Recommended Grade Level:
3-5

Season:
All

Indoor

Root Study

Description:

Root vegetables are an important part of a healthy diet. Students will explore the function of roots by dissecting a radish. Students will keep a dissection log of their findings in their Garden Journal.

Background:

Roots serve four functions: absorb water, store nutrients, anchor the plant and store food. The three types of roots are:

- The **taproot** is the large main root that's longer and supports other roots.
- The **fibrous** roots are the stringy roots.
- The **root hairs** are the tiny structures that go between the soil and absorb water and nutrients.

Materials:

- Above or Below the Ground Sheet
- Variety of root vegetables (carrots, radish, jicama, onion)
- Whole radishes
- Radish cut in half lengthwise
- Paper plate or cutting boards for each small group
- Magnifying glass
- Garden Journals for dissection log
- Ruler
- Anatomy of a Radish Sheet

Preparation:

1. Gather several root vegetables (carrots, radishes, jicama, onion) from the garden or grocery store. Try to choose root vegetables that have their leaves and obvious root hairs.
2. Determine the number of groups. Gather enough radishes from the garden so each group will have one whole radish and one radish half. Radishes can be purchased from the store if no radishes are available from the garden.

Activity:

1. Review the parts of plants and their functions:
   - Roots: Absorb water, store nutrients, anchor the plant in the ground and store food.
   - Stems: Transport water and nutrients through the plant like a straw.
   - Leaves: Gather sunlight for the plant to make food.
   - Flowers: Produces fruit and attracts pollinators.
   - Fruit: Contains the seeds.
   - Seeds: Grow new plants.
2. Explain to students that the vegetables we eat come from different parts of the plant, including the roots, and root vegetables grow underground.
3. Explain the three types of roots:
   - The taproot is the large main root that's longer and supports other roots.
   - The fibrous roots are the stringy roots.
   - The root hairs are the tiny structures that go between the soil and absorb water and nutrients.
4. Play the game Above or Below the Ground. See the directions and answer key on page 61.
5. Show students the different types of root vegetables you've gathered from the garden. Ask students to share any other types of root vegetables they know. Students may say potato, but it's a tuber (thickened part of the stem).
6. Explain that they will be studying root vegetables by dissecting a radish and learning about how a root works. Review the Anatomy of a Radish Sheet with them.
7. Divide the students into groups and pass out the supplies: whole radish, radish cut in half, paper plate and the magnifying glass.
8. Have students start by sketching their whole radish in their journals. Demonstrate how to use the skin of the radish to shade in the coloring for the red part and use the leaves to shade in the leaf sketch for green. Have them also sketch the inside view of the radish that's cut in half. Have them label their drawings, including leaves, stem, tap root and root hairs.
9. Have students use the magnifying glasses to take a closer look at the radishes and write their observations in their Garden Journals. Have students draw a line down the middle of the paper and label one side "outside" and the other side "inside." Once finished, have the groups share their findings.

Tying it Together:

1. What are the functions of a root?
   Absorb water, store nutrients, anchor the plant and store food.
2. Why do you think the radish is moist inside?
   The root pulls in water from the soil.

3. How did water get inside the root?
   Root hairs absorbed the water.
4. How does the water from the roots get to the rest of the plant?
   The stem pulls the water from the roots.
5. What if the radish didn't have a root?
   It wouldn't get water and nutrients and wouldn't grow properly.
6. What happens if we don't eat healthy food and water?
   Our bodies wouldn't be healthy.
7. What do water and nutrients do to help plants and animals grow?
   Nutrients give plants and animals energy and strength.
   Water helps keep plants and animals hydrated and working properly.

Digging Deeper:

Use hydroponics (a jar of water) to grow a root vegetables and study the growth. Regrow root vegetables by using the tops of carrots, base of celery, top of leeks, etc. Place the tops in a shallow dish of water in a sunny window or under a grow light and refill with water as needed. Record the growth and gather data on the process. When it has grown and developed a root system, it can be transplanted into the garden.

National Standards:

NGSS

- Inheritance of variation of traits.
- Structure, function and information processing.
- Matter and energy in organisms and ecosystems.

Lesson Extensions:

Health: Conduct taste tests with root vegetables. Describe the tastes, including similarities and differences. Gather data about tastings (favorite root vegetable, least favorite, softest, crunchiest, etc.).

Math: Have students measure the weight, volume and length of the radishes and compare with the other groups.

Science: Compare other root vegetables by going through the same procedure as the radish. Then students will compare a carrot root to roots of grass to see the difference between the taproots of root vegetables and the fibrous roots of grass.

Literature Connections:

The Gigantic Turnip by Alelsey Tolstoy
Stone Soup by Robert Moser
Tale of Peter Rabbit by Beatrix Potter
What are Bulbs and Roots? By Molly Aloian
What Do Roots Do? By Kathleen V. Kudlinski and David Schuppert

Above or Below the Ground?

This activity can be done individually or in a small or whole group.

Whole Group:
Read the list of fruits and vegetables. If the part that's eaten grows above the ground, students stand up. If the part that's eaten grows below the ground, students sit down.

Small group or individual:
A line is drawn down the middle of a piece of paper and labeled "Above the Ground" or "Below the Ground." Students make a list of as many fruits and vegetables that they can think of to fit each category. Students share the lists when they're finished.

Orange (above)
Tomato (above)
Beet (below)
Carrot (below)
Strawberry (above)
Pear (above)
Potato (below)
Cucumber (above)
Cantaloupe (above)
Peanut (below)
Pumpkin (above)
Celery (above)
Green Bean (above)
Onion (below)
Lettuce (above)
Broccoli (above)
Squash (above)
Brussels Sprout (above)
Turnip (below)
Apple (above)
Cabbage (above)
Avocado (above)
Cabbage (above)
Horseradish (below)
Cherry (above)
Sugar Beet (below)
Date (above)
Green pepper (above)
Radish (below)
Banana (above)
Cauliflower (above)
Corn (above)
Parsnip (below)
Peach (above)
Garlic (below)
Watermelon (above)

Anatomy of a Radish