

**TEACHING KATE
TEACHING KIDS ABOUT THE ENVIRONMENT**

POTTING SOIL OR YOUR SOIL, WHICH IS BETTER FOR PLANT GROWTH?

Grade Level: 7

Time Required: 4-6 weeks

SC Science Standards

This lesson plan was correlated with only the grade level specified unless otherwise noted.

- I. A. 1. b. 1
- I. A. 1. d. 1
- I. A. 1. e. 1
- I. A. 2. g, h
- I. A. 5. a
- I. A. 7. a
- III. A. 2. b, d

Purpose

Students will compare the compatibility, based on pH levels, of home site soil sample versus potting soil for growing wildflowers.

Skills

Analyzing, comparing, interpreting, measuring.

Concepts

Soil pH levels vary according to area; one type of plant may grow on one soil while another will not.

Materials Needed

students' soil samples	wildflower seeds
milk cartons	universal indicator solution
distilled water	grow lab (if available)
potting soil (may want to use pH adjusted potting soil)	

Definition of Terms

<u>Acidic</u>	Having a pH below 7.0.
<u>Basic</u>	Having a pH above 7.0.
<u>Distilled Water</u>	Water which has been purified by heating it until it is transformed into steam and collecting the condensation in a separated container. The condensate is the distilled water.
<u>Neutral</u>	Having a pH value of 7.0.
<u>pH</u>	Measure of how acidic or basic a solution is, on a scale of 0-14. (0 = very acidic, 14 = very basic.)
<u>Topsoil</u>	The upper layer of soil in which most plant roots grow.

Before the Session

Decide on what type of wildflower seeds to use based on time of year. Have students begin bringing in rinsed milk cartons from their lunch or breakfast. Check grow lab setup. Purchase bag of potting soil and containers of distilled water.

Background Information

In order for plants to grow, they have to have conditions suitable for their needs. One condition is the pH level. The pH level is a chemical condition affected by living organisms such as bacteria, fungi, algae, worms and insects as well as the mineral composition of the soil itself. The living organisms are usually present in the topsoil. Most plants grow best when the pH level of the soil is slightly acidic. Soils usually range between a pH of 3.0, which is very acidic soil, and 9.0, which is strongly basic. A pH of 7.0 is considered neutral. If the pH is between 6.0 and 7.0, a plant can get almost all its nutrients in a great amount. Some plants, however, prefer more acidic or more basic soils. Pines, azaleas, citrus, and cranberries, for example, prefer more acid

soils; while many desert plants can compete favorably only in more basic soils. If soil pH is below 6.0, nutrients like calcium (Ca^{++}), magnesium (Mg^{++}) and potassium (K^+) cannot bind as well to the soil because hydrogen ions (H^+) out compete these cations (positively charge molecules) for uptake sites. Since these cations are not bound to the soil, if they are not taken up by plants, they are carried deeper into the soil or displaced altogether by rainwater or groundwater. If soil is over 7.0, it is just the opposite with these three minerals being over abundant. However, at a higher pH, hydroxyl (OH^-) or bicarbonate (HCO_3^-) ions compete with nutrient anions such as nitrate (NO_3^-), chloride (Cl^-) and phosphate (H_2PO_4^-). Based on these reasons and location of soils, some plants grow better in some areas than others.

Suggested Lesson Plan

Day 1

1. Give background information and purpose.
2. Have students divide into groups of three and assign roles.
3. Assign students to bring in a bag of soil taken from an area around their house. Instruct them to take the soil sample from the top 6 inches. They should remove all live plants from the soil.
4. Have students draw a map of the sample location.

Day 2

1. Divide students into groups of 3.
2. Using the students' soil samples, have them test the pH with the universal indicator.
3. Have the students test the pH level of the potting soil.
4. Have each group fill a milk carton with each member's soil.
5. Students should label each carton with the name of the student who brought the soil.
6. Next, students will plant wildflower seeds evenly.
7. Instruct students to Fill one carton with potting soil and plant wildflower seeds.
8. Have students water cartons with distilled water.
9. Then students should place cartons under the grow lab or near sunlight.

Day 3 - Until

1. Students will water plants when needed.
2. Students should continue to observe for growth.
3. Instruct students to measure growth of plants in each carton.
4. Students will periodically test pH of soils.

Final Day

1. Ask students to interpret measurements of all samples from the group.
2. Have students determine which home site would be the best to grow wildflowers.
3. Post results on the board.
4. Ask students “Could any of the soils be modified to improve their capability to grow wildflowers?” “If so, how?” Discuss.

Application

Which soil had the best pH level for wildflower growth? Did some species grow better in one soil than another? For instance, one may grow better in more neutral soils while another prefers more acidic soils. If this happens you may get good growth, in several containers with different pH levels, but of different plant species. Farmers of all types of crops need to keep a watch on the pH levels of their soils. If they do not, optimum growth can not be achieved for the plants they grow and that will result in decreased profits when they sell their product. For instance, pine trees, azaleas and tomatoes prefer a slightly acidic soil; and citrus farmers must be aware that citrus trees prefer very acid soils (4.5) or they will end up with stunted trees.

Extension

Based on your results, would wildflowers grow at your home and why? What other plants might grow in your yard?

Should nutrient levels be considered? Students could take larger samples and send part of each sample to Clemson University for analysis. Boxes can be obtained from the county extension service. Even with a preferred pH, if the nutrient levels are not high enough, optimum growth will not be achieved.

Did some wildflower species show a preference for a certain pH level? Planters with differing pH levels may have good plant growth but the species of plants with good growth levels in those containers may be different.

Resources Available

Biology, 3rd edition. 1987. K. Arms and P. Camp. Saunders College Publishing.

Elements of Ecology, 3rd edition. 1992. Robert L. Smith. Harper Collins Publishers Inc., New York, N.Y.

Environmental Soil Science. 1994. Kim H. Tan. Marcel Dekker, Inc.

Focus of Life Science. 1984. Charles Heimler. Charles E. Merrill Publishing Co.

Principles of Soil Chemistry. 1993. Kim H. Tan. Marcel Dekker, Inc.

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DATA TABLES

Name:

Data Table 1 - The pH Level of Soil

Soil Samples (Student's Name)	Initial pH of Soil

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DATA TABLES

Name:

Data Table 2 - Daily pH Level and Height of Plants

Name							Potting Soil	
Day	pH	Height	pH	Height	pH	Height	pH	Height
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

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WORKSHEET- SOIL pH DISCOVERIES

Name:

1. Did the soil samples have different pH levels?
2. What would account for the pH levels?
3. Did pH levels change while growth was occurring?
4. How did your sample compare to the potting soil?
5. What is the best soil pH level for wildflower growth?
6. Why did we use the potting soil and distilled water?
7. Can wildflowers be planted at your house based on your pH level?

