

INTERMEDIATE SCIENTIFIC INVESTIGATION PLANNING TEMPLATE

Our **question** is:
Which plant has the longest root? Which plant has the widest?

Our **prediction** is: **(this will depend on the plants you use and where they are grown)**

The **materials** we will use are
(include measuring tool):

- **Pencil**
- **Paper**
- **Ruler**

The **variable** we are **changing** is:
Plant variety

The **measured** (responding)
variable is:
Root size

These are the **controlled**
variables (things kept the same):
Sun
Rain

The step-by-step **procedure** is:

1. **Have students do a detailed description and drawing of each different plant (color, shape, texture, etc.). Compare properties between plants of the same species and between different plant species.**
2. **Have students pull up the different plants. Make sure they pay attention to how difficult or easy this is for them. Have them compare their experiences to the experiences of classmates of different size and strength, including the teacher.**
3. **Measure the roots. Explain root systems to the children and why they are of varying lengths and widths.**

Grade(s) : 3

Subject Area: Science

EALR/Standard:

2-3 Inquiry (A-D)

2-3 Application (A-C)

2-3 Physical Properties (1A-D)

2-3 Physical Properties (2A and B)

2-3 Physical Properties (3A)

Activity: Take three different mature plants in the garden (this activity should be done right when students get back to school. It is also relatively simple, so it would be a good one to start students on). Record and measure their properties, compare the properties of the same and different varieties of plants. Pull plants out of the ground to compare root systems. In the process, have students take note of the force needed to pull out plants. Measure root systems.

Lesson created by Robin Lewis, Environmental Studies Intern, Whitman College Spring 2010

Goals:

Students will learn how to pay close attention to the details of things, both between things of the same variety and between things of the same family (ie lettuce vs. lettuce and lettuce vs. corn). Students will understand the idea of force as they consider the force needed to remove a plant from the ground. They will see how different people based on their different size and strengths affect motion and make force easier or harder to administer. Finally, the students will measure the root systems and the teacher will ask them to think about why plants have different root lengths and widths and explain in simple terms the reasoning once students are done hypothesizing. These three tasks correspond well with the EALR Physical Properties Section. It also continues to build inquiry and application skills.

Brief description:

Students use the garden to gain empirical observation and analysis skills in addition to understand more nebulous concepts of force.

Complete lesson plan on back:

Materials

Students will need a notebook, pencil, and a ruler.

Procedure

Break students into groups of four. Have students closely identify their plants, taking measurements, noting color, texture, size, etc. They should compare one plant of the same species to another as well as similarities and differences between their different plant species.

Second, pick one student from each group to pull up each group's three plants. You as a teacher should do this to try to get variety in size and strength of student to demonstrate force. As a class, talk about the differences between the students (of course, be sensitive) and then one by one, have each student pull up his or her group's three plants. The teacher should also pull three up. Discuss how easy/hard this was and incorporate a discussion of force based on the EALR standards.

Finally, have students measure the length and width of the roots and hypothesize why different root systems exist and what purposes they serve. Clarify hypothesis with a simple scientific explanation of root systems.

Additional Activity

None.

New vocabulary

force root system

Assessment:

1. Name three differences between these lettuce plants:



a.

<http://www.vegetableseed.net/heirloom-vegetable-seeds/lettuce-seeds/rubyred.jpg>
<http://plantfinder.sunset.com/sunset/plant-details.jsp?id=1675>



b.

Answer (for teacher use): color, shape of leaf, red one goes out more than green one (more surface area).

2. Would you rather pull up a lettuce plant or a corn plant? Why?

Answer: Corn plants have deeper roots and are a bigger plant. Pulling it up would require more force (bigger person, harder pull) than pulling up a lettuce plant.

3. What is a tap root?

Answer: A tap root is a deep root that draws water and nutrients to the plant from deep in the ground. These plants are generally difficult to get rid of because the tap root is hard to pull out (dandelions have tap roots).

Draw your lettuce

Write about your lettuce (describe its size, shape, color, texture, abnormalities, etc)

Compare your lettuce to another lettuce (what similarities and differences do you see?)

Fact sheet about roots (for teacher to aid in explaining the length and width of root systems)

Roots exist to absorb water and nutrients, store nutrients, and anchor plants.

The quality of soil, the type of plant, and the weather conditions all factor in to what the root system will look like.

In the experiment, we can see which root is the longest and the widest. But there is not an easy way to predict this because of the variables listed above. A lettuce plant grown in slightly different soil or given more or less water can have a completely different root system than another.

But we can loosely predict root configuration based on the families plants come from.

Storage roots: carrots beets. Store nutrients and water particularly well for plants. They are generally very thick in comparison to the other roots and are the primary deliverer of sustenance.

Tuberous roots: potatoes. The roots collect nutrients and water in specific areas but still have a collection of smaller roots.

Taproot: storage roots can be taproots (although not all are). One primary root forms vertically and is the primary deliverer of sustenance. Taproots can be difficult to get rid of because the root can be difficult to dislodge. Dandelions are taproots.

Most plants' roots stay in the first meter or two of soil because this is where the most nutrients and water is available. But particularly in dry climates, roots will go deeper in order to draw out more moisture from the soil. The longest root ever recorded was 60 m long!

Resources used:

Wikipedia

Botany books