Size Up the Soil - Growing in the Garden.org

(40 minutes, divided in two days)

CONTENT OBJECTIVES: Understand that there are different kinds of soil, which affects the ability to grow plants.

LIFE SKILL OBJECTIVES: Learning to learn using senses to sort and classify, critical thinking

INDICATOR: Correctly identify the kind of soil from a sample near school or home and explain plant life at the location where the soil sample was taken.

MATERIALS

- Cleaned out spaghetti sauce, peanut butter, mayonnaise, ice tea or any jar that is at least quart-sized and has a lid.
- Masking tape
- Permanent marker
- Trowel
- Soil (see Apply)
- Water (see Apply)
- Paper and pencil (one per student)

INTRODUCTION

What do the following places all have in common: football, baseball, and soccer fields; corn and soybean fields; vegetable and flower gardens; parks; yards; golf courses; orchards; Christmas tree farms; roadside ditches; forests; prairies; and potted plants in the greenhouse?
They all are places that we find plants growing out of the soil.

How did the soil get there?
Soil is a natural resource, people don't make soil and put it on the ground.
In some cases, people add healthy soil on top of existing soil in order to grow healthier plants.

How does the soil get the way it is?
Soil starts as large rocks. After thousands of years of rain, hot and cold temperatures, and sunlight, the rocks break apart into smaller pieces. As they continue to weather and break down, wind and water wash the rock parts away, plants grow and die in the tiny rocks, and after thousands of years, the rocks become the soil we have today.

We are going to look at the tiny rock or mineral particles that make up the soil.

DO and REFLECT

Mineral particles are sorted according to size. The largest mineral particle is **sand**.

Where can you find sand?
On the beach, in a sandbox, at the lumberyard and desert areas.

If you tried to plant something in sand, what would happen and why?
A seed planted in sand may sprout and begin to grow, however, it may not do very well because there would be very few nutrients in the sand
and it does not hold water well enough to support plants that don't tolerate dry conditions.

What kind of plants can survive in sand?
Cacti.(Palm trees live on beaches because there is a shallow water table)

If you were a teeny tiny organism, you would see that there are lots of open "windows" between each particle of sand.
These open spaces are called **pore spaces**. You can pour water right through the pore spaces of sand.

The medium-sized particle is called **silt**.

Where can you find silt?
Silt is found along riverbanks. If it's dry enough, it will easily blow around. The Loess Hills in western Iowa are made from silt blown in from the Missouri River valley. (*You may want to visit a website on the Loess Hills with your students. See http://www.nfinity.com/~exile/loesspg.htm)*

The smallest particle is called **clay**.

Where can you find clay?
New housing developments or areas of the ground that have been dug up. The clay is usually below the top soil. Clay is used for pottery and bricks.

If you tried to plant something in clay, what would happen and why?
The clay particles are so tiny that they are really close to one another, leaving little or no pore spaces between them. This restricts the amount of oxygen available to the plant's roots. It also doesn't allow good water penetration and when it does, all the pore spaces can be filled with water, leaving no space for air.

Most plants won't grow healthy and strong in just one type of soil. That is why the best soil mixture is called **loam**. Loam is a combination of equal parts of sand, silt, and clay. Loam gives structure and stability to the soil.
It provides a good balance that holds some water yet allows some open pores for air.

Let's see how sand, silt and clay works in soil.

Identify one volunteer to be a seed and two volunteers to be water. Ask the rest of the students to count off around the room as sand, silt, or clay. Find a large space at one side of the room, in the hallway, gym, or outdoors. Have all the students meet in the space. Plant the seed in the back of the room. Have the students representing clay form lines representing the ground in front of the seed. Have them stand close together, shoulders touching.

Have the students representing silt to form another couple lines in front of the layers of clay. Ask them to mover their hands half-way out from their bodies and stand with the back of their hands touching.

Have the students representing clay form the front couple lines. Ask them to spread their arms out, touching each others shoulders.

Tell everyone to hold their positions and ask them to yell out what sized soil particle they represent.

Have the two students representing water to stand in front of the lines of soil particles. Tell them that it is their job to move through the pore spaces of the soil particle to reach the seed that is waiting to grow. Have them proceed between soil particles.

Did the seed get watered?
No

What happened?
The water couldn't get through the clay.

What soil particles were the easiest to move through?
Sand.

Which soil particles were the hardest to mover through?
Clay.

Put the seed at the other end of the lines of soil particles and have the water representatives try to move through the clay first.

What happened?

Next, tell everyone to remember what size particle they represent and to mix up the lines. Remember how they stood with their arms to their sides, half-way out, or straight out touching the next person's shoulder. Now have them work with their new neighbor and stand as they did in the previous line.

What kind of soil do you represent now?
Loam, a mixture of sand, silt, and clay.

Have the students representing water try to reach the seed by going through the loam.

What happened?

Did the water reach the seed?

Will the seed probably grow?

What is the best soil mixture for growing plants?
Loam

Why?
The sizes of soil particles are mixed up so that the water can reach the seed and be absorbed.

- **Soil Sample Mud Shake**

Ask various students to help with the different steps of the following mud shake activity.

- Put two long pieces of masking tape vertically (from top to bottom) on the jar.
- Take the jar, lid, trowel, and permanent marker to a place on your school ground where you might like to examine the soil. Ask the students what they see growing in the area. Ask one of the students to record your location and what is growing there on one of the pieces of masking tape.
- Clear away the debris and plant materials laying on the top of the soil. Using the trowel, dig up enough soil to fill at least half of your jar.
- Take the students and the jar back into the classroom. Fill the jar with water, screw on the lid tightly, and shake the jar. Two or three students can take turns shaking the jar until the soil and water are blended together.
- Explain that the soil particles will settle into three layers.

What will the layers be?
Sand, silt, and clay

- Have them draw the jar on a piece of paper and make lines where they think the three layers will fall. Then have them label the three layers by guessing which will be on the top and the bottom. Let the jar set on a counter, undisturbed, for three days.

- Have everyone take a look at the jar while it sits on the counter. Ask them if they can identify the layers of soil particles in the jar. On the blank strip of masking tape, have someone mark the division lines between the layers.

Which size particle has fallen to the bottom of the soil sample?
Sand

Why?
It is the largest and heaviest particle. Gravity has pulled it down.

Which size particle is in the middle layer?
Silt

Why?
It is the medium-sized particle.

Which size particle is forming the top layer?
Clay

Why?
It is the smallest particle.

What particles float to the top?
Organic materials. Write the name or each layer on the masking tape.

Is this soil a loam soil?

What makes it a loam soil?
It has all three sized particles.

Is there an equal amount of each of the layers?

What layer is the largest or the smallest?

Would this be a good soil to plant things in? Why or why not?

What was growing where you found the sample?

Why do you think these things were growing or not growing there?

What might you do to make the soil in that area better?

Do you want to make it better?

How can you carry out a plan to make it better?