

## Make your own soil

### Investigating the type and origin of the ingredients of soil

Mix together some gravel, sand, powdered clay, dry compost (to represent humus\*) and decayed, crumbled, dry leaves (to represent litter\*). Mix enough for small groups of children to have one small bowlful each.

#### Ask the pupils to:-

- use magnifiers to identify all the ingredients of the mixture. Ask one child in each group to record the results
- use rulers to measure each of the ingredients
  - gravel should be above 2 mm (long axis)
  - sand (1 - 2mm)
  - clay less than 1mm
  - compost - variable
  - dry leaves - variable
- add a tablespoon of water to their mixture and stir it up
- suggest what their mixture might be  
*Hopefully, they will say soil*
- suggest what is missing from their soil mixture  
*Answers should include small creatures, worms, bacteria, fungi etc*
- suggest what could make two soils different  
*Soils would be different depending on the quantities of the ingredients above and on the type of litter and the type of rock grains.*

#### Introduce correct terminology\*

- litter is the name used for dead plant material  
- humus is decomposed litter and animal remains; decomposition occurs from the action of bacteria, fungi and small animals.

The pupils now know that the organic ingredients of their soil are litter, humus and living things.

**Now ask the pupils** to suggest where the gravel, sand and powdered clay come from.  
*They all come from broken down (weathered) rock which is beneath the soil.*

#### Finale

Put all the ingredients for making the soil on to the table in front of you. Invite the pupils to contribute as you make soil in front of them. Any debate about 'how much to use' leads on to further discussions about the make-up of different soils.



The ingredients for 'Make your own soil'  
Photo: Elizabeth Devon

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#### The back up

**Title:** Make your own soil

**Subtitle:** Investigating the type and origin of the ingredients of soil

**Topic:** This activity can be used in any lesson about the environment, rocks and landscape, agriculture, gardening or investigations out of doors.

**Age range of pupils:** 6 - 12 years

**Time needed to complete activity:** 20 minutes

**Pupil learning outcomes:** Pupils can:

- use magnifiers to look carefully and identify the ingredients of their mixtures;

- use rulers to measure small and very small grains;
- record their results;
- realise that all soils are made up of similar ingredients;
- appreciate that those ingredients may vary in quantity and type.

#### Context:

Soil is a mixture of rock grains and decayed plant matter (litter). Bacteria and fungi are essential to decompose this litter. The most productive soils usually have 45% mineral particles, 25% air, 25% water, 5% humus. Humus is decayed litter and animal debris decomposed by bacteria, small creatures and worms. Soils vary with different types of underlying rock and different vegetation types.

**Following up the activity:**

- If litmus paper is available, pupils could mix a dessert spoonful of soil with a little distilled water. A piece of litmus paper dipped into the mixture will indicate whether the soil is acid, neutral or alkaline.
- They could try the following Earthlearningideas:-  
Soil doughnuts,  
Soil layers puzzle,  
Permeability of soils - 'The great soil race'.  
Why does soil get washed away?  
Darwin's 'big soil idea' (make your own wormery).
- The ingredients in the soils around the school or from a garden could be investigated.

**Note:** Pupils should wear disposable plastic gloves if these are available, or take care to wash their hands carefully after handling soils.

**Underlying principles:**

- Rock weathers by physical and chemical processes and the broken pieces form the inorganic component of soils.
- Litter, (decayed plant matter) and humus, (decomposed litter and animal remains) comprise the organic components of soils.
- Soils can be acid, alkaline or neutral, measured on a pH scale. Acid soils give pH readings of below pH 6, alkaline soils of above pH 7 and neutral soils have a reading of pH 6 - 7.
- Sandstone weathers to give a sandy soil which usually results in an acid pH and so is suitable for acid-loving plants, such as heathers.
- Limestone weathers to give a lime-rich soil which has an alkaline pH, encouraging alkaline-loving plants such as brassicas (cabbage family).
- Bacteria and fungi are essential in the decomposition of plant and animal matter.

- Worms are important in mixing litter, humus and rock particles and in aerating soils, thus allowing water to percolate into the soil.

**Thinking skill development:**

By looking carefully at a variety of soils, pupils will realise that there is a pattern in their composition. Discussion within the group involves metacognition. Relating their own mixture of ingredients to real soils involves bridging.

**Resource list:**

- gravel, sand, powdered clay, humus, decayed, crumbled, dry leaves - all in separate containers
- magnifiers
- paper and pencils
- rulers
- jug of water
- tablespoons
- if available, disposable plastic gloves for any work with real soils

**Useful links:** Soil-net <http://www.soil-net.com>

'Working with Soil' - activity pack and booklet (Waldorf the Worm ISBN 873266 16 2), ESTA Primary Committee, Earth Science Teachers' Association, 2003.

**Source:**

Elizabeth Devon, Earthlearningidea team

**The progression of thinking skills shown by the Earthlearningidea 'Soils' activities**

Earthlearningidea	Strategies and skills development
Make your own soil: investigating type and origin of the ingredients of soil.	Pupils discover the ingredients of soil. The ingredients can be varied to make different soils.
Soil doughnuts: sorting out soils.	By experimenting with different soils, pupils discover that different soils have different properties depending on their ingredients.
Soil layers puzzle: make your own soil profile and investigate others.	Pupils now realise that other factors apart from ingredients, affect soil types.
Permeability of soils - 'The great soil race': investigating the properties of different soils by pouring water on them.	Different soils have different permeability.
Why does soil get washed away? - investigating why some farmers lose their soil through erosion whilst others do not.	The essential minerals in soils can be easily eroded. Pupils become aware of this and can suggest remedies.
Darwin's 'big soil idea': can you work out how Charles Darwin 'discovered' how soil formed?	Pupils discover for themselves how a great scientist formed his ideas about soils.

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