

00:06 Speaker 1: In this part, students use tools to dig up plants and compare the structures above ground to those below ground. They also compare root structures of different plants. The focus question is: How do the roots of schoolyard plants compare to the roots of bean plants?

00:25 S1: Here's what you'll need from the kit. For each group, one trowel and two hand lenses. For the class, three 8 L basins, transparent tape, and string. You'll need to supply for the class, four squares of paper in different bright colors, water, three 2 L recycled plastic bottles, one mystery plant with fibrous roots, one mystery plant with a taproot, two large opaque shopping or paper bags, one marking pen, one hole punch, and one camera, optional.

01:05 S1: Make copies of notebook sheets, teacher masters, and assessment masters as described in your Investigations Guide on the materials page for this part. For this part, you will need to find a weedy location easily accessible by students. The site you select needs to have an abundance of at least four different kinds of weeds that students can dig up. Decide which kind of weeds you want students to dig up and observe. Dandelions, tall overgrown grasses, and clover all make great choices. Use a trowel to dig up two of these plants, one with fibrous roots such as a grass plant, and one with a taproot such as a dandelion. These will be your mystery plants. If you are unable to pick and package the plants within 12 hours of doing this activity, set the plants in a container of water. Do not show the plants to students.

02:01 S1: Get two opaque shopping bags and label them, one and two. Place bag one over the fibrous root mystery plant, and bag two over the taproot mystery plant, so that only the root is exposed. Secure the bag tightly with tape or string. Each group of students will select and dig up only two different weeds, but give them at least four possible kinds to select from. Two of the choices need to match mystery plants one and two. Decide which other weeds and/or tall grasses you want students to dig up and observe. Prepare four paper plant markers, each a different color. Cut a rectangle about 12 x 15 cm, a quarter sheet of paper. Fold a small piece of tape over one corner to reinforce the paper. Using a standard hole punch, punch a hole through the tape and paper.

03:00 S1: Thread a string through the hole and cut it, so it is long enough to tie around the sample plant. Tie a plant marker on each of the four sample plants you've chosen outdoors using a different color for each plant. Fill three empty recycled 2 L plastic bottles with water to transport outdoors. Each basin will hold 2 L of water. Consider bringing along a camera, so students can take pictures of the plants before and after digging them up. When students have completed all the inquiries and readings for this investigation, they will be ready for a review and the investigation I-Check. See the assessment chapter for information about coding I-Checks, conducting self-assessment activities, and available online tools.

03:49 S1: This video is not intended to replace your FOSS Investigations Guide. The materials, preparation, and procedures may differ slightly from the edition that you are currently using. When in doubt, always follow the steps as written in your guide.

04:14 S1: To begin, display the hydroponic bush beans setup. Ask, How do our beans get the nutrients they need? If our bean seeds are planted in the ground, where would they obtain the nutrients they need to grow? Hold up mystery plant number one. Say, "Today, we are going to look at different plants that we will find in our school yard. We will look at the roots and the parts of the plant above ground, the shoots." Point to the top part of the bush bean plant and explain that the shoot includes everything above ground or water. The stem, branches, leaves, and flowers are all

part of the shoot. While looking at mystery plant one, explain that the shoot is hiding inside the bag, and that the roots of the plant are exposed. Pass the mystery plant around and have the class describe what the roots look like. Also display the bag, mystery plant two.

05:10 S1: Tell students that they will go to the school yard and each group will dig up two different weeds. Show students the trowels they will use to gently loosen the roots of the plants from the ground. Explain that they can select from four different types of plants, and that you have marked sample weeds with brightly colored paper. Each group will end up with two different plants. After they collect the plants, students may gently rinse the roots in the basins of water. Review the procedures and behaviors for outdoor learning using the outdoor safety poster. Once students understand the task, distribute the hand lenses. Have helpers carry the water basins, and two mystery plants outside. Distribute the trowels outdoors.

06:00 S1: Gather in a sharing circle near some of your marked plants. Explain where the boundaries are. Model how to find a weed that matches a marked plant, and how to use the trowel to dig out the roots from the ground. Also, show students how to shake out soil from roots and how to replace soil in the hole. Walk among your groups, observing as students dig to get all the roots with the shoots. Discuss what students notice about the roots. Have students rinse the plant roots in the basin of water if the roots are hard to observe. Call students to the sharing circle and ask students to place the plant in front of them and to look at the roots.

06:41 S1: Display mystery plant one and ask if anyone has a plant with roots similar to mystery plant one. Once students have discussed the similarities of these plants, name them fibrous roots. Then show mystery plant two. Ask the class for a descriptive name for this root. Give students time to look at their roots to see if any of the plants they dug up have similar roots. Name these types of roots, taproots. Ask students if anyone wants to guess what the shoots of the mystery plants will look like, and have a student helper uncover the mystery shoots.

07:19 S1: Depending on your edition, introduce or review what inherit means. Have students look at the roots of several examples of the same kind of plant so they can see that the general type of root is the same, but each plant has a slightly different looking root. Collect the trowels and have students bring the plants and hand lenses back to the classroom. Recycle extra water by watering plants. Take a few minutes to review the vocabulary and write the words on the word wall. Write or project the focus question and have students transcribe it into their notebooks: How do the roots of schoolyard plants compare to the roots of bean plants? Students should draw and label at least one of their plants to help them answer the question. Have students answer the focus question after they have completed their labelled drawings.

08:20 S1: Take a few minutes to review the keywords developed in this investigation. Ask students to take a few minutes to locate all the focus questions for this investigation in their science notebooks and review their answers. These are some of the big ideas that should come forward in the review discussions. Seedlings have roots, stems, leaves, and cotyledons to help them grow as a young plant. Young plants need water, light, nutrients, and space to grow. The plant cycles from seed through all its stages and begins again with new seeds.

09:00 S1: Germination is the seed's early growth. Seeds are found in fruit. Fruits develop from flowers. Roots are plant structures that serve a number of functions that include taking up water and nutrients for the plant. Each kind of organism looks like it does because it has inherited its

characteristics from its parents. Some characteristics are a result of interactions with the environment.

09:34 S1: Give students the I-Check when the class has completed the entire investigation. You can read the items allowed to the whole class and have students answer independently. Refer to the assessment chapter for coding guides and self-assessment strategies. Note concepts that you might want to revisit with students using next step strategies. At the end of every FOSS investigation, you'll find interdisciplinary extensions. Prior to finishing this investigation, be sure to review these extension activities. Masters for the Math extension and the homeschool connection can be found in Teacher Resources and on FOSSweb.

10:14 S1: For more information, including discussion questions, teaching notes, and English learner notes, plus additional strategies for science notebooks, language development and assessment, please refer to your FOSS Teacher Toolkit.