Pondering Plants

First Grade Science Exploration

Examining the jobs of three different plant parts - roots, stems, and leaves - helps students to understand that all plants need the same fundamental resources: sun, soil, water, and air.

Teaching people to care for themselves, each other, and the world through farm- and garden-based programs.

LIFE LAB

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Pondering Plants
First Grade Science Exploration
Life Lab Science Program

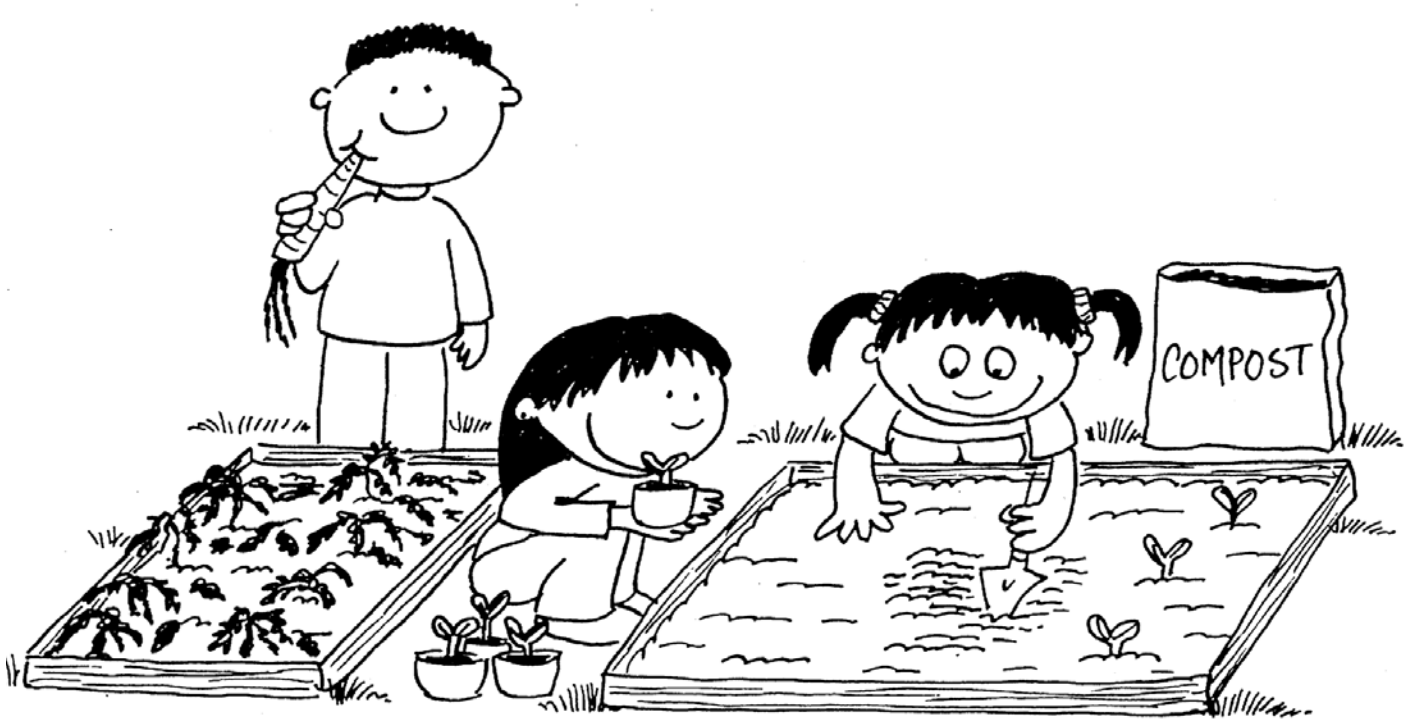
Contents

Teacher Introduction

These exploration lessons are a product of the field trip program at Life Lab's Garden Classroom and can be used in your own school garden or classroom.

Students clearly understand what trees, flowers, and bushes are. They may have a more difficult time comprehending the idea that all of these are plants and are living things. Finding the similarities between all plants becomes easier once students understand the jobs of three different plant parts -- roots, stems, leaves. In this unit, students will learn about the different resources that plants need (sun, soil, water, and air) and how the different plant parts capture those resources from the environment. They will explore plants from different environments and discuss why their roots, stems, and leaves look different.

During their visit to the garden, students will explore the different plant parts and their functions through song, art, guided exploration and hands-on experiences. Students can explore a root view box and draw pictures of roots while they talk about different types of roots and how roots get nutrients and water from the soil. Students can draw stems and do leaf rubbings and explore the many different plants in the garden while discussing what leaves and stems do for the plant. Students will get a firm grasp on the functions of the different plant parts and how plant meet their needs by seeing many different types of plants growing in the garden.



Science Standards

The California Science Standards listed below will be addressed during the Pondering Plants Science Investigation:

Life Sciences:

2. Plants and animals meet their needs in different ways. As a basis for understanding this concept:

a. Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

b. Students know both plants and animals need water, animals need food, and plants need light.

e. Students know roots are associated with the intake of water and soil nutrients, and green leaves are associated with making food from sunlight.

Earth Sciences:

3. Weather can be observed, measured, and described. As a basis for understanding this concept:

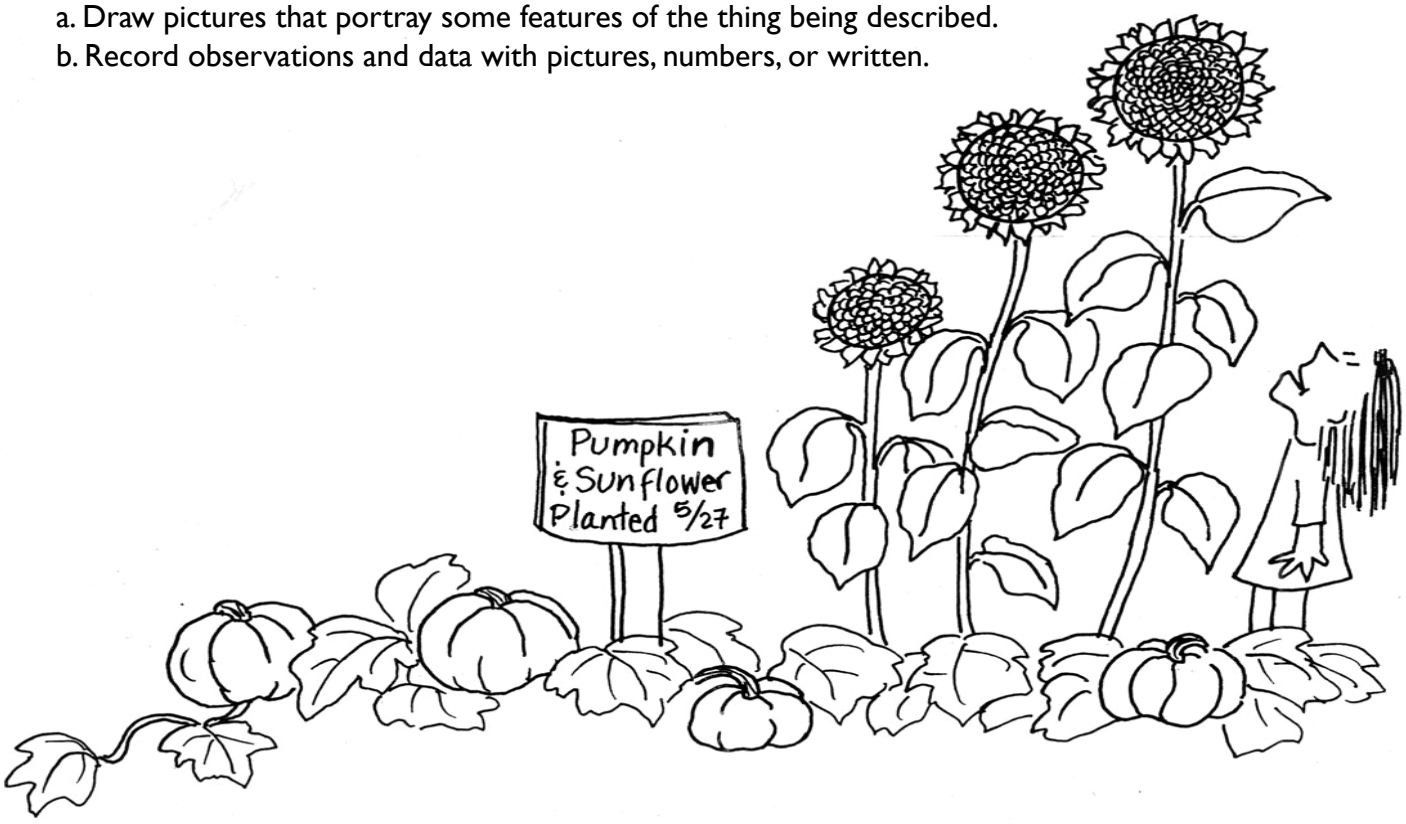
c. Students know the sun warms the land, air, and water.

Investigation and Experimentation:

4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

a. Draw pictures that portray some features of the thing being described.

b. Record observations and data with pictures, numbers, or written.



Resources

Story Books

Jack's Garden. By Henry Cole. HarperTrophy, 1997. The story of Jack as he plants his backyard flower garden. The reader watches the garden flowers grow from seedlings to buds to beautiful flowers in the spring.

The Magic School Bus Gets Planted: A Book About Photosynthesis. By Lenore Notkin. Scholastic Press, 1997. A more advanced book that describes how plants get water from soil, air from leaves and energy from the sun. Also introduces the concepts of chloroplasts, stomata, and xylem and phloem.

Pumpkin Circle: The Story of a Garden. Written by George Levenson, Photos by Shmuel Thaler. Tricycle Press, 2002. Beautiful photographs tell the life story of a pumpkin, from seed to pumpkin to jack-o-lantern and back to a seed.

Pumpkin, Pumpkin. By Jeanne Titherington. HarperTrophy, 1990. The story of Jamie, a young gardener, as he plants his own pumpkin. Beautiful pictures and an easy to read story make this a great book for new and old readers alike.

Tops and Bottoms. By Janet Stevens. Harcourt Children's Books, 1995. A funny and beautifully illustrated story about a bear and a rabbit who plant crops together, and comically make the distinction between "top" and "bottom" crops.

Even more story books are found here:

The Good Kids' Book List, compiled by the The Junior Master Gardener Program and the American Horticultural Society, includes the top children's garden books of the last 100 years.

www.cfaitc.org/books/ California Foundation for Ag in the Classroom offers an extensive list of garden and nature based books for all grade levels.

Garden Songs

The Banana Slug String Band has an extensive collection of environmental ed and garden-themed songs, including one of our favorites, "Roots, Stems, Leaves." Find more at http://bananaslugs.bandcamp.com/album/singing-in-our-garden.

Hear Life Lab Staff singing garden related songs at our YouTube channel:
http://www.youtube.com/lifelabvideos.

Master Materials List: Pondering Plants

Plant Detectives

- 8 objects: 4 plants, an insect, a rock, and two human-made objects
- 2 3-foot long sheets of butcher paper
- 2 sheets of 8 1/2" x 11" paper (scrap paper is okay)

Leaves and Stems

- Leaves and stems for students to draw, rub, or trace
- Art supplies: paper, crayons, markers, and colored pencils for all students
- One knife
- 3-4 magnifying lenses per group of 6-7 students
- 1-2 stems to cut up (broccoli works well) per group of 6-7 students
- Leaf scavenger hunt list (see page 15)

Roots

- Weeds for students to pull (either one large weed for the whole class, or one small weed per student)
- One sheet of poster paper and markers for each group of 6-7 students
- Art supplies: paper, crayons, markers, and colored pencils for all students
- Root matching game cards (see pages 16-18)

Watercolors

- One fresh celery stalk with leaves per group of four students
- One clear glass or cup per group of four
- Red food coloring
- Water

Plant Watchers

For the class:

- 1 bag organic seed starting mix

For each pair:

- 1-2 spoons
- Spray bottle full of water
- 6 seeds (lettuce, peas and/or radishes) or 2 broccoli seedlings
- 2 3-inch plastic pots
- 2 labels or 2 strips of masking tape
- Art supplies: paper, markers, crayons

Plant Detectives

Description

Students act as detectives to decide whether or not given objects are plants, and then describe the characteristics of plants.

Objective

Students describe what they know about plants and practice categorizing.

Teacher Background

Children may have many naive ideas about the natural world that contradict scientific thinking and may even seem humorous to adults. In their visit to the garden classroom, students will explore what plants need to survive, but first it is important that they have a firm understanding of what is and is not a plant.

Materials

- 8 objects: 4 plants, an insect, a rock, and two human-made objects
- 2 3-foot long sheets of butcher paper
- 2 sheets of 8 1/2" x 11" paper (scrap paper is okay)

Class Discussion

Encourage students to share their ideas about plants by asking them to be detectives. *How does a detective solve a mystery?* Tell the students they have a mystery to solve. We have a collection of objects, and we need to know which are plants. *What clues should we be watching for? How can we tell if something is a plant?*

Action

1. Divide students into groups of three or four.
2. Rotate students to different stations (each with a different object) and instruct team members to look at each object and decide if it is a plant or not.
3. Review each item separately with the whole class. Write each object's name on the butcher paper under the heading "Is it a plant?" Ask students if each item is a plant. Why or why not? If groups disagree, help them to rephrase their ideas into questions, and write these on the second piece of butcher paper under the heading "Questions we have about plants."

Wrap Up

Review and discuss the two lists. *What is a plant? How can you tell if something is a plant? What things on our list tell us what a plant looks, feels, or smells like? What things tell us what a plant does? What things tell us what a plant needs?*

Leaves and Stems

Description

Students explore the garden to look at a variety of leaves and stems, and learn about their functions through hands-on exploration, art and discussion.

Objective

Students learn about the functions of leaves and stems including how stems transport materials from the roots to the leaves, and how leaves gather sunlight to make food.

Teacher Background

Students may not know that stems play an important role for the plant: transportation of water and nutrients from the roots to the leaves, and food from the leaves to the roots or other parts of the plant. This activity allows them to get up close and personal with different kinds of stems and leaves and explore why they are different.

Materials

- Leaves and stems for students to draw, rub, or trace
- Art supplies: paper, crayons, markers, and colored pencils for all students
- One knife
- 3-4 magnifying lenses per group of 6-7 students
- 1-2 stems to cut up (broccoli works well) per group of 6-7 students
- Leaf scavenger hunt list (see page 15)

Preparation

You will need two or three parent volunteers or aides to allow students to move through the steps of this activity in smaller groups.

Class Discussion

Review what students already know about leaves and stems. *What do leaves and stems do for the plant?* (Leaves capture sunlight that plants need to make food. Stems bring up water and nutrients from the roots and take food from the leaves to where it is needed in the plant and bring down food from the leaves.) *Why is that important? How do water and nutrients get from the roots to the leaves? How do plants make their own food?*

Action

1. Divide the class into groups of three to four students. Have each parent volunteer or aide lead a group of students through the following steps of the activity.
2. Allow students time to explore different garden beds in the garden classroom and the plants found there. *Where are the leaves and stems on these plants? Do all of the leaves and stems look the same?*
3. Lead students on a leaf scavenger hunt (see page 15). Tell the students that it is their job to find each of the items on the list. Read each item on the list, one at a time, and encourage students to search the garden together. Discuss the different types of leaves and what each one might do to help the plant survive.
4. End the scavenger hunt by allowing students to pick up leaves from the ground.
5. Give students time to create art projects with the leaves and stems they found. Encourage students to be creative. They can draw the whole plant, make leaf rubbings, or trace the stem.
6. After cutting open a stem, allow students to use magnifying lenses to look inside. Talk about how the stem of a plant is like the elevator of the plant.

Wrap Up

Encourage students to share what they have learned about leaves and stems. *Why are leaves important? Would the plant grow without them? What would happen if plants didn't have stems? What can we do to help leaves grow?*

Roots

Description

Students explore roots in the garden, describe them verbally and through art, and play a matching game to investigate different types of roots.

Objective

Students learn about the many functions of roots including how they get water and nutrients from the soil.

Teacher Background

Students may have broad ideas about roots and their functions. This activity allows them to see roots growing, feel and draw roots, and learn about different kinds of roots.

Materials

- Weeds for students to pull (either one large weed for the whole class, or one small weed per student)
- One sheet of poster paper and markers for each group of 6-7 students
- Art supplies: paper, crayons, markers, and colored pencils etc. for all students
- Root matching game cards (see pages 16-18)

Preparation

You will need two or three parent volunteers or aides to allow students to move through the steps of this activity in smaller groups.

Class Discussion

What are roots? What do they do for the plant? How? (Roots take up nutrients and water from the soil that the plant needs to grow and live.) *We're going to look at many different kinds of roots and talk about what they do to help plants grow.*

Action

1. Divide the class into groups of three to four students. Have each parent volunteer or aide lead a group of students through the following steps of the activity.
2. Start by letting the students conduct a finger test of the soil. Have them try to "plant" a finger into moist, soft soil and also into the hard compacted soil of a path. *Which place would plants want to grow? Why? Roots like light, fluffy soil in order to move into the soil to find water and nutrients.*
3. Let students pull out a weed (you may need to loosen the soil to enable them to pull up the roots) and bring the roots back to a parent or another adult who did not see the roots. Have the students work as a group to use describing words to tell the parent how to draw the roots from one of their weeds without the parent seeing it. Have the parent draw the root based on these descriptions and then compare the drawing with the actual root.
4. Allow students time to draw, trace, or in anyway explore the roots they collected.
5. Play the matching game with students (see paqges 16-18). The group leader (parent or aide) should hold onto the root description cards, and give a root picture card to each student. Read each root description card aloud to the group, and ask students to raise their hand if their root picture matches that description. Have the students explain why their root belongs in that group.
6. End with a discussion about the activity. Ask students to tell you what they have learned about roots and what roots do for the plant.

Wrap Up

Encourage students to share what they have learned about roots. *What do roots take from the soil to give to the rest of the plant? Would the plant survive without roots? How can we help roots to grow in the soil?*

Watercolors

Description

Students observe colored water move through a celery stalk.

Objective

To demonstrate how water moves to the leaves and is used in photosynthesis.

Teacher Background

Water moves upward in plants: it enters through the roots, travels up through the stem, and exits the plant through tiny holes in the leaves. As water evaporates from the leaves of plants, more water is pulled upwards through the stem. By moving water through in this way, plants play an important role in the water cycle. The water that leaves the plant enters the atmosphere. This lesson will give students an opportunity to see that water moves through the plant, and that the stem provides roadways for its passage.

Materials

- One fresh celery stalk with leaves per group of four students
- One clear glass or cup per group
- Red food coloring
- Water
- Hand lenses

Class Discussion

Start by asking questions: *Where do plants get water? (From the roots.) How do we know plants need water? Leaves need water to make food. How do the leaves get the water? How does the water travel from the roots to the leaves? (Through the stem.)*

Action

1. Divide the class into groups of four and distribute materials.
2. Have each group add water and food coloring to their containers.
3. Immerse a celery stalk with bottom cut off in the water in each container.
4. Have each group label their container and set it in a visible location.
5. Make a drawing or graph of the celery plant. Daily, observe and record the height of the colored water in the stalk every few hours.
6. When the food coloring reaches the leaves, cut the stem and examine it with hand lenses.

Wrap Up

Ask the students, *What did you observe? Why is it important for water to reach the leaves? How did the water get pulled to the leaves? What do stems do for the plant?*

Plant Watchers

Description

Students plant seeds or seedlings and learn about the needs of plants.

Objective

Students practice planting seeds or seedlings and use their observation skills to watch their plant change over time.

Teacher Background

The transformation of a seed from a tiny motionless speck to a green shoot pushing its way out of the soil is thrilling to observe -- especially for children.

For seeds to germinate, the right conditions are necessary:
Water: Water the seeds lightly to keep the soil moist. The water softens the seed coat and swells the inside of the seed, causing it to crack open. However, too much water can drown a seed.
Temperature: Each type of seed has a range of temperatures at which it grows best. A classroom temperature of 60 ° F to 80 ° F is satisfactory for most seeds. Until the plants have two sets of leaves, try to avoid window sills and other sections of the room in the which the temperature fluctuates radically.
Oxygen: Seeds need oxygen. Soil that is compacted too tightly can smother them. Plant them in a seed starting mix.
Light: Seeds germinate best in the dark. Seedlings, on the other hand, need plenty of light.

Materials

For class:
- 1 bag organic seed starting mix

For each pair:
- 1-2 spoons
- Spray bottle full of water
- 6 seeds (lettuce, peas and/or radishes) or 2 broccoli seedlings
- 2 3-inch plastic pots
- 2 labels or 2 strips of masking tape
- Art supplies: paper, markers, crayons

Class Discussion

Encourage students to share what they know about seeds by discussing how scientists work. *What is a seed? What does it need to grow? How do you plant a seed? How does it change after it has been planted? Scientists observe things to find answers to their questions. As they watch, they record their observations.* Tell students that they, too, will be watching and recording in this activity.

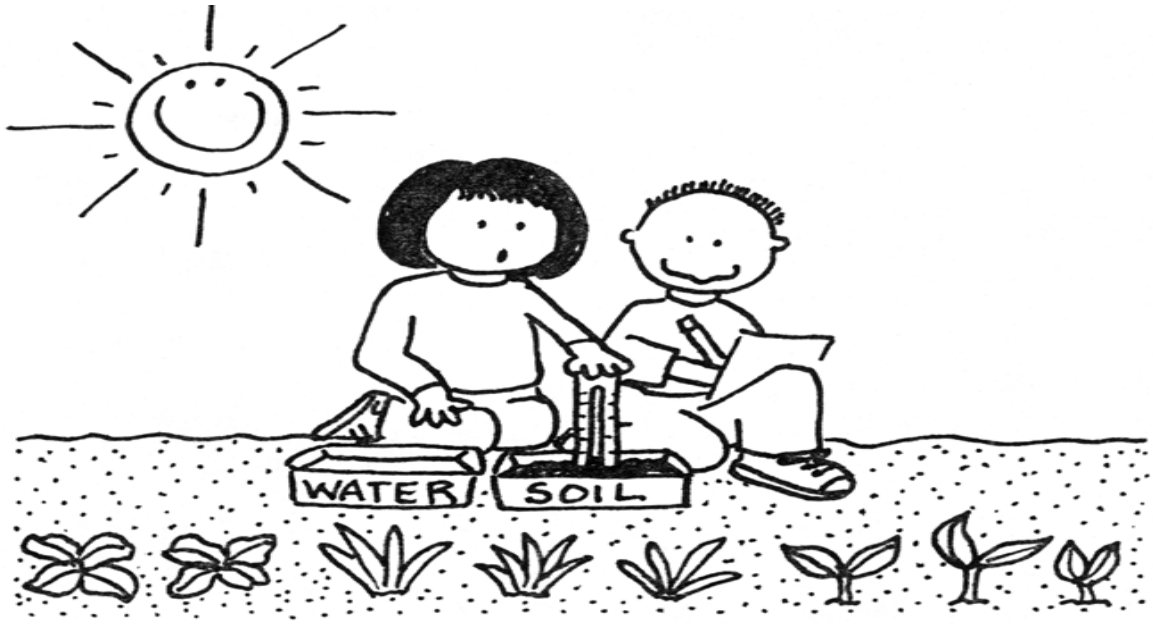
Action

1. Divide the students into pairs. Have them draw a picture of one or all of the seeds. If you are using more than one type of seed, explain which seeds are which and have students identify each in their picture. If you are transplanting seedlings, have the students draw the seedlings.
2. Direct each pair to a planting station. Instruct them to work together to do the following:
- Write their names on the masking-tape strips or labels and place one on each pot.
- Use the spoons to fill the pots about three quarters full of soil.
- Plant each seed by poking a hole in the soil about twice the seed's length. In other words, the smaller the seed, the shallower the hole.
- Gentle brush the soil back over the seeds
- Use the spray bottle to mist the soil. The soil should be wet but not drenched.

3. Place the seeds in a location where they can be watched and maintained.

Wrap Up

Ask pairs to reflect on their experience. *What do you think will happen to your seeds? What do you think the seeds need to grow? What can we do for the plants to help them grow?*



Plant Reporters

Description

In this post-assessment activity, students discuss what they have learned, and review and answer the questions they had about plants (recorded during "Plant Detectives" activity).

Objective

Students demonstrate what they have learned about the characteristics of plants and what resources plants need to grow.

Teacher Background

This activity serves as a way to review what the students have learned, as well as answer any lingering questions students might have about plants.

Materials

- "Questions we have about plants" poster from "Plant Detectives" activity

Class Discussion

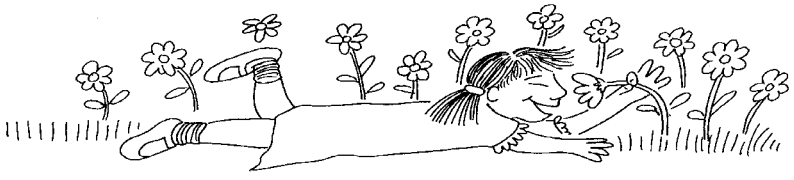
Review the list of "Questions we have about plants". *Do we now know the answers to these questions? How did we find the answers? What have we learned about what plants need? What have we learned about how plants change?*

Action

1. Share a newspaper or magazine gardening column with the class.
2. Have students imagine that they are reporters planning to interview their classmates about their plant experiments. Have them brainstorm questions and record the questions on chart paper.
3. Pair up students and have them role play as television reporters and plant scientists being interviewed about the class experiments.

Wrap Up

Ask students what they learned during their plant unit. *What was your favorite part of the unit? What do you still want to learn about plants? Where could we find answers to those questions?*



See Leaves and Stems Activity, Page 7

Leaf Scavenger Hunt

Find a plant with…

BIG leaves

Why would a plant have big leaves? What might collect there? What happens to the soil underneath them?
(Some plants have big leaves to collect water, keep the soil underneath the plant moist, and collect more sunlight.)

Spiny leaves

Why would a plant have spiny leaves? Who are they protecting the plant from?
(Some plants have spiny leaves so animals will not eat them.)

Leaves that smell good

Why would a plant have leaves that smell good?
(To attract pollinators.)

Leaves that smell bad

Why would a plant have leaves that smell bad?
(So animals will not eat them.)

Waxy leaves

Why would a plant have tough, waxy leaves?
(Some desert plants have waxy leaves to help keep water inside.)

Thick leaves

Why would a plant have thick leaves? What might the plant store in its leaves?
(Some plants that live in dry places store water in their leaves.)

Leaves that trap insects

Why would a plant have leaves that trap insects? What does a plant do with the insects that it catches?
(The plant digests the insect and gets minerals from it. This is a way for plants to survive in soil with very few nutrients.)

Leaves we like to eat

We eat food from plants every day! What are some leaves that we like to eat?

See Roots Activity, Page 9

Tap Roots

Plants with tap roots have one big, long root.

- Plants with tap roots will not be knocked over by the wind or animals.
- Plants with tap roots can reach nutrients and water that are deep down in the soil.

Fibrous Roots

Plants with fibrous roots have many small roots.

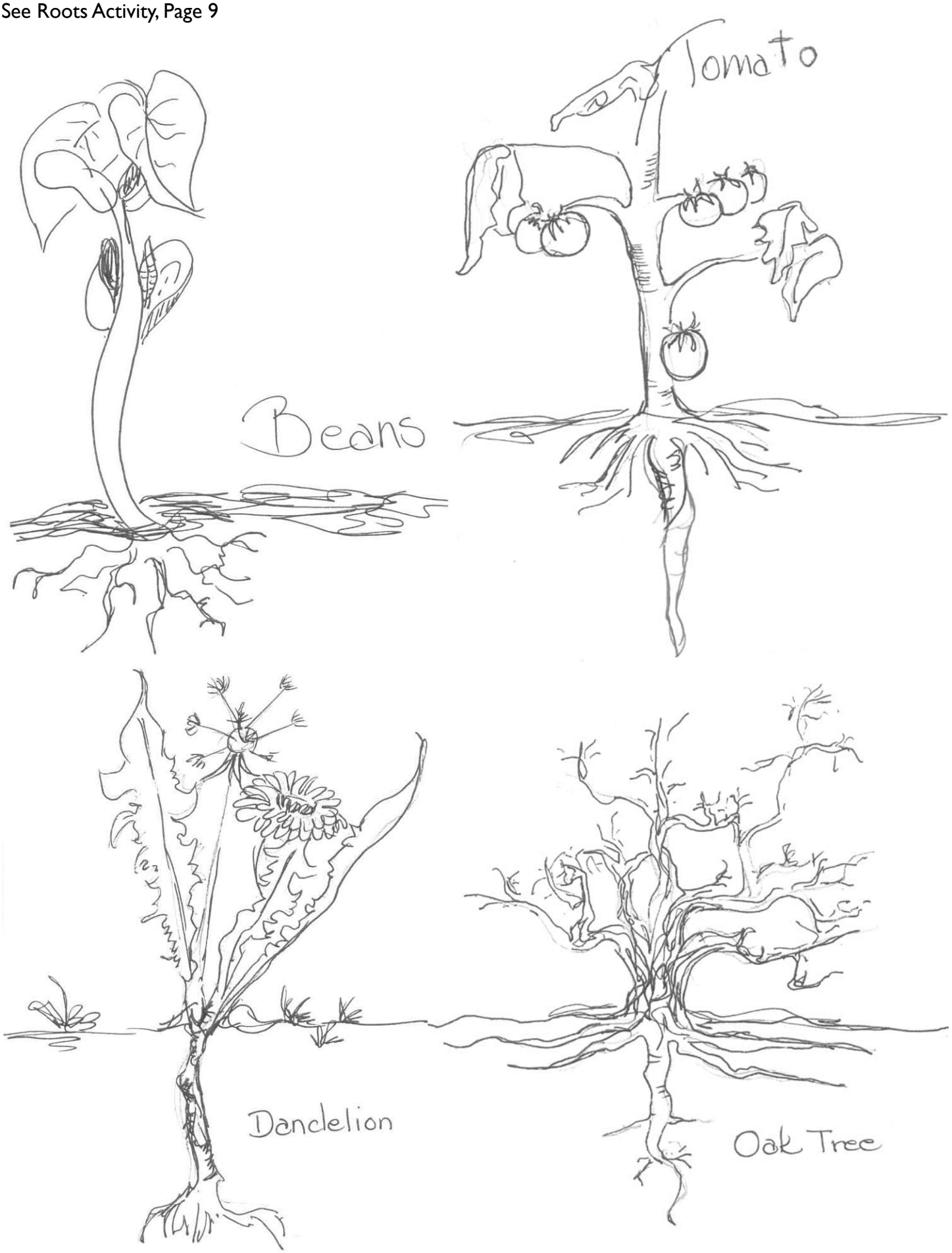
- If animals eat the leaves and stem of a plant with fibrou roots, some of the roots will stay behind to start growing again.
- Plants with fibrous roots can gather many nutrients and water from the top layer of the soil.

Food Storage Roots

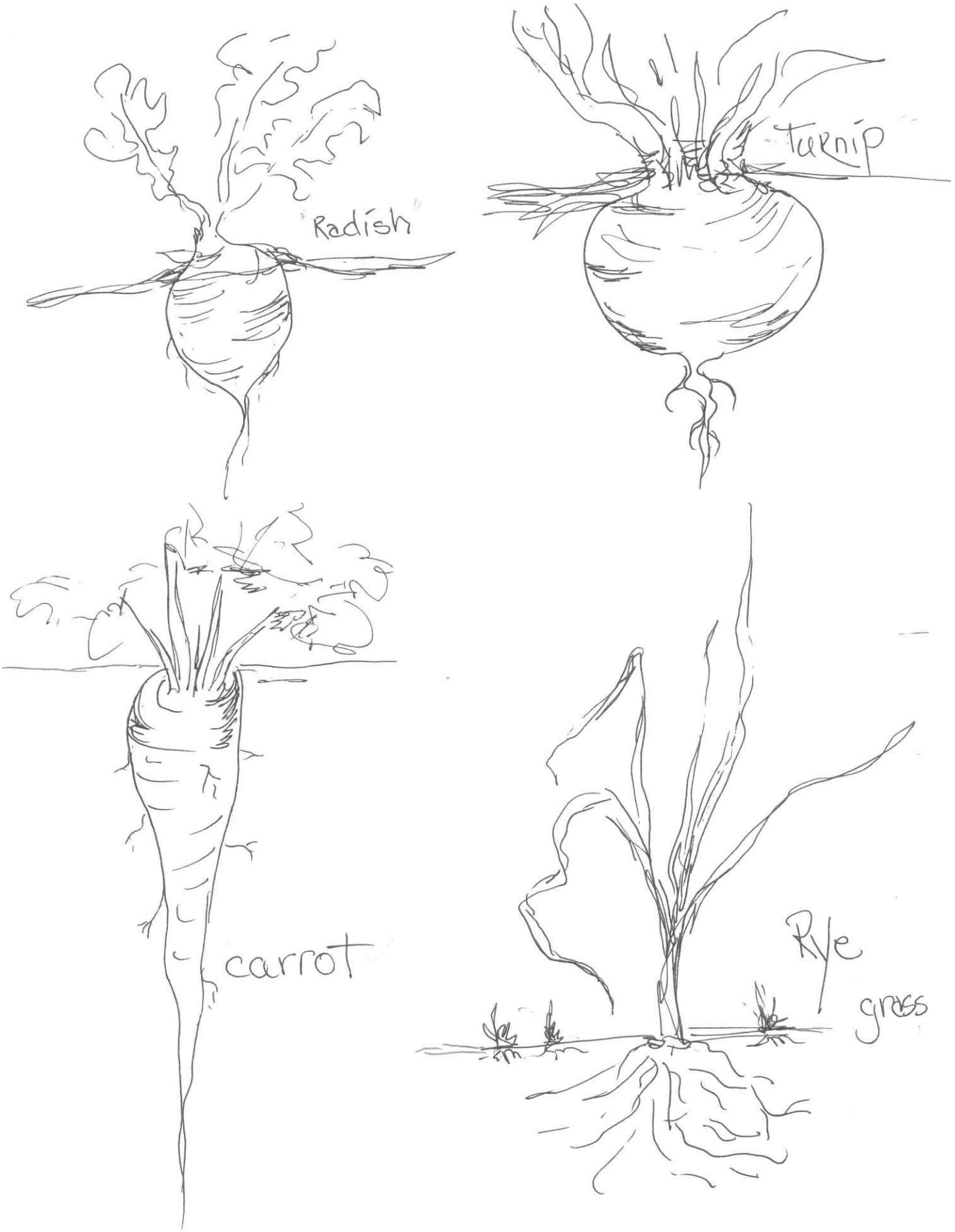
Plants with food storage roots have one main root that grows long and wide.

- Plants with food storage roots keep animals above ground from eating the food that they worked hard to make.
- Plants store food in their roots to use during the winter, when there is little sunlight and the plants can not make very much food.
- Food storage roots are actually a type of tap root!

See Roots Activity, Page 9



See Roots Activity, Page 9



Garden-Based Learning Resources

Life Lab Science Program

Watch learning come to life in the garden!.

Since its inception in 1979 Life Lab Science Program has been a leader in Garden-Based Education. Training thousands of teachers across the nation, creating the Garden Classroom, a nationally recognized model school garden and training center, and publishing curriculum and activity guides are a few of Life Lab's accomplishments.

Life Lab teaches people to care for themselves, eachother and the world through farm- and garden-based programs.

Professional Development Workshops

Life Lab has developed a wide selection of garden-based learning workshops, available at our Garden Classroom Training Center or at your school site. Consulting services and/or specialized workshops are also available. Contact education@lifelab.org or visit the professional development page at www.lifelab.org.

Creating and Sustaining School Gardens

In this one day workshop you'll learn how to take the first steps of creating a living laboratory, including setting goals for your site, gathering input from users, making a fundraising plan, finding volunteers and donors, publicizing your garden and connecting to academic standards.

The Growing Classroom

This two-day workshop is ideal for those interested in supplementing their existing science program with garden-based learning. Using The Growing Classroom activity guide for grades 2-6, you'll experience hands-on activities aligned with CA State Science Standards, learn basic science concepts and gardening techniques, and develop planning and management strategies for a school gardening program.

Life Lab Science

This two-day workshop uses Life Lab's K-5 core curriculum- Life Lab Science to teach earth, life and physical science using the garden.

Discovering the Garden in Early Childhood Education

Spend a day looking at the garden through the eyes of a pre-schooler. Sample many activities that encourage young children to learn about their world using all their senses.

Plant It!, Grow It!, Eat It!

Make the connection from seed to table in this fun and delicious workshop. Explore ways to teach nutrition through gardening, harvesting and meal preparation while integrating with core academic subjects.

Math and Science in the Garden

This is a one-day workshop for upper elementary and middle school teachers who want to use the garden to enhance math and science learning.

Creating A Waste Free School

Learn how to reduce the amount of waste your school sends to the landfill while you reduce the amount of money you are literally throwing away.

Consultation & School Gardens Tour

Life Lab was founded in 1979 at Green Acres Elementary School in Santa Cruz. Since that time, Life Lab Science Program has been a leader in the school garden movement, helping to create thousands of school gardens across the U.S. Life Lab will lead your garden team on a tour of thriving school gardens in and around the Santa Cruz area. Gain ideas on design, educational uses, management and nutrition education.

Garden-Based Learning Publications

Life Lab Science K-5 Curriculum

Recognized by the Smithsonian Institute as an "outstanding curriculum", Life Lab Science is a garden-based, and grade level specific (K–5) curriculum. Teacher instructional manuals include pre- and post- assessment, unit planners, parent letters, and suggested connections to language arts, math and social studies. Also available: student activity guides and Spanish blackline masters for grades first through fifth, and music CD. Downloadable California State Science Standards matrix available at www.lifelab.org

www.lifelab.org (831) 459-2001

Life Lab Science K-5 Curriculum

Kindergarten: Great Explorations
Teacher Resource Book $75.95

1st Grade: Earth Is Home
Teacher Resource Book $79.95

2nd Grade: Change Around Us
Teacher Resource Book $79.95

3rd Grade: How Things Work
Teacher Resource Book $79.95

4th Grade: Connections
Teacher Resource Books with Lab Materials $189.00

5th Grade: Change Over Time
Teacher Resource Books with Lab Materials $189.00

More Resources

The Growing Classroom: Garden-Based Science and Nutrition Activity Guide

The Growing Classroom is our award winning resource book containing step-by-step instructions for setting up a garden-based science program and many outdoor classroom activities. Topics include working together in the garden, growing, nutrients, garden ecology, climate, nutrition, gardening tips and food choices. Downloadable CA State Science Standards matrix available at www.lifelab.org. 464 pages. **$39.95**

Kids' Garden Activity Cards - 40 Fun Indoor and Outdoor Activities and Games

This boxed card set makes a great gift for any child or family ready to create and explore the garden. These activities come in a set of 40 beautifully illustrated double-sided activity cards. Activity themes include:

* Exploring the Garden
* Planting and Growing
* Having Fun With Plants
* Discovering Garden Critters
* Creating Garden Art

The box also includes a garden instruction leaflet providing tips for gardening with kids. **$19.99**

Getting Started: A Guide for Creating School Gardens as Outdoor Classrooms

This 50-page guide that asks and answers most questions you need to consider for creating an outdoor classroom garden. **Free download at www.lifelab.org**

Sowing the Seeds of Wonder: Discovering the Garden in Early Childhood Education

Through hands-on activities preschool-age children will engage all of their senses as they discover the joys of gardening. Sowing the Seeds of Wonder is an educator guidebook that provides insight and lessons for educators to help students develop a lifelong connection to the outdoors. Lessons guide young students to dig into the soil; observe birds, insects, and other critters in the garden; and enjoy the tastes of fresh fruits and vegetables they plant, harvest, and prepare. **$16.95**

Popcorn/Maize

Activities help raise awareness about the diversity of local and national food production, introduce components of farming and demonstrate basic ecological concepts related to growing food sustainably. **Popcorn (lower grades)/ Maize (upper elementary and middle grades) $19.95each**

Create from Waste

K-7 activity guide for engaging students in community based ecology and waste reduction.
75 pages, **$19.95**

Away with School Waste

A teachers guide to starting school waste reduction, recycling, and composting program. 17 pages, **$19.95**

Banana Slug String Band CD Singing In Our Garden_

Teach ecology, science and nature with the Banana Slug String Band. A collection of Banana Slug favorites including: Roots, Stems Leaves; I'm A Tree; Dirt Made My Lunch; Soil, Sun, Water and Air; Water Cycle Boogie; and Decomposition. This CD accompanies our curriculum. **$15.00, Singing In Our Garden Lyrics $9.00**

Garden Signs

Created by the Life Lab Garden Classroom Staff and Design Science Graphics these garden themed signs will turn your garden plot into an interpretive site. Themes: weather, habitat, plant's needs, investigating the garden, plant adaptations, vermi-composting and composting. Have your sign professionally manufactured at esigns.com. **$20/design, order online to download PDF files**

Life Lab teaches people to care for themselves, each other, and the world through farm and garden-based programs.

For more information, please contact Life Lab Science Program (831) 459-2001
www.lifelab.org