

Curriculum Embedded Performance Task
Middle School Science
Content Standard 6.1, 6.2 or 6.4



DIG IN!

Student Materials

**Connecticut State Department of Education
Bureau of Curriculum and Instruction**

Dig In!

A Guided Exploration of How Water Moves Through Soil

ENGAGE

When you think of soil, you may think of just plain dirt. Look again at the picture of the soil on the cover. Can you see some things that are mixed in with the soil? Are there other materials that are mixed in that are not so easily seen?

EXPLORE

Imagine that your class will be planting a vegetable garden as part of a study about ecosystems. You need to choose the best location for the garden, and one of the important factors is the type of soil.

In this activity, you will observe and compare different types of soil. Then you will investigate factors that may affect how much water the soils can hold and how quickly water can pass through them. Finally, you will apply the results of your investigations to make decisions about the location of a new garden.

1. **Observe** the different soil samples with and without the hand lens. Notice different properties such as color, grain size, lumpiness, etc. Do you notice anything that is alive or was once alive?
2. **Record** your observations in your science notebook. Make an organized list of things you notice and things you wonder.
3. Identify a property that may be related to the soil's ability to hold water. This property is called "**absorbency**". Write a research question that can be answered by doing an experiment.

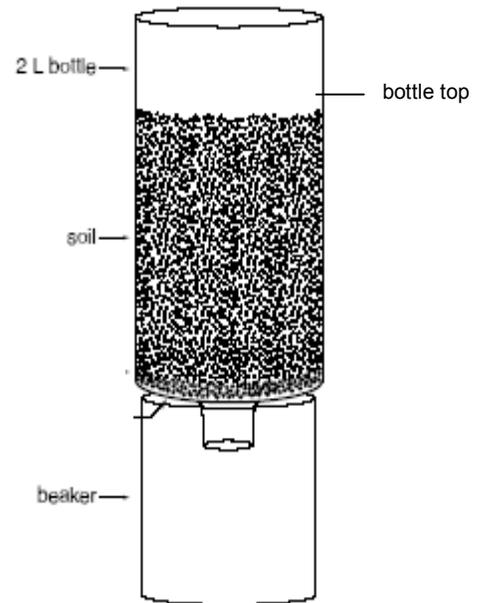
Experiment #1 – Relationship Between Soil Properties and Water Absorption

1. **Gather** the following materials to use in planning and conducting your experiment:

<u>For each lab group:</u>	<u>For each student:</u>
2-liter plastic bottles	Scissors
1 liter each of 4 different soil types (in labeled zip-loc bags)	Hand lens
<ul style="list-style-type: none"> • Sand • topsoil or potting soil • clay soil, powdered clay or cat litter (no additives) • home soil sample (optional) • school campus soil sample (optional) 	Plastic spoon
Piece of fine mesh, panty hose, screen, or cheesecloth	Gloves
Duct tape	
500 mL beaker	
100 mL graduated cylinder	
Water	
Stopwatch or clock	

2. To conduct your experiment, you can make a soil testing device like the one in the diagram:

- a. Cut the plastic bottle across the middle. Remove the labels and the caps. The bottle top will hold the soil, and the beaker (or the bottle bottom) will catch the water.
- b. Position the mesh near the bottle neck so it will keep the soil in the bottle top.
- c. Rest the bottle top, neck down, on the bottle bottom so that water poured through the soil in the bottle top will flow into the bottle bottom.



3. **Design** a procedure that will help you answer your research question. List the steps you will follow in your science notebook. Include enough detail so that anyone could repeat your experiment.

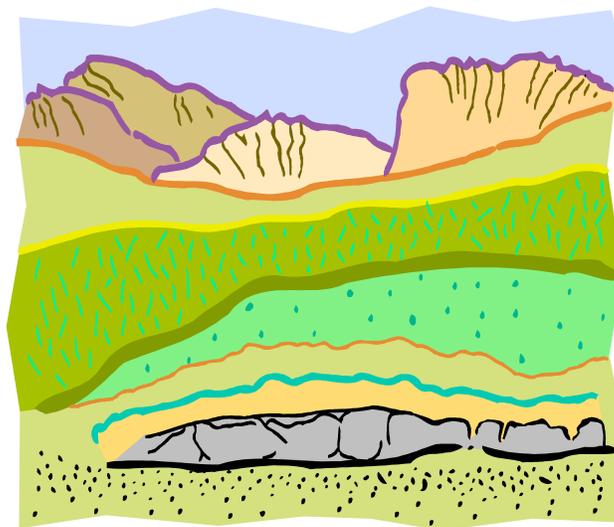
4. In this experiment, the **dependent** variable is the soil absorbency. In your science notebook, record the **independent** variable you will investigate and the variables that must be kept constant in your experiment.
5. Design a **data table** to record your findings in your science notebook.
6. Do your **experiment** and record your findings. Do the data seem reasonable? If not, do you need to repeat any trials to correct errors?
7. **Calculate** the amount of water remaining in each soil.
8. **Interpret** the data. Use your calculations to help you reach a conclusion about what properties affect soil absorbency (how much water the soil holds).
9. Share your procedures and conclusions with others in your class. How are they alike? How are they different? What changes could be made to the procedures to make the results more similar?

EXPLAIN

Investigate Through Research

The food we eat and water we drink, in many ways, depend on the quality of the soil. Do some research in books, magazines or the Internet to find out more about what soil is, where it comes from, different soil types and how wet and dry soils affect an ecosystem.

Write a reflection in your science notebook that explains your understanding of how the soil type affects what grows in a particular area.



ELABORATE

Investigating Further

Experiment #2 – Relationship Between Soil Properties and Water Percolation Rate

In this investigation, you will explore properties that affect how quickly water moves through different soil types. This is called the soil's "**percolation rate**".

1. **Observe** the different soils again. What are your ideas about soil properties that might be related to soil percolation? Discuss your ideas with your partners.
2. **Predict** which soil type might have the fastest percolation rate based on the properties you observed.
3. **Write** a procedure that will help to answer your question. To conduct your experiment, you can use a soil testing device like the one used in Experiment #1. List the steps you will follow in your science notebook. Include enough detail so that anyone could repeat your experiment.
4. Identify the **dependent and independent variables** in your experiment. Identify the variables that will be kept **constant** in your experiment.
5. Create a **data table** to record your findings in your science notebook.
6. Do your **experiment** and record your findings.
7. Think about the data you have collected. Do the data seem reasonable? If not, do you need to repeat any trials to correct any problems?
8. **Analyze** the data. Calculate the average time it took for the water to move through each of the soils.
9. **Interpret** the data. What **conclusions** can be made based on your data?
10. **Share** your procedures and conclusions with others in your class. How are they alike? How are they different? What changes could be made to the procedures to make the results more similar?

Possible Variations/Extensions (optional):

Some plants prefer moist soil, while others prefer dry soil. You may want to find out if a soil's moisture content can be changed by experimenting with different soil combinations.

Applying Your Findings To Solve A Problem

Imagine that you are going to plant a vegetable garden at your school or at home. You need to know what type of soil you have so you can select the right plants and know how much or how often you will need to water them. Use what you've learned through your experiments and your research to describe the type of soil in the school or home sample you have tested.

Communicate Your Conclusions:

Make a recommendation to the school principal about where the garden should be planted and how much watering it will need. Write an expository report that includes the following:

- An introduction that summarizes your research questions and findings;
- A description of the different soils you observed and how they were tested;
- A description of the school soil type and how it is similar to or different than the other samples you tested;
- A recommendation about whether the school garden should be planted in the area from which you took your test sample; and
- A conclusion that suggests areas for further research needed before planting the school garden.