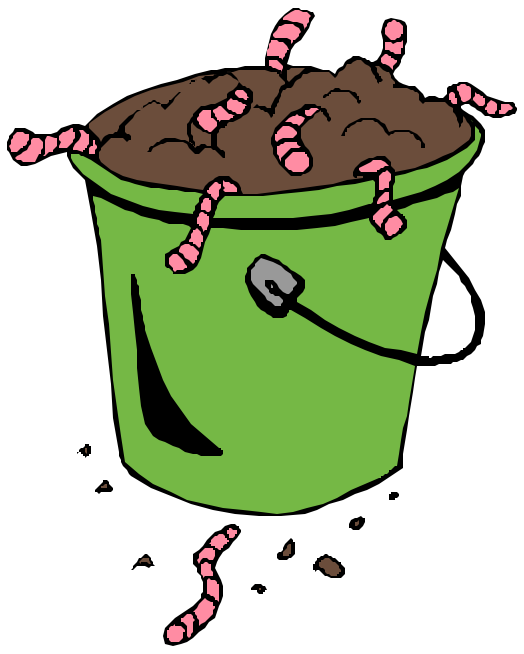
Soils



Teacher’s Notes

Ontario Science and Technology Curriculum 1999
Strand: Earth and Space Systems
Topic: Soils in the Environment
Grade: 3

Developed by T. Tasker

Overall Expectations:
- demonstrate an understanding of the similarities and differences between various soils and the effects of moving water on soils
- investigate the components of various soils, and describe the effects of moving water on these soils
- recognize the dependence of humans and other living things on soil and recognize its importance as a source of materials for making useful objects.
* All specific expectations are covered by this unit and are mentioned at the end of each activity with the exception of the following one which is covered by all activities.
ES8:plan investigations to answer some of these questions or find ways of meeting these needs, and explain the steps involved

Materials box	
- soil (from outside, that has a variety of components) - newspaper - magnifying glass - bucket of sand - bucket of clay - bucket of humus - bucket of rocks - bucket of loam (potting soil) - bucket of school yard soil (from the field) - bucket of playground soil - bucket of marsh soil - bucket of forest soil - bucket of beach soil - five funnels - cotton balls - graduated Cylinders - five jars with lids (1 L size)	- 250 ml measuring cup - two aluminum loaf pans - bean seeds - text books - kitty litter box - 2 L clear pop container with the top cut off - dead leaves - 2 worms - black construction paper - tape - Magic School Bus Meets the Rot Squad video tape (© Scholastic Inc, 2001) - The Magic School Bus Inside the Earth by Joanna Cole and Bruce Degen (ISBN 0-590-40760-0) - fimo - crayola white clay - clay

Dear Parent or Guardian,

We are beginning our next Science and Technology Unit, Earth and Spaces Systems, Soils in the Environment. By the end of this unit, your child will:

- demonstrate an understanding of the similarities and differences between various soils and the effects of moving water on soils
- investigate the components of various soils, and describe the effects of moving water on these soils
- recognize the dependence of humans and other living things on soil and recognize its importance as a source of materials for making useful objects.

As outlined in the Science and Technology Curriculum, Ministry of Education , 1999.

Home Links:

To help your child further their understanding in this science unit, here are some fun activities for you and your family.

- when watering the garden, spray the water on different surfaces (asphalt, soil or grass) and see what happens.
- go to the beach and build sand castles
- when in the garden take a closer look at the soil
- when pulling weeds take a closer look at the roots
- create a compost heap for the family

Happy Adventures,

Soils in the Environment
Our New Science Words

Grade 3 ES9:use appropriate vocabulary in describing their investigations, explorations, and observations (eg. use terms such as clay, sand, and pebbles to describe the earth materials in soil).

Soils in the Environment
Soil is not Dirt

Dirt is something you wash from your hands. Soil is ALIVE. Soil is a mixture of living material and nonliving material.

****The best soil for this is spring soil dug from a backyard. Make sure it has pebbles, some dead leaves, sticks etc. in it.****

Purpose: *To find the components of soil.*

Materials:
1) a handful of soil
2) newspaper
3) magnifying glass
4) a partner

Method:
1) Find a partner.
2) Have one partner get a piece of newspaper and one partner get a handful of soil.
3) Place the soil on top of the newspaper.
4) Spread it out, pick it apart and look at it.

I spy with my little eye . . .

Describe what you saw . . .

_____

_____

_____

_____

Grade 3 ESactivity001 covers:
ES1:describe, using their observations the various components within a sample of soil (eg. pebbles, decaying plants)

Soils in the Environment
The Components of Soil

**** Put a list of texture words, scent words and colour words up on the blackboard. You may want your students to brainstorm these words with you.****

Materials:
1) a bucket of sand
2) a bucket of clay
3) a bucket of humus
4) a bucket of rocks
5) a bucket of loam

Method:
1) There will be five stations. There will be one bucket at each station. You will start at your home station, then travel clockwise to the next station as directed by the teacher. Your group has 5 minutes at each station.
2) At each station fill out the chart below.

Component	Describe the texture	Describe the smell	Describe the colour	Where would you find this component?
Sand				*beaches*
Clay				*near springs or river beds*
Humus				*compost*
Rock				*mountains*
Loam				*the perfect soil, regularly found on farms!*

Let's write down some definitions.
HUMUS: *The living materials in soil.*
LOAM: *A type of soil made up of equal amounts of sand, silt (a fine rocky substance) and clay. It is usually sold as potting soil at gardening centres.*

Soils from around Our Community

Materials:
1) a bucket of school yard soil
2) a bucket of playground soil
3) a bucket of marsh soil
4) a bucket of forest soil
5) a bucket of beach soil

Method:
1) There will be five stations. There will be one bucket at each station. You will start at your home station, then travel clockwise to the next station as directed by the teacher. Your group has 5 minutes at each station.
2) At each station fill out the chart below.

Component	Describe the texture	Describe the smell	Describe the colour	What is the major component of this soil?
School yard soil				
Playground soil				
Marsh soil				
Forest soil				
Beach Soil				

Grade 3 ESactivity002 covers:
ES2:describe, using their observations, the differences between sand, clay, humus, and other soil components (eg. texture, smell, malleability), and compare and describe soil samples from different locations (eg. school yard, forest, marsh, beach)

Soils in the Environment
Shake 'em up

Purpose: *To separate the components of our community soils.*

Materials:
1) 250 ml of school yard soil
2) 250 ml of playground soil
3) 250 ml of marsh soil
4) 250 ml of forest soil
5) 250 ml of beach soil
6) 5 1L jars with lids

Method:
1) Make sure each jar is clearly labelled.
2) Add 500 ml of water to each jar of soil.
3) Shake each jar of soil really well.
4) Let the jar settle overnight.

The soils will settle into layers. Make a prediction, order the components from top (1) to bottom (7).

Component	clay	sand	gravel	humus	silt	rocks
Order	*2*	*4*	*5*	*1*	*3*	*6*

The next day . . . complete the chart.

School yard soil	Playground soil	Marsh soil	Forest soil	Beach soil
Name the components	Name the components	Name the components	Name the components	Name the components

Grade 3 ESactivity003 covers:
ES6:describe through experimentation how soil can be separated into its different components (eg. sieving, sedimentation)
ES11:communicate the procedures and results of investigations for specific purposes and to specific audiences, using drawings, demonstrations, simple media works, and oral and written descriptions (eg. record what happens when soil and water are shaken together in a container; prepare a display comparing the composition of soils from different locations)

Soils in the Environment
Water Absorption

Purpose: *To find out which soil component is the most absorbent.*

Materials:
1) five funnels
2) five cotton balls
3) sand
4) clay
5) rocks
6) humus
7) five graduated cylinders
8) 250 ml cup

Method:
1) Place a cotton ball in the bottom of each funnel.
2) Place each soil into a different funnel.
3) Place the funnels over the graduated cylinders.
4) Pour 250 ml of water into each funnel.
5) Using the graduated cylinder, measure the volume of water that is not absorbed by the component of soil.
6) Record the results in the chart below.

Component	Sand	Clay	Rock	Humus
Volume of water not absorbed (ml)				

Which component was the most absorbent?_____

Which component was the least absorbent?_____

If you owned a farm, which component would you want the most of in your soil?

_____

Why?_____

What component would you build castles with?_____

What component would you build pottery with?_____

What lasts longer, castles or pottery?_____

Grade 3 ESactivity004 covers:
ES3:compare the absorption of water by different earth materials, and describe the effects of moisture on characteristics of the materials (eg. on texture, coherence, ability to hold a shape).
ES10: record relevant observations, findings, and measurements, using written language, charts, and drawings (eg. create a tally chart to record the water absorption of different earth materials)

Soils in the Environment
Will it grow?

Purpose: *To find out what kind of soil plants prefer.*

Materials:
1) two loaf pans
2) bean seeds
3) loam (potting soil)
4) sand
5) water

Method:
1) Fill one loaf pan with sand.
2) Fill the other loaf pan with loam.
3) Plant the bean seeds.
4) Put the pans in a sunny place and water them regularly.

Let's make a prediction:
Which soil do you think the bean seeds will prefer?_____

Why?_____

Our Growth Log: Draw what each plant looks like.

DAY	2	4	6	8
Sandy Soil				
Loam Soil				

Which soil was better for bean growth?_____

What kind of soil would a cactus prefer?_____

Do you think different kinds of plants prefer different kinds of soil?_____

Grade 3 ESactivity005 covers:
ES14:recognize the importance of understanding different types of soil and their characteristics (eg. enables people to determine which crops can be grown in a particular area; enables gardeners and farmers to improve plant growth)
ES15:describe how the use of different soils affects the growth of indoor plants.

Soils in the Environment
Erosion

Let's write down the definition of erosion:
Erosion is the slow wearing, washing or eating away of soil.

Purpose: *To find out which soil component erodes the most.*

Materials:
1) text books
2) kitty Litter Box
3) sand
4) clay
5) rocks
6) humus
7) water

Method:
1) Place the textbooks in a pile.
2) Place one end of the kitty litter box on top of the text books so that it is on a slant.
3) Place one of the soil components into the kitty litter box.
4) From the top pour, water over the soil component.
5) Observe what happens.

From your observations place the soil components in order of eroding the most to eroding the least on your special notepad below.

_____

_____

_____

_____

Show and Tell

Look at these two pieces of glass. One is sharp, jagged, and clear, the other is frosted and smooth. What happened to the second one ?
It was washed over with sand and water.

Grade 3 ESactivity006 covers:
ES4:describe using their observations how different earth materials (rocks, pebbles, sand) are affected by moving water (eg. sand on a beach washed by waves; pebbles in a river)
ES7:ask questions about organisms and events in the outdoor environment and identify needs of organisms that arise from these events, and explore possible answers to these questions and ways of meeting these needs (eg. investigate the different effects produced when water is sprayed on and poured on exposed soil, asphalt, and grass)

Soils in the Environment
Underground Animals

As a class let's make a list of all the animals that live underground. Write the list down on your special notepad below:

ants, bees, gophers, moles, snails, toads, turtles, worms, badgers, foxes, rabbits, bacteria, fungi, insects . . .

Farmers and gardeners use worms to help them determine the health of their soil. If the earth worm is dark in colour it means that the soil is healthy and fertile. If the worm is pale in colour it means the soil has too much water or not enough nutrients. Worms also dig and mix the soil and their tunnels keep the soil airy and create passages for rainwater.

Let's build a wormery!

Materials:
1) a clear 2L pop container with the top cut off
2) soil
3) sand
4) dead leaves
5) two worms
6) a large piece of black construction paper
7) tape

Method:
1) Place a layer of soil in the 2L container and spray it with water, then add a layer of sand and spray with water again.. Repeat this until the container is 3/4 full.
2) Place the worms in the container.
3) Place the dead leaves on top.
4) With the large piece of construction paper and tape make a cylinder that will fit around the wormery.
5) Keep the wormery moist and dark.
6) Take a peek in a few days to see what is happening.
7) Draw a picture of what we made:

Grade 3 ESactivity007 covers:
ES12:identify living things found in the soil (eg. roots, earthworms, larvae)

Soils in the Environment
Looking at our Roots

****The root-view can be purchased from Scholastic Canada OR you can make one using a three-sided box and clear plastic. You have to keep the plastic covered when not peeking at the roots so that they grow normally (in the dark).****

Let's take a peek at the roots in our root-view farm. We have carrots and beans.

What kind of root system does a carrot have? *Tap root system*

What kind of root system does a bean plant have? *Fibrous root system*

Let's draw the two kinds of roots in the chart below.

A carrot has a *tap* root system.	A bean plant has a *fibrous* root system.

Grade 3 ESactivity008 covers:
ES5: compare different ways in which plant roots (eg. fibrous roots, tap roots) grow through the soil.

Soils in the Environment
The Rot Squad

As a class let's watch The Magic School Bus Meets The Rot Squad
(© Scholastic Inc., 2001)
****The book could be read in addition to or as a substitute for the video.****
Let's write the definition of decompose:
To rot or decay.

Why would someone have a compost in their back yard?
A compost is where food scraps and dead plants can decompose. This decomposition creates humus, which can be used in a garden to ensure fertile soil for the plants.

What is another good reason for having a compost heap at home?
It decreases the amount of garbage that goes to the garbage dump.

Draw a picture of what you would put in a compost heap . . .

Why would someone leave grass clippings on the lawn?
The bits of grass decompose adding nutrients to the soil for growing grass.

Grade 3 ESactivity009 covers:
ES13:demonstrate awareness of the importance of recycling organic materials in soils (eg. explain the purpose of a compost heap; explain the reason why it is useful to leave grass clippings on the lawn)

Soils in the Environment
Soil in Useful Ways

Fimo is excellent for making beads and little statues; however, tends to be expensive. The new Crayola white clay is great for masks.

As a class let's read The Magic School Bus: Inside the Earth by Joanna Cole and Bruce Degen.

Materials:
1) fimo
2) crayola white clay
3) clay

Method:
1) Choose one type of material to work with.
2) Use your imagination to make something useful and creative. Some ideas include; beads, pottery, masks and statues.

Draw your creation here:

ESactivity010 covers:
ES16:describe ways of using soil materials to make useful objects, and investigate, through manipulation, ways of shaping clay to make useful objects (eg. model bricks or beads)

Soil Certificate

This certificate hereby certifies

_____

as a Grade 3 Soil expert.

_____ _____

Principal Teacher

Share
your science booklet with at least one family member at home. After you have shared complete the following:

1) Cut out your Soil Certificate.
2) Get the person you shared your science booklet with to fill out the form below, detach it and bring it back to school.

C.....

_____ shared their science booklet with the following family members:

_____

Parent's Signature