

## **Plant Nutrients and Soil Samples**

**Grade:** 8

**GPS:** S8P1. Students will examine the scientific view of the nature of matter.

**Essential Question:** What nutrients are essential to plant growth?

**Teacher Note:** Students will learn about plant primary, secondary, and micronutrients by playing a matching game. This game will also reinforce skills for using the periodic table of elements. Afterwards, students will collect a soil sample from the school garden.

### **Resources:**

Soil Testing for Home Lawns and Gardens:

<http://www.caes.uga.edu/extension/columbia/anr/documents/soilsampling.pdf>

Soil Testing:

<http://www.caes.uga.edu/extension/carroll/anr/documents/L99.pdf>

### **Interest Approach:**

Ask students why it is important to eat healthily. Focus on vitamins and minerals that come from healthy foods. Ask students what happens when they do not get needed nutrients. Discuss the negative effects of mineral deficiency on health: examples can include Calcium deficiency leads to weak bones and teeth, and Iron deficiency can lead to anemia. Explain that just like humans, plants also need minerals to be healthy.

### **Lesson:**

Before class, make enough copies for each student to have one page of each the primary, secondary, and the micronutrient element activity pages. Direct students to stand in a circle so that they cannot see each others backs. First, attach a random page from the primary element activity packet to the back of each student. If there is not an equal amount of students for a group of three, partner extras with a student that already has a page. Each student should also have an activity guide worksheet which you have already reviewed instructions for completing. At your signal students should move to find other students to complete the group of elements. For example, for primary elements, students would need to get into groups of Nitrogen, Phosphorus, and Potassium. Once in groups, they can take the papers off their backs, and use them to fill out the activity guide worksheet. Continue this activity with both secondary and micronutrient groups. At the end of the activity, students should have a completed activity guide worksheet describing the importance of each nutrient.

\*If you would like to add an element of team-building to this activity, instruct students to get into each group without using verbal communication. To get more outdoor time, this lesson can take place in the garden area.

Before beginning soil sample activity, review activity sheet with students to check for understanding.

### **Learning Activity:**

Collecting soil samples is a very simple student garden activity that will apply the periodic table of elements to the real world. It is also a great way to gather information for improving school garden fertility and thus production. If you are unfamiliar with this process, please read the brief instruction resources listed above before completing this activity.

This activity can be completed as a ...

### Class demonstration

Supplies: 1 soil sample bag, 1 bucket, 1 trowel,

1. Review behavior expectations for the school garden.
2. Take all supplies to the area that you are testing.
3. Explain to students that scientists that work for UGA test the soil for the primary, secondary, and micronutrients that are most likely to be present in limiting quantities in the soil. Explain that while Nitrogen is important, and can often be a limiting factor in plant growth, it moves from the soil too quickly for tests to be an accurate indicator. By knowing what is in the soil, the class will be able to make informed decision about how best to manage fertility.
4. Have a student volunteer use a trowel to dig a 6" deep sample. Make sure the student gathers a core sample, with equal parts of each level, and not just a sampling of the top, middle, or bottom layer. Place sample in bucket.
5. Move to another section in your sample area. Instruct a volunteer to take another sample. While they are taking the sample, make sure to stress to your students the importance of multiple samples in an area, and separating tests for areas with distinct soil condition or distinct uses.
6. Take at least one more sample (normally you would have at least 8-10, but for the demonstration 3 will be fine). Mix all the samples together in the bucket. If soil is overly moist, spread on a newspaper inside for a couple of days to dry.
7. When soil is ready, fill out relevant information on soil sample bag, and fill bag with soil. Discuss with students what tests you are selecting (I recommend the standard test as well as the test for organic material). A copy of the soil sample bag is included; if possible project this onto the board to teach how to fill out the sample bag. Or, pass the finished sample bag around the classroom for students to see. Take sample to your local county Cooperative Extension office to be sent off for testing.

OR

### Class activity

Supplies: soil sample bag for each area tested, bucket for each area tested, trowels for each student group (two per group is great for this activity)

1. Review behavior expectations for the school garden.
2. Take all supplies to the area that you are testing.
3. Explain to students that scientists that work for UGA test the soil for the primary, secondary, and micronutrients that are most likely to be present in limiting quantities in the soil. Explain that while Nitrogen is important, and can often be a limiting factor in plant growth, it moves from the soil too quickly for soil tests to be an accurate indicator. By knowing what is in the soil, the class will be able to make informed decision about how best to manage fertility.
4. You, or a student volunteer, should use a trowel to dig a 6" deep sample. Make sure the student gathers a core sample, with equal parts of each level; not just a sampling of the top, middle, or bottom layer, but an even sample of all levels. Place sample in bucket.
5. It is now time for students to collect their own samples. When completing this activity as a class, it is possible to sample multiple areas. Examples include vegetable, herb, and butterfly gardens, areas of fruit production, and areas where future gardens will be located. Keep in mind students will be digging samples with trowels; if the area to be tested is heavily compacted either forego as a testing area or provide appropriate digging tools. If possible, divide students into large groups (or groups proportional to the areas being tested), and have partners within those groups each complete samples. It is important to have multiple samples for each area. Set up a well-labeled sample collecting bucket for each area. Discuss with the class how samples within an area should be spaced, as well as what makes a good or bad sample spot. If you are unfamiliar with taking soil samples, review resources listed above.
6. Thoroughly mix soil samples within each bucket. If soil is overly moist, spread on a newspaper inside for a couple of days to dry.
7. When soil is ready, fill out relevant information on soil sample bag, and fill bag with soil. Discuss with students what tests you are selecting (I recommend the standard test as well as the test for organic material). A copy of the soil sample bag is included; if possible project this onto the board to teach how to fill out the sample bag. Or, pass the finished sample bag around the classroom for students to see. Take sample to your local county Cooperative Extension office to be sent off for testing.

**Check for Understanding:** Students will be evaluated on their activity guide worksheets, as well as skills demonstrated in the school garden.

**Activity Packet and Worksheet:** all activity sheets needed for this lesson are found in the Plant Nutrition Activity Sheets document.

