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 explanation 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 planed 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 discussed/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.

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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 lessons 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

Class	Unit
Primary 4	Unit 1:Composition and uses of soil
Primary 5	Unit 1: Types of soil **Unit 2: Properties of soil** Unit 3: Soil erosion – causes, effects and control
Primary 6	Unit 1: Land degradation Unit 2: Soil fertility

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

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
Wednesday 2nd of Oct 2007 60 MINS	**TOPIC:** Types of Soil. **SUB-TOPIC:** Properties of Soil	**R.P.K.:** Pupils are familiar with the type of soil in the school garden. **OBJECTIVES:** By the end of the lesson pupil will be able to: – determine two differences in loamy, sandy and clayey soils. – demonstrate the water holding capacity of loamy, sandy and clayey soils.	**INTRODUCTION:** Short talk or discussion about real life experiences related to water holding capacity. (e.g.: erosion of sports grounds of the school) Through question and answer method, pupils state the types of soil near their houses and in the school garden. **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. **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. 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. **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.)	loamy, sandy and clayey soils funnels, cotton wool, empty transparent plastic containers, water, cups and sticks	**CORE POINT 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 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. **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. **APPLICATION:** Loamy soil is suitable for growing tomatoes.	**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?

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 lesson 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 lesson plan on the previous page.

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
Wednesday 2nd of Oct. 2007 60 MINS	**TOPIC:** Types of Soil. **SUB-TOPIC:** Properties of Soil.	**R.P.K.:** Pupils are familiar with the type of soil in the school garden. **OBJECTIVES:** By the end of the lesson pupil will be able to: – determine two differences in loamy, sandy and clayey soils. – demonstrate the water holding capacity of loamy, sandy and clayey soils.	**INTRODUCTION:** Short talk or discussion about real life experiences related to water holding capacity. (e.g.:- erosion of sports grounds of the school) Through question and answer method, pupils state the types of soil near their houses and in the school garden. **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. **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. 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. **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 the most suitable soil type.)	loamy, sandy, and clayey soils, funnels, cotton wool, empty transparent plastic containers, water, cups and sticks	**CORE POINT 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 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. **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. **APPLICATION:** Loamy soil is suitable for growing tomatoes.	**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?

Hints for Introduction

Hints for Activity 1

Hints for Activity 2

Hints for Closure

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

Type of Soil	What happened to the water after 3 minutes?
Clay	
Sand	
Loam	

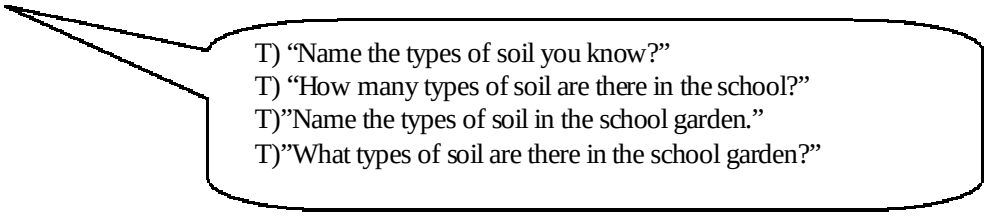
3. Teaching Hints

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

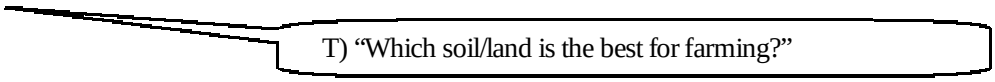
Hints for Introduction

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



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



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.

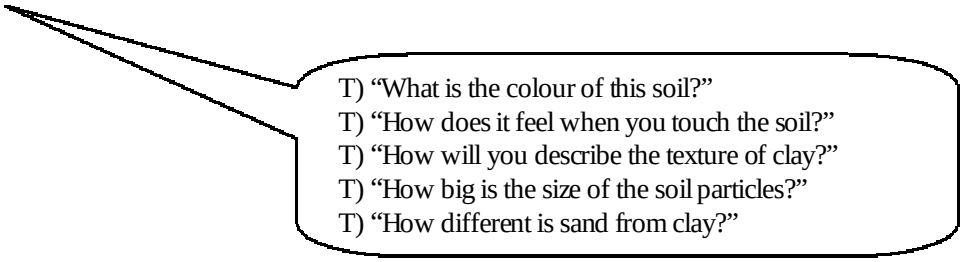
Table 2: Properties of Soil Types

Type of soil	Colour	Size of particles	Feel or texture
Sandy			
Clayey			
Loamy			

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



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.

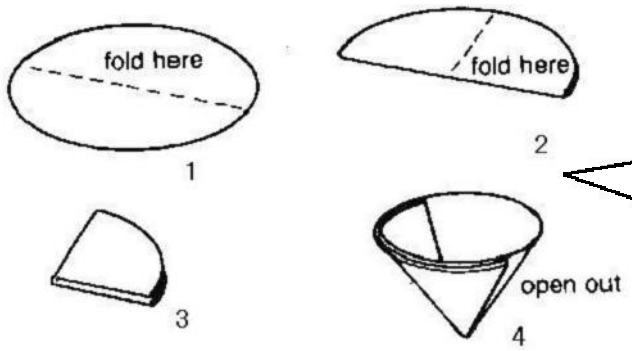
Preparation of Teaching and Learning Materials for the lesson

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

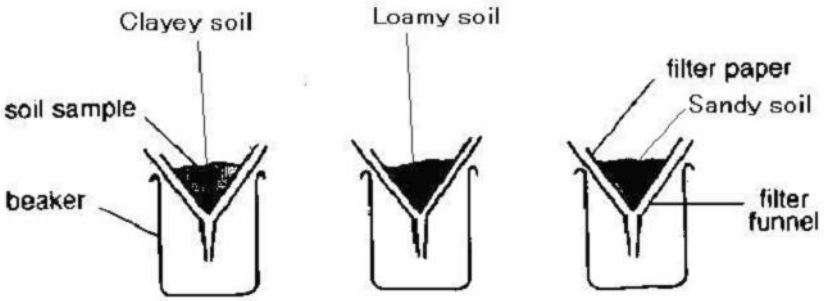
Steps to follow:

1.Fold the filter paper as shown.

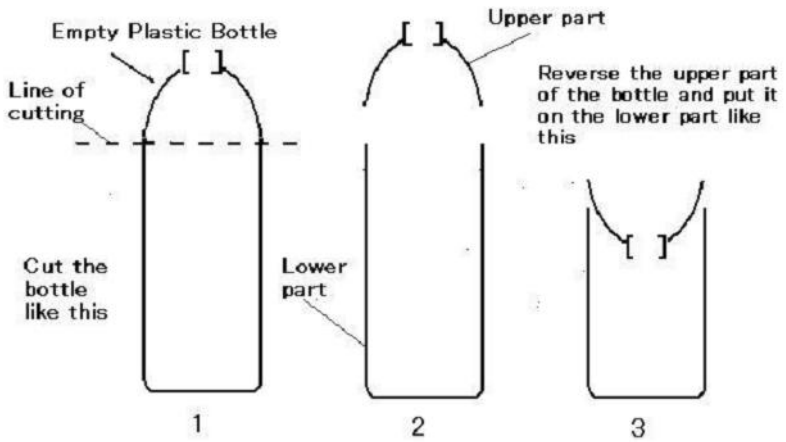


When filter paper is not available, we can improvise it. Instead of filter paper, we can use cotton wool or a piece of tissue from toilet roll.

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

Question	Process Skill
"What is likely to happen?"	Predicting
"Which type of soil is likely to hold water the longest?"	Predicting
"Why will the clayey soil hold water longest?"	Hypothesising
"How will you group the soils?"	Classifying
"What will you need to make this experiment fair?"	Handling apparatus
"How would you do it?"	Designing
"What will you measure?"	Measuring

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

Question	Process Skill
"What have you found?"	Evaluating
"How do you compare the results?"	Discussing
"What might be said about the relationship between water holding capacity and size of participles of soil?"	Generalising
"How will you tell your friends about today's finding?"	Communicating

Related Information

The smaller the particles of soil, the greater the total surface area of the particles on which the water can collect. The further 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 c halkboard writing is shown below.

3rd/May/06

Properties of Soil

Types of soil we can fin d in the school garden .

Examples: Sand, clay, loam a nd so on.

Activ ity 1: Prop erties of Soi l

Types of soil	Colo ur	Size of particles	Feel or texture
Sandy			
Clayey			
Loamy			

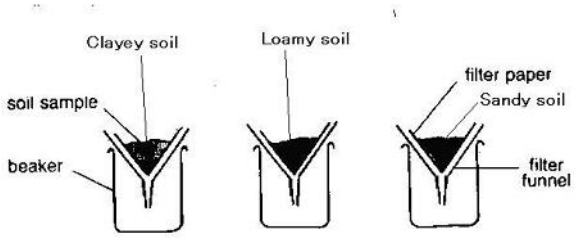
Sandy soil has larger particles and is brownish in colour. It feels very rough b etween the fingers. Clayey soil has s maller particles and is whitish or brownis h in colour depending on its location. It feels very smooth and has medium size particles. Loamy soil is dark in colour. Its particle size is smaller than sandy soil particles, but not as s mall as cla y soil particles.

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

Materia ls (TLMs): loam y, sandy and clayey soils, cotton wool, funnels and beakers (or empty transpare nt plastic containers), water, cups, sticks

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

Set-up:



Predictions:

Group A: Clay allows water to pass through it faster than others.

Group B: There is no differen ce. They are all the same.

Group C: Water passes through sand at the fastest rate.

Group D: Differ ent soils do not allow water to drain through them at th e same rate.

Result:

Table: Results of the Experiment

Type of Soil	What happened to the water after 3 minutes?
Clay	
Sand	
Loam	

Con clusion (of activ ity 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 tha n clayey soil.

Application and Conclusion:

Clayey soil retains water most while loamy soil holds sufficient water for plant growth.

Loam y 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.

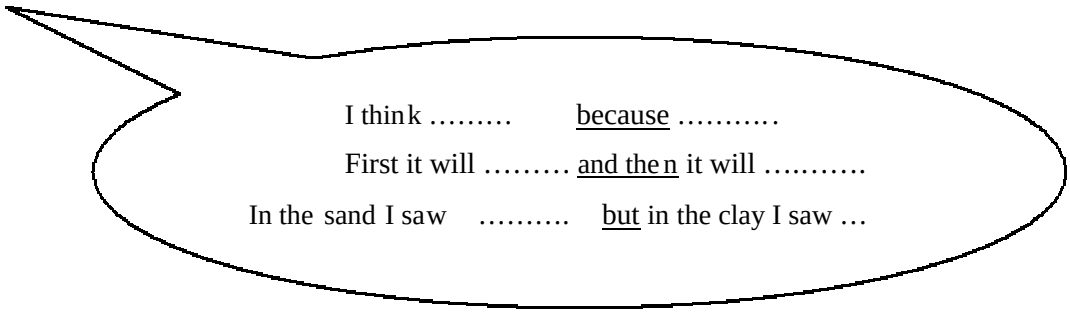
The following descriptive words will be helpful:

clay	sand	loam
small grains	bigger grains	crumbly
smooth	rough	loose
sticky (grains stick together)	You can pour it	a mixture of textures
You can make it into a ball	It runs through your fingers	bigger and smaller pieces together

(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:



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

Type of Soil	What happened to the water after 3 minutes?
Clay	
Sand	
Loam	

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 H_2O (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 place of the topic, Characteristics of Water and other Liquids, **in bold**.

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

Class	Unit
Primary 4	Unit 1:Sources of water **Unit 2: Characteristics of water and other liquids** Unit 3: Uses of water Unit 4: Water pollution
Primary 5	Unit 1: Purification of water Unit 2: Water as a solvent Unit 3: Water cycle

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 :
SUB JECT: Integrated Science
CLASS: Primary 4

REFEREN CES: 1. Primary Sch ool Integrated Science S yllabus p .9
2. Primary Integrated Science P upils' Book 4 (Wiredu, M.B., et al.) pp . 94-97

<table>
<tr><th>DAY/DATE/
DURATION</th><th>TOPIC/
SUB-TOPIC</th><th>R.P.K./
OBJECTIVE S</th><th>TEACHING/ LEARNING MATERIALS
TEACHER/LEARNER AC TIVITIES</th><th>TLMS</th><th>CORE POINT S</th><th>EVALUATION/
EXERCISE</th></tr>
<tr>
<td>Wednesday

1st of Oct.
2007

30 MINS</td>
<td>TOPIC:
Water and Other Liquids

SUB-TOPIC:
Characteristic s of Water and Other Liquids</td>
<td>R.P.K:
Pupils use water and other liquids in their everyday activities.
OBJEC TIVES :
By the end of the lesson, pupil will be able to:

- identif y water from other liquids.

- state at least 2 differences between water and other liquids.</td>
<td>INTR ODUCTIO N:
Lesson is i ntroduced through Q a nd A, for exam ple,
“What kin d of liquid do you use in makin g stew?”
“Do all liquids have t aste, sm ell and colour ?”

ACTIVITY 1: Group activity
In groups, pupils compar e the liquids, looking at the differenc es in colour, smell and texture (thick/thin). Complete the t able.
<table>
<tr><th rowspan="2">Liquid</th><th colspan="2">Colour</th><th colspan="2">Smell</th><th colspan="2">Texture</th></tr>
<tr><th>With colour</th><th>Without colour</th><th>With smell</th><th>Witho ut smell</th><th>Thick</th><th>Thin</th></tr>
<tr><td>Water</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Cooking oil</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Orange Juice</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Kerosene</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td>
<td>Water, orang e juice, kerosene, cooking oil, e.g. palm oil in transpare nt bottles with lids</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>
<td>State 2 differenc es 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>
</table>

<table>
<tr><th>DAY/DATE/
DURATION</th><th>TOPIC/
SUB-TOPIC</th><th>R.P.K./
OBJECTIVE S</th><th>TEACHING/LEARNING MATERIALS
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EXERCI SE</th></tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>
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>
<tr><th rowspan="2">Liquid</th><th rowspan="2">Time it takes to reach the mark (In seconds)</th><th colspan="2">Does it flow fast or slow?</th><th colspan="2">How does it feel between your fingers?</th></tr>
<tr><th>Fast</th><th>Slow</th><th>Thick</th><th>Thin</th></tr>
<tr><td>Water</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Cooking Oil</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</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?”
</td>
<td>stopwatch, rulers, marker, pen and funnel</td>
<td>
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.
</td>
<td></td>
</tr>
</table>

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>
<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>
<tr>
<td>Wednesday

1st of Oct.
2007

30 MINS</td>
<td>TOPIC:
Water and Other Liquids

SUB-TOPIC:
Characteristics of Water and Other Liquids</td>
<td>R.P.K:
Pupils use water and other liquids in their everyday activities.
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>INTRODUCTION:
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?”

ACTIVITY 1: Group activity
In groups, pupils compare the liquids, looking at the differences in colour, smell and texture (thick/thin). Complete the table.
<table>
<tr><th rowspan="2">Liquid</th><th colspan="2">Colour</th><th colspan="2">Smell</th><th colspan="2">Texture</th></tr>
<tr><th>With colour</th><th>Without colour</th><th>With smell</th><th>Without smell</th><th>Thick</th><th>Thin</th></tr>
<tr><td>Water</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Cooking oil</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Orange Juice</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Kerosene</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Hints for Activity 1
</td>
<td>Water, orange juice, kerosene, cooking oil, e.g. palm oil in transparent bottles with lids</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>
<td>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>
</table>

DAY/DATE/DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
			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. **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?"	stopwatch, rulers, marker, pen, and funnel.	**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.	

Hints for Activity 2

Also See "the Use of Chalkboard".

Liquid	Time it takes to reach the mark (In seconds)	Does it flow fast or slow?		How does it feel between your fingers?	
		Fast	Slow	Thick	Thin
Water					
Cooking Oil					

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

Liquid	Colour		Smell		Texture	
	With colour	Without colour	With smell	Without smell	Thick	Thin
Water						
Cooking oil						
Orange Juice						
Kerosene						

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.)

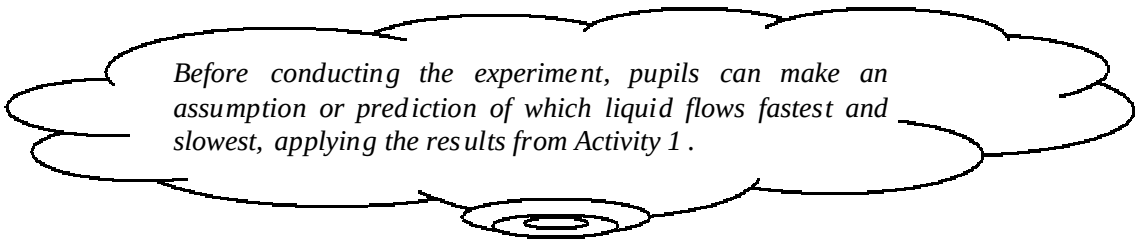
Hints for Activity 2

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.



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

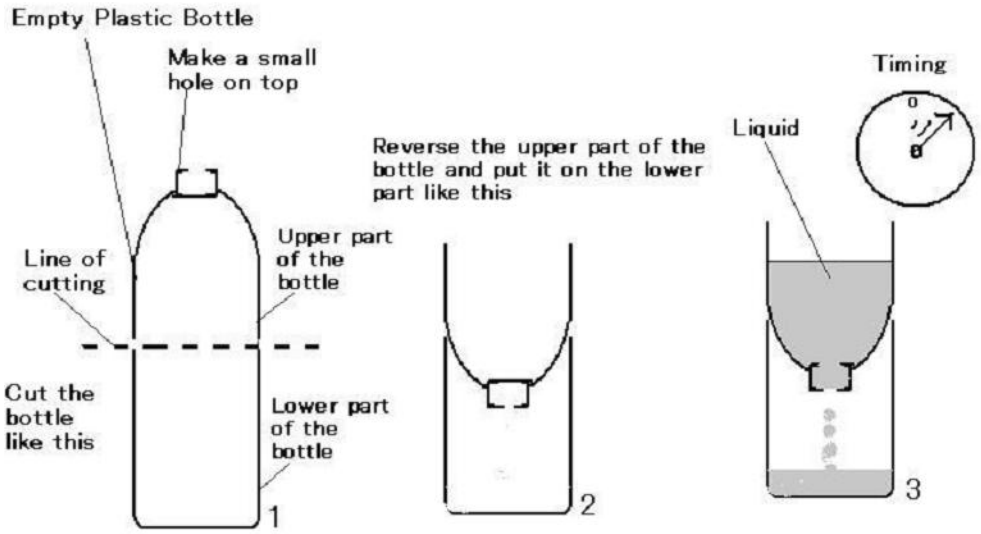
Procedure

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?

Liquid	Time it takes to reach the mark (In seconds)	Does it flow fast or slow?		How does it feel between your fingers?	
		Fast	Slow	Thick	Thin
Water					
Cooking Oil					

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 Examples

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/cm ^{3} 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 *(->Title)*

2). Characteristics of water and other liquids

Activity 1: Comparing some liquids *(->Title of activity)*

Materials: water, kerosene, orange juice, cooking oil, (transparent) and bottles *(->Resources of the activity)*

Liquid	Colour	Smell	Texture
Water	Colourless	No smell	Thin
Kerosene	Colourless	Has smell	Thin
Orange juice	Orange	Has smell	Thin
Cooking oil	Has colour	Has smell	Thick

(->Result of the activity)

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?

(->Title of activity)

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:

Conclusion/ today's summary

Liquid	How long does it take to reach the mark	Does it flow faster or slowly?
Water Cooking Oil (Palm oil)		

Pure water is colourless, odourless and tasteless.

Cooking oil flows more slowly than water

Conclusion

Conclusion/today's summary

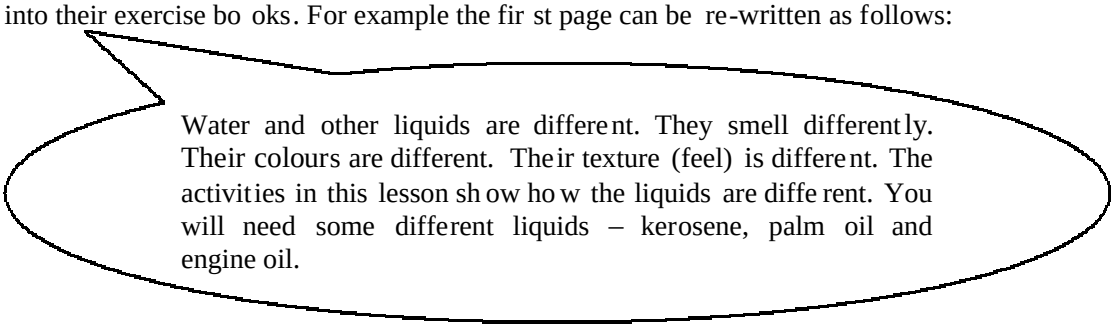
Pure water is colourless, odourless and tasteless.

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:



Write the name of each liquid in the first column.

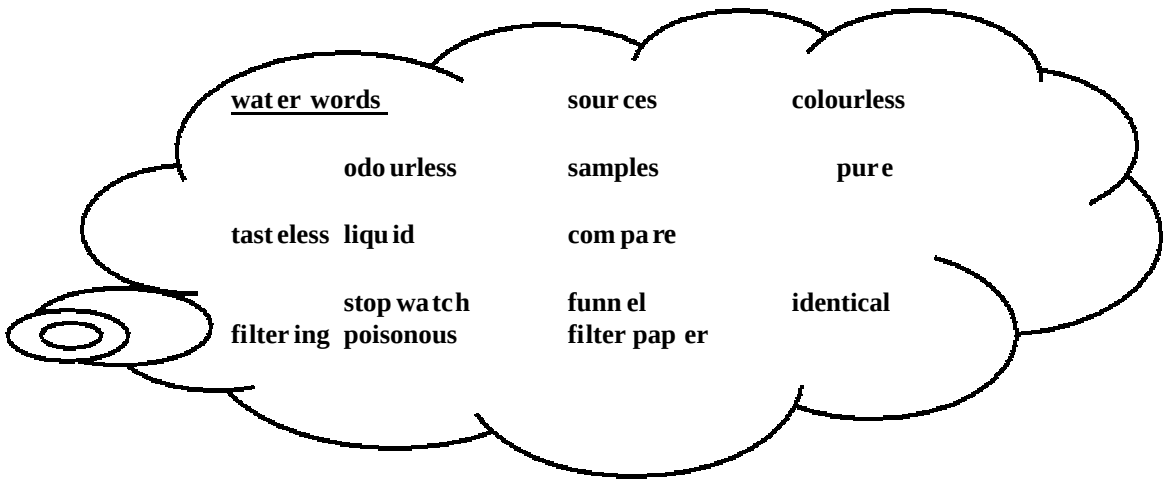
Make a class chart as shown:

Liquid	Does it have colour?	Does it have smell?	Does it have taste?	What is the texture? Is it thick or thin?

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

WEEDENDING :
SUBJECT: Integrated Science
CLASS: Primary 4

REFERENCES: 1. Primary School Integrated Science Syllabus p .9
2. Primary Integrated Science Pupils' Book 6 (Wiredu, M.B., et al.) pp . 174-179

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES/	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
Thursday 19th of May 2007 30 MINS	**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>
<tr><th>DAY/DATE/
DURATION</th><th>TOPIC/
SUB-TOPIC</th><th>R.P.K/
OBJECTIVE S</th><th>TEACHING/LEARNING MATERIALS
TEACHER/LEARNER AC TIVITIES</th><th>TLMS</th><th>CORE POINT S</th><th>EVALUATION/
EXERCI SE</th></tr>
<tr>
<td>Observation of the experim ent after a wee k</td>
<td></td>
<td>– state at least two ways of preventing rusting.</td>
<td>
PROCEDURE:
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.
2. Put some new iron nails and some new steel wool into all the six jars.
3. Leave the set up for about one week or more for further discussion.
4. Observe the nails and the steel wool for one week and record any changes in colour.
5. Record your observations in a ta ble like t he one below.
<table>
<tr><td>Jar</td><td>Steel wool</td><td>Iron nail</td></tr>
<tr><td>Dry</td><td></td><td></td></tr>
<tr><td>Ordinar y water</td><td></td><td></td></tr>
<tr><td>Vinegar/ lemon juice</td><td></td><td></td></tr>
<tr><td>Oil</td><td></td><td></td></tr>
<tr><td>Salt soluti on</td><td></td><td></td></tr>
<tr><td>Cooled boiled water</td><td></td><td></td></tr>
</table>
After a week:
1. Pupils record the results of their observations in the table.
2. Teacher and pupils discuss the process of rusting using the rusty n ails an d steel wool as ex amples.
3. Teacher and pupils discuss two wa ys of prev enting rusting.
CLOSURE:
Review the lesson through questions an d answers.
“What are th e conditions n ecessary for rusting? ”
“Why do old roofing sheets appear reddish-brown?”
</td>
<td>water, oil, salt, lemon juice or vinegar, jars, rusty nails and rust y steel wool.</td>
<td>
CORE POINT 2:
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.
Painting and oiling can prevent rusting.
APPLCAT ION:
Spoons are coated to prevent rusting.
Old roofing sheets look reddish-brown because of rust.
</td>
<td>List four examples of objects that are in similar condition like the rust y nails.</td>
</tr>
</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.

Chalkboard

Activity 1
What is likely to happen to the nails?
What is likely to happen to the steel wool?

Activity 2
What did you observe?
What happened to the nails?
What happened to the steel wool?

Have you seen any rusty metal in the village?

iron
nails

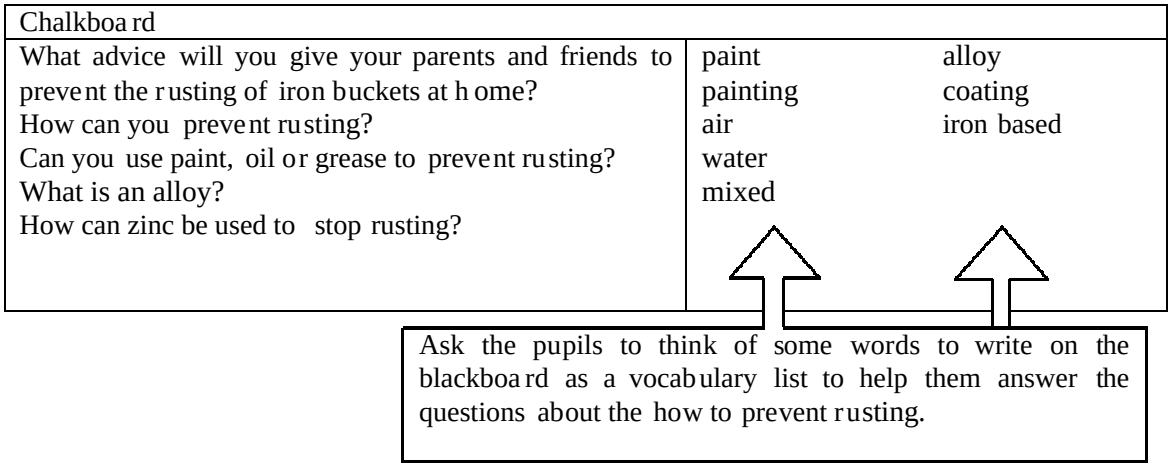
steel wool
machinery
roof

rusty
red colour

air
water
process

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.



(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)

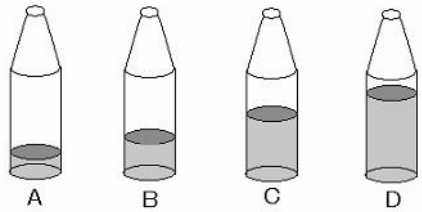
1. Lesson Plan

WEEDENDING :
SUBJECT: Integrated Science
CLASS: Primary 6

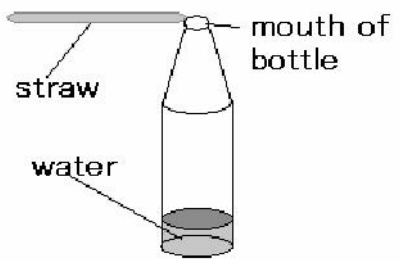
REFERENCES: 1. Primary School Integrated Science Syllabus p. 63
2. Primary Integrated Science Pupils' Book 6 (Wiredu, M.B., et al.) pp. 148-153

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
Thursday 26th of Aug. 2007 60 MINS	**TOPIC:** Sound Energy **SUB-TOPIC:** Production of Sound	**R.P.K.:** Pupils can beat drums to produce sound. 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. **OBJECTIVES:** By the end of the lesson, pupil will be able to: - demonstrate how sound is produced by vibration. -identify materials that can vibrate	**INTRODUCTION**: Introduce the lesson through questions. "What kind of music do you like?" "Do you know how musical instruments produce/make sound?" Call a pupil in front of the class to beat a drum for the other to listen. **ACTIVITY 1:** Pupils place rulers at the edges of the tables and tap the free end. Ask pupils the following questions. – "Can you hear any sound from the rulers?" – "What is making the sound? – "How do you describe the movement of the ruler?" **ACTIVITY 2:** 1. Sprinkle sand on the drum surface and ask a pupil to beat it. 2. Ask pupils to observe carefully the movement of the sand particles. 3. Guide pupils to compare the movement of the ruler and sand particle.	a drum rulers sand	**CORE POINT 1:** Rapid movement of an object back and forth is called vibration. Vibration produces sound. Vibration of the sand particles was caused by vibration of the drum surface. The vibration of drum surface produces sound.	Exe. Sound is produced by ( ).

Continued from the previous page.

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
		- compare the differences in sound produced such as, high pitched sound, low pitched sound, quality of sound and noise.	**ACTIVITY 3:** The use of bottle as musical instruments. 1. Pour different amounts of water in empty bottles. Bottles with different amount of water and air  2. Hit each bottle with a metal spoon and listen carefully to the sound each bottle makes.	empty bottles of soft drinks, straws, water and metal spoons	**CORE POINT 2:** 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. The smaller the amount of water, the larger the volume of air and the lower the pitch becomes. The larger the amount of water, the smaller the volume of air, the higher the pitch becomes.	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 ( ).

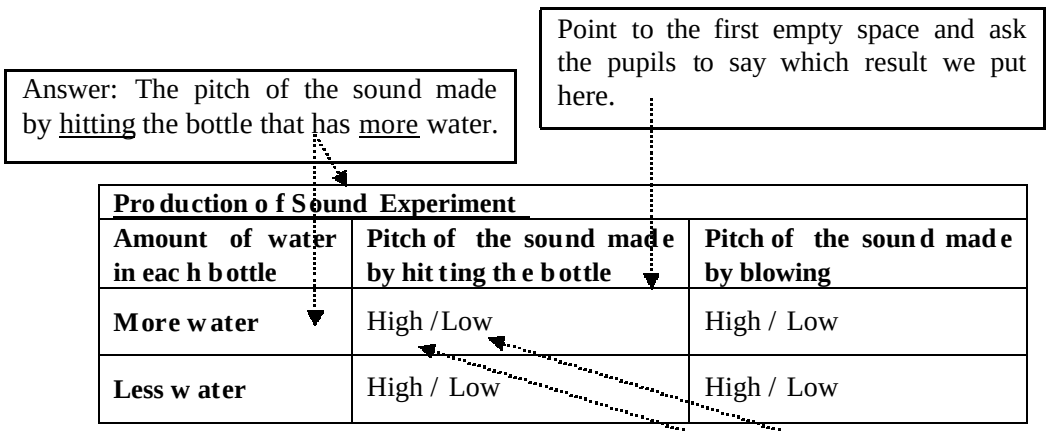
Continued from the previous page.

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
			ACTIVITY 4: 1. Put a straw near the mouth of the 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/by 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.	How do you make high pitched sound using empty bottles and water?

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."



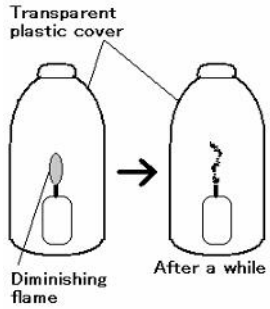
9. Ask the pupils to listen again to the sound made by each bottle and say whether the pitch of the sound made by hitting the bottle that has more water is high or low.
10. Repeat points 7 and 8 for each of the other spaces to complete the table.

Lesson 5: Primary 4 Properties of Air

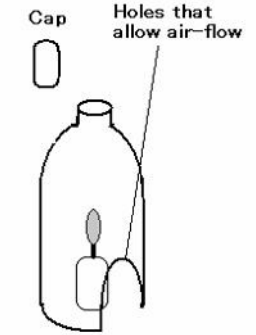
1. Lesson Plan

WEEDENDING :
SUBJECT: Integrated Science
CLASS: Primary 4

REFERENCES: 1. Primary School Integrated Science Syllabus p. 12
2. Primary Integrated Science Pupils' Book 4 (Wiredu, M.B., et al.) pp. 114-119

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K./ OBJECTIVES	TEACHING/ LEARNING MATERIALS TEACHER/LEARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
Thursday 3rd of May 2007 60 MINS	**TOPIC:** Air **SUB-TOPIC:** Properties of Air	**R.P.K.:** Pupils have learnt that air is around us and they have used fans. **OBJECTIVES:** By the end of the lesson, pupil will be able to: Show how air supports burning.	**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." **ACTIVITY 1:** 1. Divide the class into groups A and B each under a leader. 2. Let the pupils light candles and guess how they can keep the candles burning and also how they can stop it from burning without blowing it off with wind. 3. Give each group work cards containing instructions below. 4. Pupils light short candles. 5. Pupils cover lit candles with transparent plastic bottles and observe the result. 6. Pupils express their opinions on why the light went off when covered.  	Small and short candles, transparent covers (cut plastic bottles etc.)	**CORE POINT 1:** Air supports burning. Continuous supply of air keeps things burning.	**EXERCISE:** Why did the covered candles go off? Why did the candles with cut cover keep burning?

Continued from the previous page.

DAY/DATE/ DURATION	TOPIC/ SUB-TOPIC	R.P.K/ OBJECTIVES	TEACHING/ LEARNING MATERIALS TEACHER/L EARNER ACTIVITIES	TLMS	CORE POINTS	EVALUATION/ EXERCISE
			Pupils light second short ca ndles. 7. Pupils cover the lit candle with the cut cover and obs erve 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.	transpare nt covers with a side hole (cut plastic bottles etc.) fans, coal pots, charcoal	**CORE POINT 2:** Fire that receives more air burns hotter. **APPLICATION:** There are holes in box irons and lanterns to allow air into them to help burning.	What will you do if food on your coal pot is not cooking fast? Why did the fire in the coal pot for group 'A' burn hotter?

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–

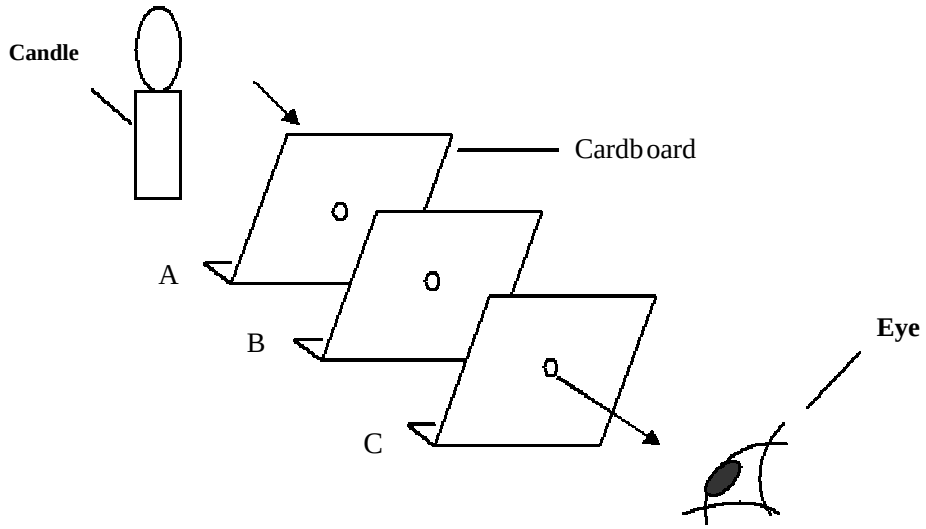
1. How Does Light Travel?

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 card board "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.

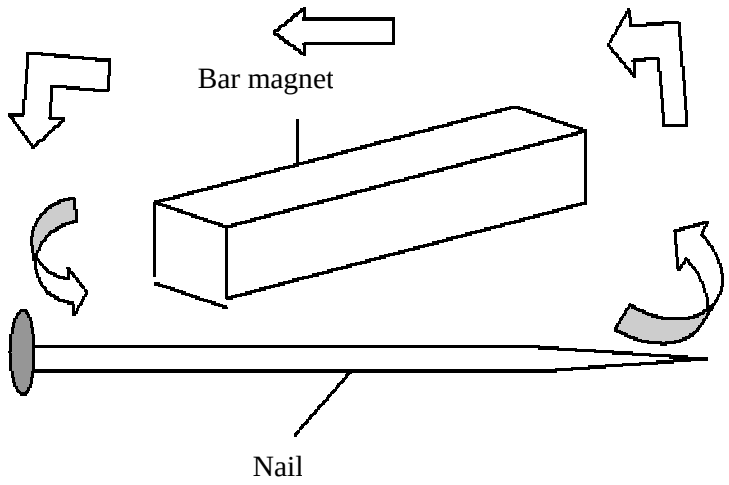
2. Making a Magnet

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 :



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 :

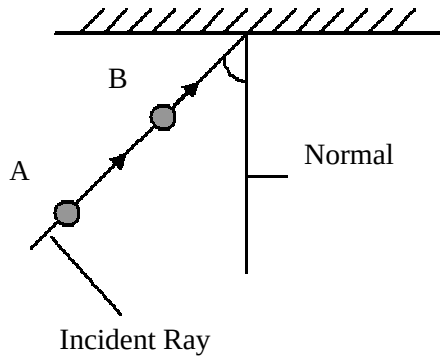


Fig. a

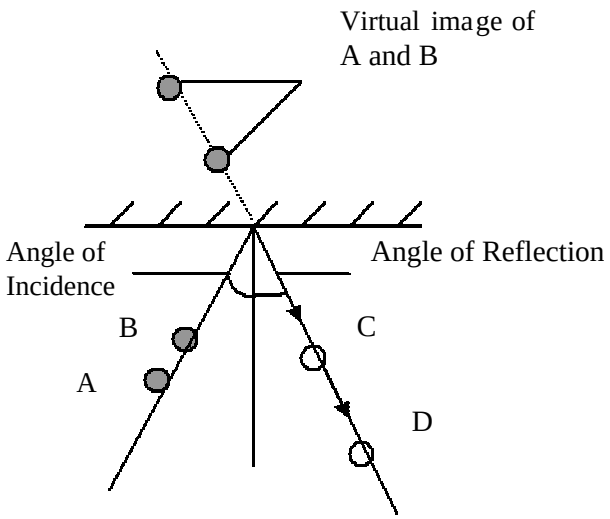


Fig. b

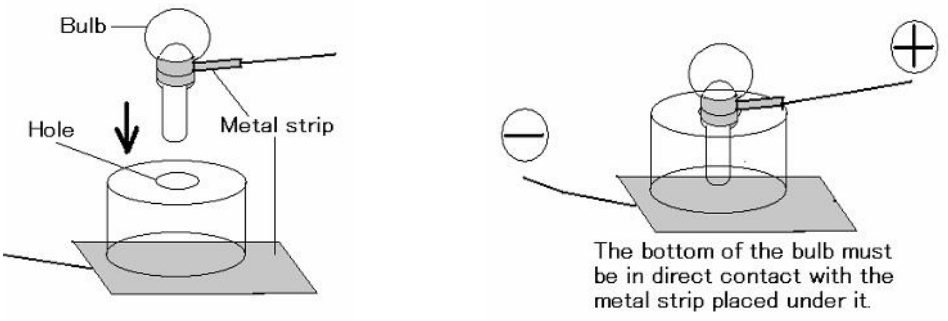
4. Simple Electrical Circuit Board

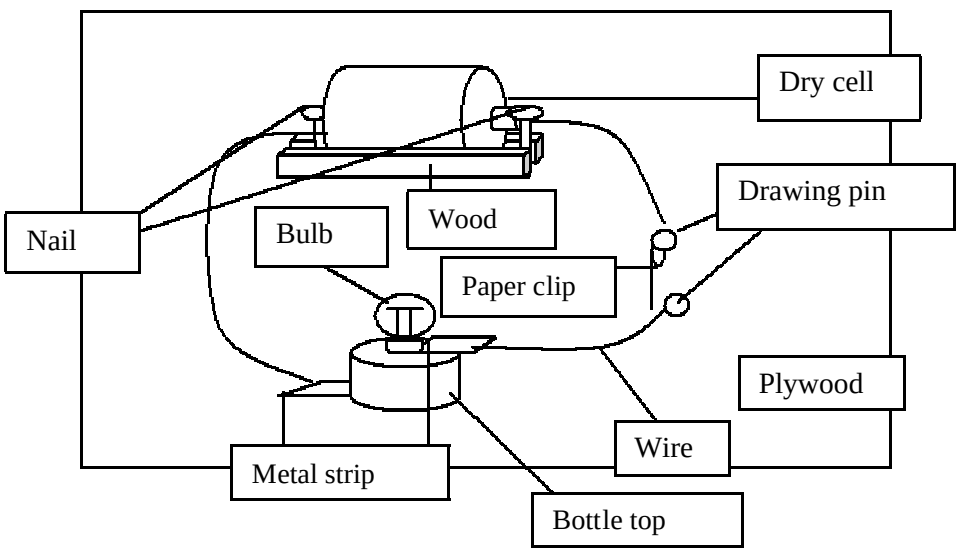
Materials: A piece of wo oden board (about 24cm by 24cm) , 2 pieces of wood (1cm by 1 cm) as dry cell holder, Aluminium foil and strips, Dry cell(s), Bottle tops/match box (any suitable material which could be used as a bulb holder), Paper clips, Drawing pins, Nails, Insulated copper wire, 1 torchlight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

Procedure:

1. Nail 2 pieces of woo d to the d rawing b oard in suc h a way that they hold the d ry cell(s) tightly in place.
2. Place the aluminium strips at two ends of the wo od making sure that they hold firmly the positive an d negative ends of the dry cell(s).
3. Make a hole in t he plastic bottle top.
4. Wind a metal strip (aluminium f oil or strips) round the base of the bulb referring to the diagrams.
5. Let the bulb sit on a nother piece of met al 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 en d of one of the wires t o the p ositive end of the dry cell(s) an d the en d of second wire to the negative end of the dry cell(s).
9. Nail the bottle top with the b ulb unto the board.
10. Use drawing pin s and paper clips to make a switch.
11. Connect the wires to ma ke a single circuit as sho wn in the diagram.

Diagrams:





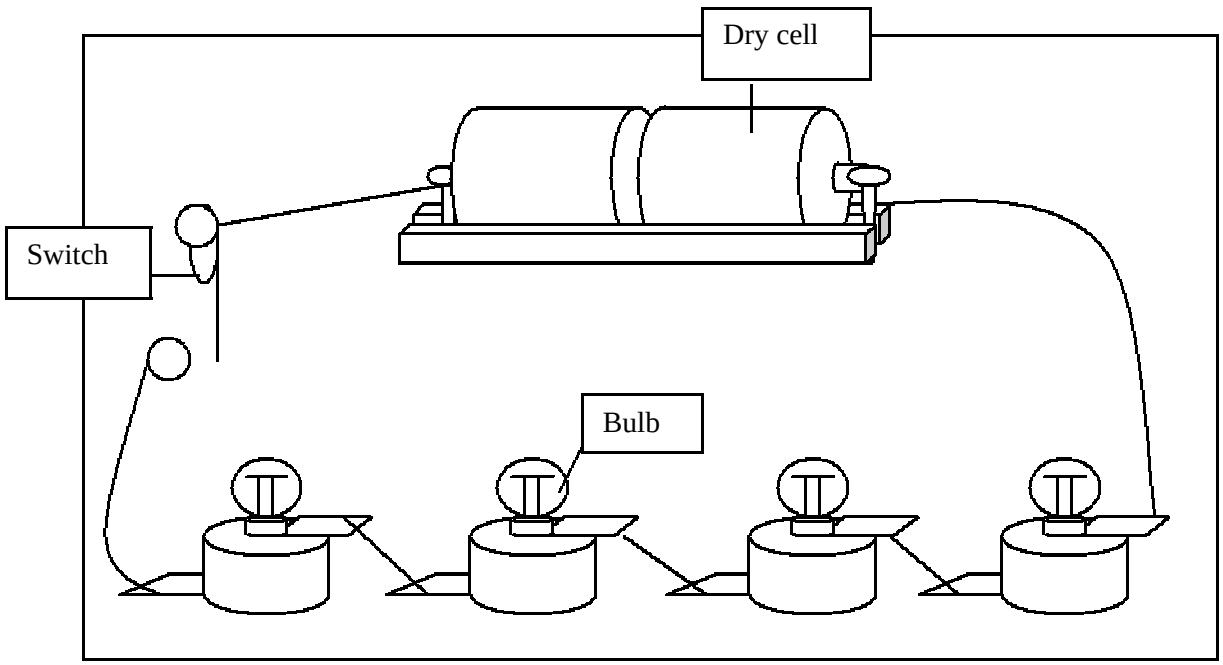
5. Electrical Circuits with Bulbs in Series

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 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. 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 :



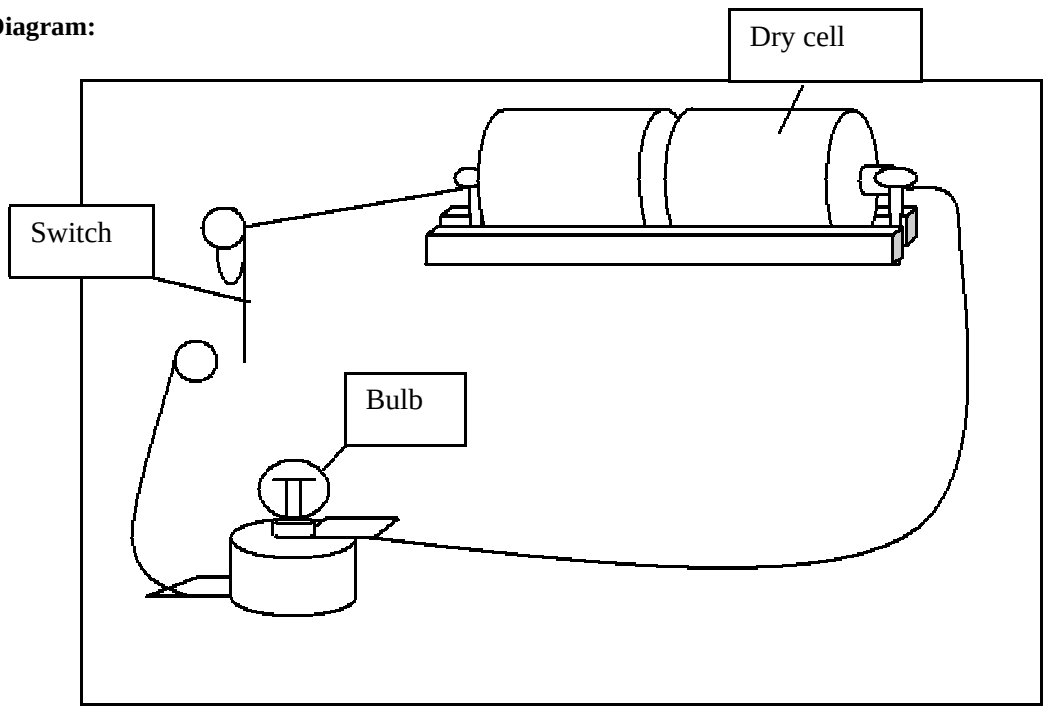
6. Electrical Circuits with Cells in Series

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:



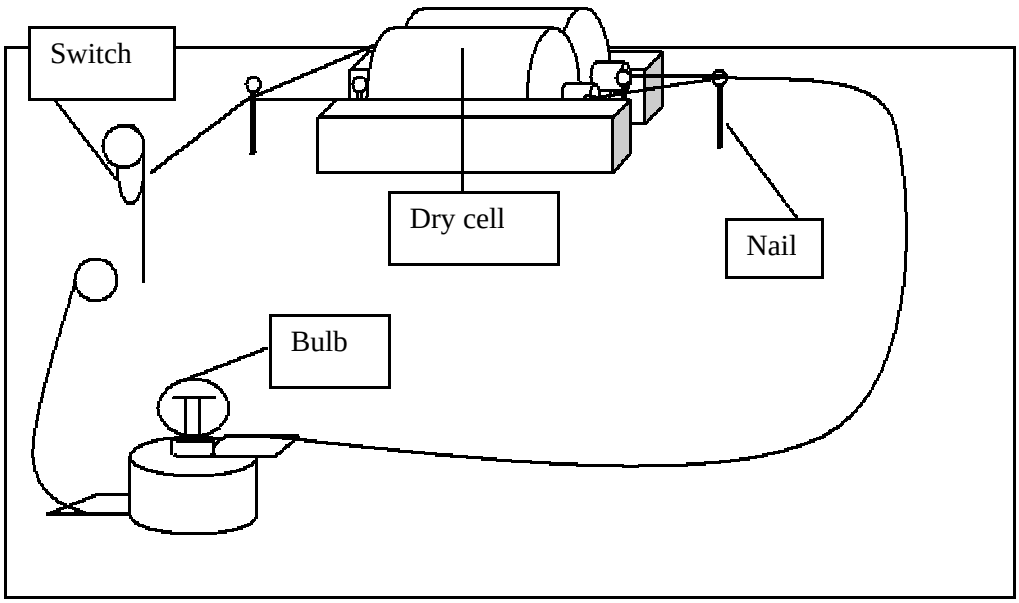
7. Electrical Circuits with Cells in Parallel

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 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 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:

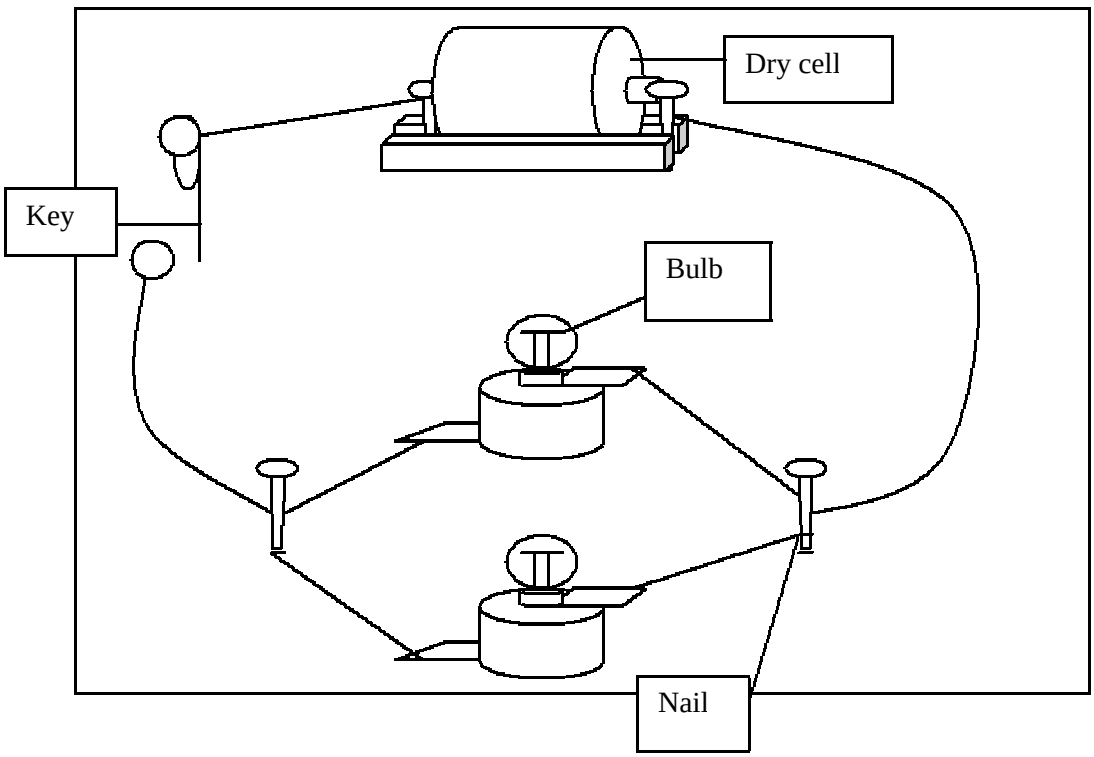


8. Electrical Circuits with Bulbs in Parallel

Materials: A piece of wo oden board (about 24cm by 24cm) , Pieces of w ood (1cm by 1 cm) as a battery holder, Aluminiu m foil and strips, Dry cell(s), 2 to 4 bottle tops/match boxes (any suitable materia l which could be used as a bulb holder), Paper clip, Drawing pins, Nails, Insulated cop per wire, 2 to 4 to rchlight bulbs

Pro cedure:

1. Nail 2 piec es of wood to the drawing board in such a way that they hold the dry cell(s) tightl y in place.
2. Place the aluminium strips at two ends of the wood making sure that they hold firmly the positive an d negative ends o f the dry cell(s).
3. Make a hole in t he plastic bottle top.
4. Wind a metal strip (aluminium foil or strip s) round the base o f the bulb.
5. Let the bulb sit on a nother piece of metal strip.
6. Connect one end of an insulated copper wire to the metal strip round the base of the bul b.
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 sec ond wire t o the negative end of the dry cell(s).
9. Nail the bottle top with the b ulb unto the board.
10. Use drawing pin s and paper clips to make a switch.
11. Connect the wires to ma ke a circuit o f bulbs in parallels as show n in t he diagram.



9. Earthquake Model –Movement of the Plates of the Earth-

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

Procedure:

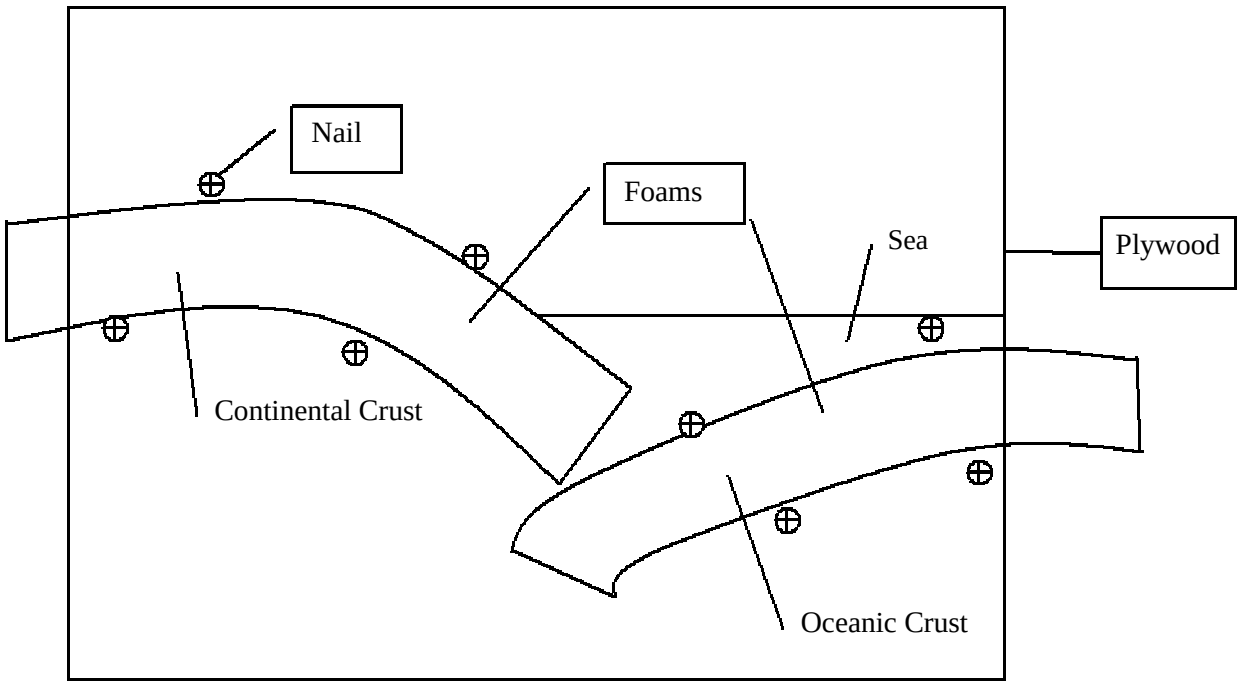
1. Cut the plywood into 80cm by 80cm size.
2. Cut the foam into two strips of dimensions: Length-50cm, Breadth-20cm, Height-20cm.
3. Fix nails into plywood as shown in the diagram.
4. Fix foam strips in between the nails such that the end of one strip is in contact with the end of the other as shown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

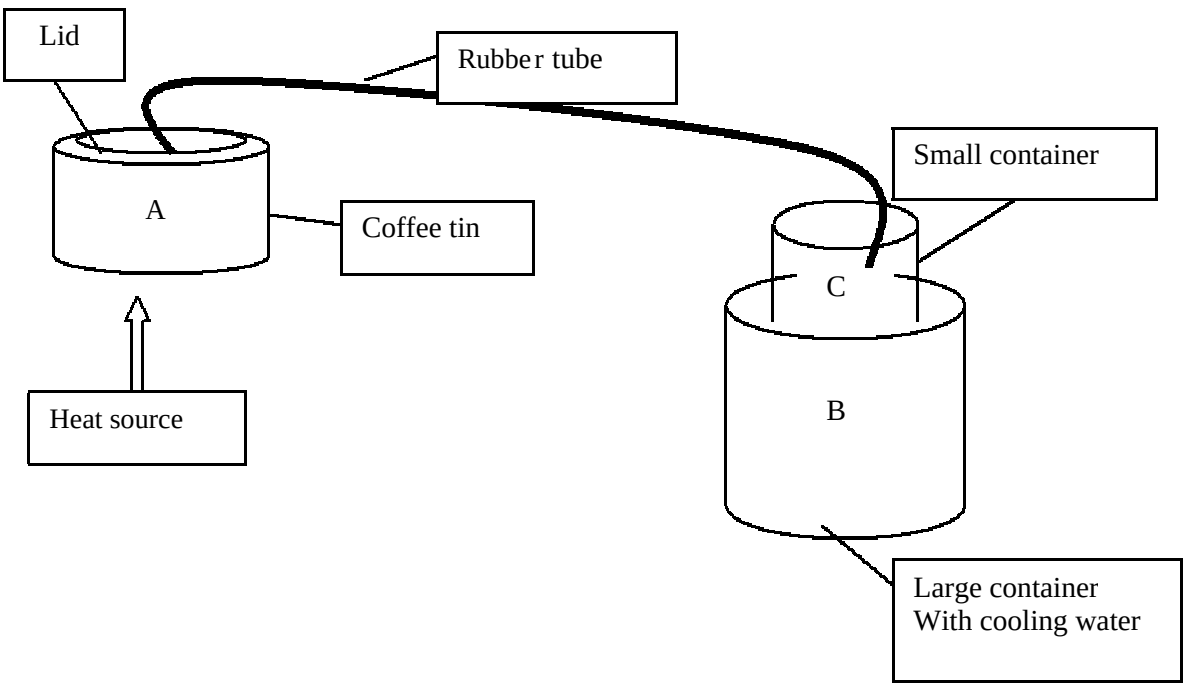
Materials: Empty coffee tins, Large Container, Small Container, Cold water, Rubber tubes of small diameter, Heating source

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 larger 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 $25cm^3$, 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 could 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 larger container "B".

Diagram:



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