Grade 5
Example for Place-Based Learning

GRADE 5
Big Ideas for Science

B BIOLOGY

Multicellular organisms have organ systems that enable them to survive and interact within their environment.

C CHEMISTRY

Solutions are homogeneous mixtures.

P PHYSICS

Machines are devices that transfer force and energy.

E EARTH SCIENCES

Earth materials change as they move through the rock cycle and can be used as natural resources.

HCTF Education

In this Example, local soil is the thread: for investigating the rock cycle E, using plants and common soil animals for investigation of multicellular organisms and organ systems B, using sand and water mixtures as a connection into solutions as homogeneous solutions C, to looking at simple machines used in gardening including First People's tools using simple machines. P.

PLACE: Dirt - in the school garden, school yard, road bank or streambank (where the soil layers are exposed).
Note of Caution: if at a road bank, ensure safety.

---

1 Experience Place

TONE: open-minded, unburdened, curious, playful
Visit, experience, observe, wonder

Offer a diversity of tools for students to choose from, such as: trowels or diggers, soil thermometers, soil probes, sieves, sticks, paper plates or flat container, and eye loupes (magnifiers). Provide guidelines for student exploration including care of fragile tools, and the need to dig with care and consideration of living things. For example: if digging where there is vegetation be careful of roots. Explore soil with the senses (omit taste).

As investigations are underway, when checking in with the groups, if prompts are needed to assist in explorations, consider the following list:

- Explore a range of places for dirt - vegetated, unvegetated, garden, natural landscape
- Get tactile with the dirt, run it between the fingers to get a sense of how it feels - smooth, gritty, silky
- Smell the dirt
- Explore the different colours of dirt
- Notice what is in the dirt (rocks, sticks, litter)
- Look for signs of life in the soil (animal and plant)
- Try digging with something found in nature

2 Questioning and Predicting

TONE: more focused, curious, reflective

B Can the animals in the soil sense the light and dark? Do they prefer wet, moist or dry soil, hot, cool, cold? What about plants? Their roots? How do they use the soil?

C What happens when dirt is mixed with water? What happens when sugar is mixed with water?

E What causes the soil to feel different or have different textures? Where does soil come from? How is it formed? What is soil? What do the layers mean? Why are there different sizes of material? (Make use of HCTF's Digging Deeper - Lesson, *http://hctfeducation.ca/lessons/earth-ecosystems-and-ecology/* to get the dirt on soil.)

P How would First People's have worked the ground? They gathered roots and clams for food. What would they have used? What First people's tools from the past used simple machines to transfer force and energy? What equipment in the gardens uses simple machines (levers, pulleys, wedges, inclined plane, wheel and axel)?

3 Planning and Conducting

TONE: creative, restrained, calculating, collaborative

B Having discovered some animals in the soil, design and carry out experiments to test their sensitivity to changes in environmental conditions. Pill bugs, slugs, and earthworms are all good contenders for gentle experiments to test their responsiveness.

C Design and carry out a simple experiment to test predictions (hypotheses) about mixing soil and water and sugar and water.

Homogeneous = looks uniformly the same, and there is only one phase of material. Heterogeneous = does not look the same, i.e., mixed salad, or assorted candies in a bowl, and the different materials can be separated out, and/or the mixture may contain two different phases, i.e., sand and water.

E HCTF's Digging Deeper, *http://hctfeducation.ca/lessons/earth-ecosystems-and-ecology/*. The Soil Profile Worksheet is particularly engaging and hands-on.

P **1)** Create a design for your personal garden tool (lever/digger) with natural materials. For information on First People's technology see "Science First People's Teacher Resource Guide" Grades 5 to 9, Unit 3 Part 2, Tools From the Land *(www.fnesc.ca)*.

2) Study equipment used in the garden looking for simple machines.

4 Processing and analyzing data and information

TONE: observant, methodical

B Record observations on a 3 column table: stimulus, a check mark for whether there was a response from the animal (X if not), and if yes, what the behaviour was. Write one or more questions generated from the observed results.

C Record your results and focus in with a series of new questions.

E Record soil observations of Digging Deeper Activity in table format. Notice differences and similarities between the different soil horizons (where possible). Tabulate information from different soil sources on the Digging Deeper Conclusion Sheet.

P Test out your simple machine in terms of its power or strength capacity. Create parameters to test your tool. Build your tool and test its effectiveness.

5 Evaluating

TONE: discerning, reflective, interdependent, collaborative

B Watch The Nature of Things 45 min. film Smarty Plants to get a sense of the organs in plants sensing their environment and discuss how this relates your findings with soil animals. *http://www.cbc.ca/player/play/2213659300*

C Share and collaborate results among groups/class. Research homogeneous and heterogeneous mixtures, and solutions. What is soil under this classification?

Sugar dissolves in the water - all the molecules mix in and are evenly distributed, becoming a homogeneous mixture. Sand can be separated out from water, it sinks to the bottom, does not form together with water into a new material and so is a heterogeneous mixture. Both are mixtures, only the sugar/water is a solution. Soil is a heterogenous mixture.

E Refer to Digging Deeper Soil Data Tables to evaluate the kind of soil sampled. Be clear on the mineral components of soil: sand, silt, &/or clay - all as earth materials transformed in the rock cycle.

P Share their personal tools. Dialogue on the building of them and their use. Reflect on the energy used to build them and the work they do. Reflect on First People's sophisticated technologies as a demonstration of their understanding and use of the science principles of transformation of power and energy and their force effect.

6 Applying and Innovating

TONE: creative, open-minded, interconnected, engaging

B What can be learned from bugs and plants about their sensitivity and response to their local environment and how is this similar to more complex organisms like us? How do we sense our environment and respond to it? What internal systems allow us to respond to external stimuli? What are our organ systems?

C Create lists of homogeneous mixtures and solutions, and heterogeneous mixtures of familiar materials. Use these lists to create an infographic to express the variety of mixtures and solutions and their uses. (An Infographic is a graphic visual representation of information, data or knowledge intended to present information quickly and clearly.)

Common homogeneous mixtures include: air, vinegar, and dishwasher liquid. Common heterogeneous mixtures include an ice cube in water, sand and water. What is a solution? A simple solution is basically two substances mixed evenly together.)

E Choose one of your favourite foods; identify it as a homogeneous or heterogeneous mixture, if is it a solution express as homogeneous or heterogeneous; draw a diagram tracing your favourite food back to the soil, how it was grown and the impact on soils, including as many stages as you can think of and include the use of any devices that transferred force and energy that might have been used in the production of your food. Reflect on how our food all starts with the soil. Reflect on the interconnectedness.

P If simple machines reduce or transform human effort, and burning fossil fuels in complex machines has allowed us to do much with little effort yet it is unsustainable, conceptualize tools for growing food (either in the garden or on a bigger scale) that reduces our effort but does not use fossil fuels.

7 Communicating

TONE: confident, engaging, interpretive, expressive, sensory, using technology

- Students create short (1-2 min) videos on something they learned about their local place.