



RESOURCES AVAILABLE TO TEACHERS

Other teaching aides are also available including:

- Videos
- Posters
- PowerPoint Presentations
- Visual Aids
- Full Curriculum for Teachers
- Activities

Visit our website to order your support materials today. The time you invest in our cause will come back to you many times over as you see the eyes of both young and old audiences respond to the information you share.

www.nutrientsforlife.org

YOUR VOICE OUR RESOURCES

Nutrients for Life is a nonprofit organization that provides information and resources to educators and individuals like you, to help inform the public about the vital role that fertilizer plays in feeding the world. The information we have compiled is science-based and user-friendly. It has been successfully implemented by educators across the country. Through a grassroots effort, we can spread the word about soil health to students of all ages and to adult organizations that are always looking for programs. Our story is not only important, but it is interesting and serves a vital role in educating consumers and decision-makers in the future.

IF YOU DON'T TELL YOUR STORY, WHO WILL?

Your story matters.
Soil science matters.



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RELAX! HERE'S A LESSON WORTH TEACHING.

Nutrient Movement

Appropriate for Middle & High School



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PROCEDURE



1) Ask students, “How do nutrients in the soil water get into the plants root hairs?”
a. Accept all answers at this time.

2) Explain that there are two ways water and nutrients move into plants’ root system. One is active transport, and the other is diffusion. In diffusion, molecules move randomly due to their kinetic energy. This movement causes molecules to intermingle. The net movement of molecules is from an area of high concentration to one of lower concentration. The net movement stops when the concentration of the molecules is the same everywhere. The movement comes from their kinetic energy and does not need additional energy (unlike active transport).



Activity: Students will now investigate the process by which water enters the root hair. Divide classroom into groups of 3 - 5 students per group.

STEP 1: Pass out a container, water, food coloring and cup (with 2 holes opposite each other towards the base of the cup to each group.) The water level in the larger container must be higher than where the holes on the cup will be.

STEP 2: Fill the cup about ½ full of water. Have someone hold the holes closed.

STEP 3: Place the cup of water into the center of the larger container.

STEP 4: Fill the larger container with the water until it is level with the amount of water placed into the cup.

STEP 5: Add several drops of food coloring to the water in the larger container and gently mix the water until the color is evenly distributed. Do not add coloring inside of the cup!

STEP 6: Watch the water in the cup for 5 minutes and record observations.



OVERVIEW

Plants remove water and nutrients from the soil through the plant’s root system. Some nutrients move into root cells from the soil by diffusion and others by an energy-requiring process (active transport). This diffusion activity represents one way nutrients are moved into the plant by using a simple visual.

MAJOR CONCEPTS

- Diffusion is the movement of a nutrient ion from an area of high concentration to an area of lower concentration.
- In a soil system, the surface of the root is usually considered to be the area of lower concentration. The surface of the clays in the soil aggregates is thought to be the area of high concentration. Therefore, the positively charged nutrient ions diffuse from the surface of clays in the soil to the surface of the root. Nutrient uptake by plants keeps the concentration at the root surface low.
- Diffusion is slow but continuous as long as the plants are growing.



Investigating Nutrient Movement

Here is a quick, but effective lesson that you can use at a moments notice.

Visual aids: Paper or disposable coffee cups, water, food coloring, larger container for the cup to sit in.

Optional: Nutrients for Life NPK poster.

This lesson is found in NFLF’s curriculum, *Nourishing the Planet in the 21st Century*.

When going to the classroom, bring a copy of the curriculum and accompanying poster to gift to the teacher.

All NFLF resources are free.