

# Stronger Than Dirt!

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**Grade Level:** Middle School Life Science, High School Biology

**Estimated Time:** 3-6 forty minute periods

**Overview:** Soils are a heterogeneous mixtures of three basic ingredients; clay, silt and sand along with organic matter. Soils have an important impact on the development of plant systems. In this activity students will select different materials and create various soil types. Students will plant seeds and see which of their soils offer the best growing conditions for their plants.

## **New York State Learning Standards:**

- Standard 1 Mathematical analysis: use various methods of representing and organizing observations.
- Scientific inquiry: Asking questions and locating, interpreting and processing information.
- Standard 4 Application of scientific concepts: Students will understand and apply scientific concepts, principles and theories pertaining to the physical setting and living environment.
- Key idea 6 Explain factors that limit growth of individuals and populations: The atoms and molecules on the Earth cycle among the living and non-living components of the biosphere.

## **Learning Objectives:**

- Students will understand that soil is a very important part of plant development and a limiting factor to what types of plants can exist.
- Students will compare soil types and describe the different taxonomies.
- Students will create different soil mixes and measure and record the mixtures they develop.
- Students will germinate plant seeds in their different soil mixtures and monitor their growth.
- Students will rate and assess soil types for their given plants and compare their data with classmates.

**Materials:** clay, silt, sand, vermiculite, sphagnum moss, soil sleeves, pans, seeds, water, trays

to mix soil in, scales, plastic beakers or measuring cups, scoops, markers, Popsicle sticks, markers, 3x5 cards, folders soil articles from the USDA.

**Safety:** Although no chemicals will be used in this lab, the use of protective eye wear is recommended, especially if glass ware is used. Students should not ingest any seeds as this is poor lab protocol and many seeds are coated with chemicals used to prevent molding.

## Lesson Outline

**Day 1:** Students will be asked to answer the following questions that are posted on large poster sized sheets of paper around the lab room:

What is soil? Why is soil important? What is a limiting factor? What is in soil? What is an abiotic factor? Is soil living?

Students are to be given markers and allowed to respond with as long or short of an answer as they prefer within the time frame given for each poster. Give students about 3-4 minutes per station. When complete, read off their answers to each question, allow them to think and reply to what they have written. Using prepared index cards each marked with a letter A, B, C, D, E and a number 1-4, such that say for letter A index card you have cards marked A-1, A-2, A-3, A-4 and the same for letters BCDE, You will be able to divide students into home groups and information gathering groups. Have folders set up on 4 lab tables that contain articles on soils. Each table will have its own particular bit of information. Randomly give students cards (this would be enough for a class of 20 students). Have them report to their letter tables, skim read information and collectively write down 10 to 20 facts that they learn about soil. Have students report back to their home groups and report to one another.

**Day 2:** Soil mixing - Have all ingredients, mixing trays, soil sleeves, scoops and measuring cups available for students. Have them check their materials and have newspapers handy to lay down on the benches for an easy clean up. Students will then collect their raw materials and then begin creating soil types. Students can then put their filled soil sleeves into trays and saturate with water. Students can then plant bean seeds in each pot.

**Day 7-10:** Students check for plant growth and begin measurement. Students should have their data sheets handy on clipboards for quick and easy recording of data as the plants grow or not grow. Students should make sure that they write down the date of measurement.

**Day 14:** Ask students how they would graph their data. What type of graph would be best to use to help interpret their data? Have students work in their groups.

**Assessment:** Students should be able to interpret a soil profile and tell what soil consists of: clay, silt and sand. Students should be able to compare the particle sizes of clay, silt and sand. Students should be able to list other important parts of soil such as gases in the particle

spaces and the meiofauna and flora such as bacteria that exist within soil.

**Extension activity:** Students should perform pH tests of their various mixtures over time. Students could try different seeds. Student could compare commercial brands of potting soil. Students could bring in samples from home. A soil profile could be prepared of the school's soil structure with the help of the school maintenance staff.

Questions: What kind of data, How should it look, Allow them time to develop what they feel would be effective.