 24cm), 2 pieces of wood (1cm by 1 cm) as dry cell holder, Aluminium foil and strips, Dry cell(s), Bottle tops/match box (any suitable material which could be used as a bulb holder), Paper clips, Drawing pins, Nails, Insulated copper wire, 1 torchlight bulb

**Procedure:**

1. Nail 2 pieces of wood to the drawing board in such a way that they hold the dry cell(s) tightly in place.
2. Place the aluminium strips at two ends of the wood making sure that they hold firmly the positive and negative ends of the dry cell(s).
3. Make a hole in the plastic bottle top.
4. Wind a metal strip (aluminium foil or strips) round the base of the bulb referring to the diagrams.
5. Let the bulb sit on another piece of metal strip.
6. Connect one end of an insulated copper wire to the metal strip round the base of the bulb.
7. Connect the end of another insulated copper wire to the metal strip on which the bulb sits.
8. Connect the end of one of the wires to the positive end of the dry cell(s) and the end of second wire to the negative end of the dry cell(s).
9. Nail the bottle top with the bulb onto the board.
10. Use drawing pins and paper clips to make a switch.
11. Connect the wires to make a single circuit as shown in the diagram.

**Diagram:**

![Diagram of simple electrical circuit board](image-url)
5. Electrical Circuits with Bulbs in Series

**Materials:** A piece of wooden board (about 24cm by 24cm), Pieces of wood (1cm by 1 cm) as dry cell holder, Aluminium foil and strips, Dry cell(s), Bottle tops/match box (any suitable material which could be used as a bulb holder), Paper clips, Drawing pins, Nails, Insulated copper wire, 4 torchlight bulbs

**Procedure:**

1. Nail 2 pieces of wood to the drawing board in such a way that they hold the dry cells tightly in place.
2. Place the aluminium strips at two ends of the wood making sure that they hold firmly the positive and negative ends of the dry cells.
3. Make a hole in the plastic bottle top.
4. Wind a metal strip (aluminium foil or strip(s)) round the base of the bulb.
5. Let the bulb sit on another piece of metal strip.
6. Connect one end of an insulated copper wire to the metal strip round the base of the bulb.
7. Connect the end of another insulated copper wire to the metal strip on which the bulb sits.
8. Nail the bottle tops with the bulbs unto the board.
9. Use drawing pins and paper clips to make a switch.
10. Connect the wires to make a circuit of bulbs in series as shown in the diagram.

**Diagram:**

![Diagram of electrical circuit with bulbs in series](image_url)
6. Electrical Circuits with Cells in Series

**Materials:** A piece of wooden board (about 24cm by 24cm), Pieces of wood (1cm by 1 cm) as dry cell holder, Aluminium foil and strips, 2 to 4 dry cells, 1 bottle top/match box (any suitable material which could be used as a bulb holder), Paper clips, Drawing pins, Nails, Insulated copper wire, 1 torchlight bulb

**Procedure:**

1. Nail 2 pieces of wood to the drawing board in such a way that they hold the dry cells tightly in place.
2. Place the aluminium strips at two ends of the wood making sure that they hold firmly the positive and negative ends of the dry cells.
3. Place the dry cells to follow each other (in series) between the pieces of wood so that the positive pole of one is in contact with the negative pole of the other.
4. Make a hole in the plastic bottle top.
5. Wind a metal strip (aluminium foil or strips) round the base of the bulb.
6. Let the bulb sit on another piece of metal strip.
7. Connect one end of an insulated copper wire to the metal strip round the base of the bulb.
8. Connect the end of another insulated copper wire to the metal strip on which the bulb sits.
9. Connect the end of one of the wires to the positive end of the dry cells and the end of second wire to the negative end of the dry cells.
10. Nail the bottle top with the bulb unto the board.
11. Use drawing pins and paper clips to make a switch.
12. Connect the wires to make a circuit of cells in series as shown in the diagram.

**Diagram:**

![Diagram of electrical circuit with cells in series](image-url)
7. Electrical Circuits with Cells in Parallel

**Materials:** A piece of wooden board (about 24cm by 24cm), Pieces of wood (1cm by 1 cm) as dry cell holder, Aluminium foil and strips, 2 to 4 dry cells, 1 bottle top/match box (any suitable material which could be used as a bulb holder), Paper clips, Drawing pins, Nails, Insulated copper wire, 1 torchlight bulb

**Procedure:**

1. Nail 2 pieces of wood to the drawing board in such a way that they hold the dry cells tightly in place.
2. Place the aluminium strips at two ends of the wood making sure that they hold firmly the positive and negative ends of the dry cells.
3. Make a hole in the plastic bottle top.
4. Wind a metal strip (aluminium foil or strip s) round the base of the bulb.
5. Let the bulb sit on another piece of metal strip.
6. Connect one end of an insulated copper wire to the metal strip round the base of the bulb.
7. Connect the end of another insulated copper wire to the metal strip on which the bulb sits.
8. Connect the end of one of the wires to the positive end of the dry cells and the end of second wire to the negative end of the dry cells.
9. Nail the bottle top with the bulb unto the board.
10. Use drawing pins and paper clips to make a switch.
11. Connect the wires to make a circuit of cells in parallel as shown in the diagram.

**Diagram:**

![Diagram of electrical circuit with cells in parallel](image-url)
8. Electrical Circuits with Bulbs in Parallel

Materials: A piece of wooden board (about 24cm by 24cm), Pieces of wood (1cm by 1 cm) as a battery holder, Aluminium foil and strips, Dry cell(s), 2 to 4 bottle tops/match boxes (any suitable material which could be used as a bulb holder), Paper clip, Drawing pins, Nails, Insulated copper wire, 2 to 4 torchlight bulbs

Procedure:

1. Nail 2 pieces of wood to the drawing board in such a way that they hold the dry cell(s) tightly in place.
2. Place the aluminium strips at two ends of the wood making sure that they hold firmly the positive and negative ends of the dry cell(s).
3. Make a hole in the plastic bottle top.
4. Wind a metal strip (aluminium foil or strips) round the base of the bulb.
5. Let the bulb sit on another piece of metal strip.
6. Connect one end of an insulated copper wire to the metal strip round the base of the bulb.
7. Connect the end of another insulated copper wire to the metal strip on which the bulb sits.
8. Connect the end of one of the wires to the positive end of the dry cell(s) and the end of second wire to the negative end of the dry cell(s).
9. Nail the bottle top with the bulb unto the board.
10. Use drawing pins and paper clips to make a switch.
11. Connect the wires to make a circuit of bulbs in parallels as shown in the diagram.
9. Earthquake Model – Movement of the Plates of the Earth

Materials: Foam, Plywood, Nails (about 4 inches)

Procedure:
1. Cut the plywood into 80cm by 80cm size.
2. Cut the foam into two strips of dimensions: Length-50cm, Breadth-20cm, Height-20cm.
3. Fix nails into plywood as shown in the diagram.
4. Fix foam strips in between the nails such that the end of one strip is in contact with the end of the other as shown in the diagram.

Principle and Explanation:
An earthquake occurs when there is a crack in the earth’s crust. Serious earthquakes occur at places where one plate slides under another. When this happens, stress/tension builds up between the two plates and this causes a sudden movement.

The foam representing the Oceanic Crust is moved to the left slowly. Then stress piles up between the two foams (crusts) and this causes a sudden movement, which represents an earthquake.

Diagram:
10. Improvisation of Distillation Apparatus

**Materials:** Empty coffee tins, Large Container, Small Container, Cold water, Rubber tubes of small diameter, Heating source

**Procedure:**
1. Make a hole in the lid of the coffee tin “A” a little smaller than the diameter of the rubber tube to be used.
2. Connect the rubber tube to the hole of the lid.
3. Pour the cold water into the large container “B”.
4. Place a smaller container “C” in the larger container “B”.
5. Put the end of the rubber tube into the smaller container.
6. Put a small quantity of water, say 25cm³, into the coffee tin “A”.
7. Heat the content of the coffee tin “A” until water boils and evaporates.
8. The vapour from tin “A” passes through the rubber tube and enters in “C”. The temperature in container “B” (containing cold water) turns the vapour into water (condensation).
9. Collect condensed water at the base of the smaller container “C”.

If possible/applicable, use ice water or ice cubes in the larger container “B”.

_Diagram:_

- Lid
- Rubber tube
- Coffee tin
- Heat source
- Small container
- Large container With cooling water
- A
- B
- C
Bibliography

Curriculum Research and Development Division (2001).  *Teaching Syllabus for Integrated Science (Primary 4-6)*. Accra: Ministry of Education.


