

Is there life in this soil sample? Questions to consolidate pupil understanding of soil-formation

Show the students samples of fresh soil, this could be as part of some of the Earthlearningidea soil-based activities such as 'Make your own soil', shown in the photographs. Then consolidate the soil understanding of your pupils by asking these questions:

Q. Is there life (anything living) in this soil sample?

A. *Yes there is. If the soil is newly collected there will be small living animals in the soil and maybe rootlets and seeds. Both new and old soil samples will retain living bacteria, even if the soil has become dry. Larger new soil samples may contain earthworms.*

Q. How could you test the soil to show that it does contain life?

A. *Add some of the soil to a sterile growth medium on an agar plate in a petri dish; tape the top and bottom dish together with a short piece of tape on either side, to allow air to circulate but keep out microorganisms, and leave it for a few days, until the growth of the microorganisms begins to show – these must have come originally from the soil (for safety, ensure nobody opens the dish after the microorganisms have grown, but it is disposed of carefully). You could also put the soil in a pot and leave it for long enough for the seeds to grow.*

Q. Is there anything in this soil sample that once was alive but now is no longer living (it is dead)?

A. *All soils contain decomposing litter and humus from dead plant and animal material. The definition of a soil is a natural material formed of rock/mineral fragments, humus and litter, with water and air.*

Q. How could you test the soil to show that it does contain dead material?

A. *You could dry the soil to remove any water, by warming it at less than 100°C (e.g. over a beaker of boiling water) and then weigh it (the soil becomes paler as it dries out). Then you could then put it on a metal dish and heat it strongly with a burner to decompose any plant or animal material, and then re-weigh it. The decrease in mass would show that something in the soil had broken down by strong heating and gas had been lost – this is most likely to be organic material.*

Q. Could the soil sample grow new life?

A. *Even old soil samples will contribute to the germination and growth of new plants.*

Q. How could you test the soil to show that it would grow new life?

A. *Plant some seeds of your own in the soil and watch them grow over days and weeks.*



The 'Make your own soil' Earthlearningidea. (Elizabeth Devon).



The 'Soil water shake test' Earthlearningidea. (Peter Kennett).



Photos: Elizabeth Devon

The 'Soil doughnuts' Earthlearningidea.



The 'Great soil race' Earthlearningidea. (Peter Kennett).

The back up

Title: Is there life in this soil sample?

Subtitle: Questions to consolidate pupil understanding of soil-formation

Topic: Help pupils to build their understanding of soil through a question and answer exercise.

Age range of pupils: 5 years upwards

Time needed to complete activity: 10 minutes

Pupil learning outcomes: Pupils can:

- explain that key components of soil contain both living and ex-living things;
- realise that without the organic litter and humus, the inorganic weathered material can no longer be called soil.

Context:

Soil often looks like a non-living substance that simply covers many parts of the Earth's surface. However, pupils should be aware that if soil did not contain living material (alive and/or dead) it would no longer be soil, but would just be part of the weathered rock material found on the surface where no obvious life is present. Such non-soil debris is called regolith, as found on mountain tops and polar regions on Earth and also on the Moon or planets like Mars.



Regolith (non-soil surface material) photographed by the Mars exploration rover, 'Spirit'.

This image is in the public domain because it came from NASA.

Following up the activity:

Ask the pupils to suggest other tests to find out what soil is made of. These might include the 'soil water shake test' Earthlearningidea, or drying, crumbling and sieving the soil to find materials of different grain sizes. Soils can be tested for their acidity (pH) to show if compounds making the soil acid or alkaline are present.

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.
- 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
- Living material is a key component of soil, both still living and dead and decomposing material. Without living material, soil is no longer called soil.

Thinking skill development:

Visualising what microscopic life soil might contain requires abstract thinking skills. Planning the tests to carry out needs skills of construction and prediction and may encounter cognitive conflict.

Resource list:

- samples of soil or the materials necessary for soil-based Earthlearningideas (Note: soils should be handled with protective rubber gloves)

Useful links:

- Earthlearningideas:-
 - Make your own soil
 - Permeability of soils: the great soil race'
 - Soil doughnuts
 - Soil layers puzzle
 - Why does soil get washed away?
 - Darwin's 'big soil idea'
- Soil-net at: <http://www.soil-net.com>
- US Department of Agriculture – educational materials about soils for teachers at: <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/edu/>

Source: Devised by Chris King of the Earthlearningidea Team. Thanks to Margaret Grimster for very helpful comments.

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