

Soak It Up

Background

Sand, silt and clay are inorganic materials. They are formed over hundreds of years from rocks breaking down. Sand is made up of larger particles which can be seen with the naked eye. It has a coarse feel and allows water to move through very quickly. Silt particles are too small to see with the naked eye. They have a smooth feel, like flour or powder, when you rub them between your fingers. Silt is often found in places that have flooded and dried out again. Clay is made up of very tiny particles. It is sticky when wet and can be rolled into a ball. The particles fit together so closely that it is difficult for water to flow through. The best kind of soil for plants allows water to move through slowly enough so that some of it stays in the soil for the plants to use. Water moves too quickly through sand. It moves very slowly through clay, but clay holds the water so tightly that plants can't get to it. Soil that is good for plants has a mixture of sand, silt, clay and organic material, or humus. Humus acts like a sponge to help the soil capture water. Humus is formed when plants and animals die. Soil that has about equal amounts of sand, silt, clay and humus is called loam. This makes the best garden soil.

Science

1. Read and discuss background and vocabulary.
2. Enlist the help of parents or your county Extension agent in gathering soil that is mostly sand, mostly silt and mostly clay.
 - Students will inspect different kinds of soil by looking, feeling and smelling them.
 - Students will examine the different kinds of soils through a magnifying glass and compare the particle size in each.
 - Students will record their observations.
3. Divide students into groups of four or five.
 - Help students cut off the top halves of their pop bottles to serve as funnels.
 - Students place the tops of the bottles upside down in the bottom parts of the bottles.
 - Provide each group with cheesecloth, paper towels or coffee filters and equal portions of dry sand, dry clay and dry garden soil.
 - Students in each group will line their funnels with the cloth or towels and place sand in one, clay in one and garden soil in the

P.A.S.S.

GRADE 3

Science Process—1.1,2; 3.1,2,3

Physical Science—1.1; 3.2

Physical Education—2.1; 3.2,3;
5.1,2,3; 6.2

GRADE 4

Science Process—1.1,2; 3.1,2,3

Physical Education—1.5; 5.2; 6.3

GRADE 5

Science Process—1.1,2; 3.1,2,3

Earth Science—3.1

Physical Education—4.1; 5.3,5;
6.3; 7.3

Materials

clean, plastic pop bottles—three per group of four or five students

scissors

cheesecloth, paper towels or coffee filters

dry sand

dry garden soil

clay soil

organic matter (decomposed leaves, grass clippings, shredded paper, etc.)

quart jars

nonsudsing detergent (dishwasher)

clean cardboard milk cartons

dried beans for planting

other.

—Students will measure one cup of water and slowly pour it into the funnel holding the sand.

—Students will measure the water in the bottom half of the pop bottle and determine how much water stayed in the sand and how much ran through.

—Students will repeat the experiment with the other funnels.

—Students will mix organic material half and half with another portion of dry sand and repeat the experiment.

—Discuss the results.

4. Provide each group with a quart jar, water, garden soil and nonsudsing detergent (dishwasher detergent).

—Students will pour water into quart jars until they are two-thirds full and add one cup of finely crushed garden soil and three tablespoons of detergent.

—Students will cover the jars tightly and take turns shaking hard, at intervals, for a least five to ten minutes, or until the soil particles are broken apart.

—Place the jars where they will not be disturbed for 24 hours.

The coarse particles will settle rapidly. (You may need to add some sand to silt or silty clay loams if all the particles are small.)

—After 24 hours students will hold white paper next to the jars and carefully mark the thickness of each layer of coarse material “sand,” the middle layer “silt” and the top material “clay.”

5. Students will use the different kinds of soil from their experiments to sprout bean plants or some other sturdy seedlings.

—Students will cut clean cardboard milk cartons in half and have fill them with different kinds of soil.

—Students will determine if the soil used is mostly sand, mostly silt, mostly clay, or a good mix and label the containers.

—Students will to give their plants equal amounts of water and sunshine.

—Students will chart the growth of the plants.

Get Up and Move

Play “Sand, Clay, Loam” as follows, to help students understand how water moves through the different soil types:

—Divide class into two groups. One group is rain; the other is soil.

SAND

—Students in the soil group stand with their arms outstretched, with each student touching the fingertips of the students on either side.

—Students from the rain group work their way through the outstretched arms of the students of the soil group to represent the

Vocabulary

clay—an earthy material that is sticky and easily molded when wet and hard when baked

coarse—made up of large parts or particles

humus—a brown or black product of partial decay of plant or animal matter that forms the organic portion of soil

inorganic—composed of matter that does not come from plants or animals either alive or dead

loam—a soil consisting of a loose easily crumbled mixture of varying amounts of clay, silt, and sand

particle—one of the very small parts of matter

sand—loose material in grains produced by the natural breaking up of rocks

silt—very small particles left as sediment from water

movement of water through sand.

CLAY

- Students in the soil group stand shoulder to shoulder.
- Students in the rain group attempt to work their way through to represent the movement of water through clay.

LOAM

- Students from the soil group stand with their hands on their waists, with elbows touching the students on either side.
- Students in the rain group work their way through to represent the movement of water through loam.

For variation, students in the rain group will hop, skip, etc., as they move each time through the soil group. After the first round, the soil group will become the rain group and the rain group will become the soil group.

Extra Reading

Brendler, Carol, and Ard Hoyt, *Winnie Finn, Worm Farmer*, Farrar, Straus and Giroux, 2009.

Gardner, Robert, *Super Science Projects About Earth's Soil and Water*, Enslow, 2007.

Lindbo, David, *SOIL! Get the Inside Scoop*, American Society of Agronomy, 2008.

Nardi, James B., *The World Beneath Our Feet: A Guide to Life in the Soil*, Oxford, 2003.