

PLANT PARTS AND PHOTOSYNTHESIS

MCAS CONCEPTS: Plant Needs, Plant Parts, Function, Adaptation, Photosynthesis, Producer

OBJECTIVES:

- Review what plants need to live and grow: air, water, minerals (nutrients)/soil, warmth, and sunlight.
- Develop an understanding that a plant is a living system. Observe the parts of this system: roots, stem, leaves, flower, seeds. Make scientific drawings of each.
- Infer the function of plant parts by noticing their shape, texture, and location. Recognize that plant parts are adaptations that enable a plant to survive.
- Reinforce the role of leaves in the process of photosynthesis.

WALK PREPARATION: (grade level coordinator)

- Mark plants for each station. Cut stem samples and place near growing plant. Dig plant samples for roots station.
- Work out a rotation plan with volunteers so that there is only one group at a station at a time.

MATERIALS:

For each student:

- Clipboard, pencil.
- Recording sheets on clipboard
- Hand lens (can be shared)

ACTIVITIES:

- Introduce walk objectives to group of students.
- Draw a tree and label its parts.
- Closely observe, label, and compare the plant parts featured at different sites. Think about how the part helps the plant to survive.
- Wrap up: Re-visit tree; add labels for plant parts if needed. Identify tree parts involved with photosynthesis. Act out how plant parts work together.

Pre-Walk Activities: To Be Led by Classroom Teacher

1. (Review from grade 4 crayfish unit)

Have each student observe a pencil (or another common object that consists of a number of parts, like a door, window). Such an object can be considered a SYSTEM. Ask: Are all the parts of this pencil exactly the same? (No) What are some of the pencil's parts? (Wood cylinder, eraser, metal eraser holder, black "lead" (really graphite), paint, etc.)

2. *What is a pencil used for?* (Used for writing) This is called the pencil's FUNCTION. A FUNCTION is what a thing is used for (its purpose)

How does the shape, size or type of material that the pencil is made of help us to use it for writing? How do the parts of the "pencil system" work together to help us write with it? What if the pencil was the shape of a basketball, or the size of a telephone pole, or was made of Silly Putty? What if the black stuff in the middle were hard metal? What properties do the pencil parts have that helps them accomplish their FUNCTION?

Pencil part	Properties	Function
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The FORM or STRUCTURE of the pencil parts allows us to write with the "pencil system."

3. A plant is a LIVING SYSTEM. On our Big Backyard walk, we will be looking at the parts of plants, not pencils. Plants have special features that help them to survive, for example, roots are shaped so that they can absorb water and are located underground. These special structures are called ADAPTATIONS. We will be thinking about the purpose of each plant part and using evidence to support our claims.

4. (**New information-** In grade 3 students recognize a plant's need for light, but they do not get into the details of food making. In Grade 5, students are expected to know the basics of photosynthesis.)

Plants are living things. Like other living things, they need food to live and grow. How do you get food? (Plants and animals we get at the store or grow in our garden.) How do plants get food? (They make their own in their leaves!!) Leaves are an important adaptation for plants because they can do something that humans and other animals cannot—they can make food. Scientists tell us that leaves are like small food factories. Leaves take in an invisible gas called carbon dioxide through small holes in their surface. They get water from their roots. Leaves use energy from sunlight to change carbon dioxide and water into sugar, which is a food. A green chemical in the leaf (chlorophyll) helps the plant to absorb light energy. The plant can use this sugar as a source of energy, just like you do. This is an amazing feat!! No other living things can do this!! (Imagine if you never had to eat as long as you got some air, sunshine and water—of course, you would have to be green!!)

In addition, one of the gases given off when plants make food is oxygen. Plants provide the oxygen that we breathe!!! (Plants actually take in oxygen, too, when they need to burn sugar to release energy for life processes. But they take in less oxygen than they give off as a result of photosynthesis.)

This process of "food-making" in plants is called: **photosynthesis**

Sometimes you can learn a lot about something by looking closely at the word that describes it.

Photosynthesis is one of those things. The word photosynthesis is made up of a prefix (photo—related to light) and a root word (synthesis—meaning “make from parts”).

Ask: *Why is this good name for the process of food making in plants?*

What might a recipe for photosynthesis look like?

See: <http://www.realtrees4kids.org/sixeight/letseat.htm>

This recipe is a very simple way to think about photosynthesis. It's really a very complicated process and scientists are still learning exactly how it works

Say: *So plants can take things that we can't hold in our hands--energy from the sun, and carbon dioxide gas, and liquid water--and turn them into sugar, which we **can hold** and eat, AMAZING! So plants are **PRODUCERS** of food for themselves and for other animals.*

All living things need food. How does the ability to make its own food help a plant to survive? This is an important plant **adaptation**. **An adaptation is a feature that helps a living thing to survive.**

Other resources:

Discovery Videostreaming:

Food: Energy from the Sun (Photosynthesis)

Newton's Apple: <http://www.newtonsapple.tv/video.php?id=915>

NATURE WALK: TO BE LED BY BIG BACKYARD VOLUNTEER
[60-75 minutes]

1. Plant Needs

Find a plant right outside to focus on. *Ask: Why are plants so important? Right—they provide food and oxygen that animals need to survive. No plants means no animals!!* * *Ask: What does this plant need in order to live and grow? (water, light, air, soil nutrients, food, warmth) You are going to observe some special plants closely and then draw what you see on these notebook pages (Each student should have copies of the recording pages on a clipboard.).* Remind students to write the name, teacher and class code on the first sheet.

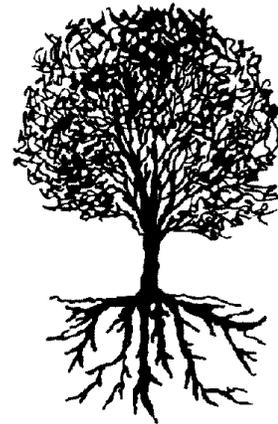
Today we will be plant detectives. We'll try to figure out how different plant parts are really special **ADAPTATIONS** that help these important organisms to survive. We will see how these plant parts help them to meet their needs.

* **Note:** There are exceptions where algae or deep sea vent organisms produce their own food, but in general, plants ARE necessary as food for animals.

2. Are Trees Plants?

Walk your group to a tree and stand around the tree (Each group should choose a different tree). *Ask: Are trees plants? (Yes.) How do you know? (Trees have plant parts—leaves, roots, etc. They are NOT animals!)*

Look for animals or signs of animals around the tree. *Ask: How do these animals get food? (They find insects or seeds on the tree. If they don't find food on this tree they can hop to the next.) What about the tree? If all living things need food, how does the tree get food?*



BE A TREE: Think: What do you do to get food? **IF YOU WERE A TREE:** How would you feed yourself if you were rooted to one spot for your entire life? Pizza delivery would be too expensive. Could you grab snacks from passing students with your branches? Would you sink your roots deep in search of an underground MacDonald's? How would you get your food?

(Accept all ideas. A tree is a plant-- and makes its own food through the process of photosynthesis. If students don't bring this up, wait until the end of the walk after they have been to the leaf station, and review food making in the plant then.)

3. Draw Tree and Label parts

Tell students that they will draw the tree on the first page of their packet. Remind them of the elements of field drawing that they learned in art class:

- Observe carefully
- Look for shapes
- Check for proportion (how big one part is compared to another)

Invite students to draw their tree (Allow 3-5 minutes to draw the tree).
If there are parts that we don't see, for example roots, draw them using dotted lines.

Ask students to label parts of the tree. Invite them to label any that they know—they will be able to return later to add parts they forgot.)

4: Observe, Label and Compare Plant Parts

Visit each of the 5 stations below. Work out a rotation plan with other volunteers so that there is only one group at a station at a time.

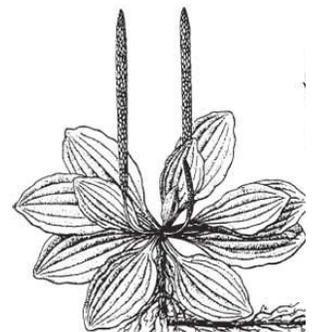
At each station ask students to:

1. Closely observe the featured plant. Use a magnifying lens. Sketch at least one plant. **Say:**
DRAW WHAT YOU SEE?
 - Encourage detail: arrows and words can be used to indicate interesting discoveries.
 - Challenge: sketch two plants and compare. Draw cross sections where appropriate (stems, flowers, nuts, berries, etc.).
 - Optional: Add the name of the plant(s), if known.
2. Consider the function of the plant part. **Say:** WHAT DOES A PLANT USE THIS PART FOR?
 - Ask them to write down a few sentences about how they think features of the plant part help the plant to survive.
 - Encourage them to explain their reasons for their claim. A few examples are listed below
 - Seeds may have fuzz or sticky parts that might attach to a passing animal. If the seed drops from the animal, this would help new plants to grow away from the parent plant.
 - Most leaves are flat, allowing the sunlight to reach most surfaces of the leaf for “food-making”.
 - It doesn't matter if the students are correct as long as they can logically justify their claim with evidence from their observations or experience.

Some students zoom through the sketch and writing. Here are some questions/invitations that promote deeper thinking:

Station A: Roots Station (plantain or grass, Queen Anne's lace or dandelion):

- Compare the two roots. Why do you think having lots of roots would help the plant?
- How would a long, thick root help a plant (think trying to pull dandelions out



of your lawn)?

- If you have plantain, encourage students to follow a root to a leaf and discover the tubes in the leaf that bring water and nutrients from the soil to the leaves. Break off a leaf to see the string-like tubes.

Plantain

Station B: Stems Station (grape, sumac)

- Encourage students to feel the firmness of the stems.
- Have them look at the growing plant to see that the stems hold up the leaves to the light.
- **Ask:** What do you think is the function (purpose) of the curly tendril for the grape plant?
- Suggest drawing a cross-section of the stem showing any tubes or sap in the stem and noting any interesting structures inside the stem.



Sumac

Station C: Leaves (two leaves from different broad-leafed plants)

- Encourage students to notice the veins in the leaves. **Ask:** *Is the vein pattern the same in both leaves?* If they want, they can make a rubbing of the leaf with the pencil rather than sketching it.
- Wonder out loud: *The veins in your arm carry blood—I wonder what is in the veins in the leaf?* (Water and sap)
- Have students hold a leaf up to the light. *Does light pass through the leaf?* (Some does)
- Be sure that students note the color of the leaf.

Station D: Flowers Station (yellow evening primrose near storage shed, or whatever is blooming, fall dandelion) If no flowers are available, bring from home—lilies are good)

- Invite students to take some flowers apart to see seeds forming inside, or look for seed pods on a plant that clearly were flowers at one time. Encourage the use of a magnifier.

Station E: Fruits and seeds Station (Can have several samples: buckthorn berries --caution: mildly poisonous, maple, oak (acorn), fall dandelion, Queen Anne's lace behind Central Office with both flowers and seeds)

- Suggest that students draw cross sections if possible. Squish the berries to see the seeds inside. Crack an acorn. **Ask:** *How do you think these seeds are spread?*
- Go to a Queen Anne's lace clump with both flowers and seeds to make the connection flowers turn into seeds.



Queen Anne's Lace

5: Wrap up

Return to the tree.

1. Review the tree drawing and note any labels that were missing from the first drawing. Check: roots, stem (trunk), leaves, seeds, flowers (Yes, all trees have flowers, but some are hard to recognize.)
2. **Ask:** *What does the tree need to make its own food?* (Sunlight, water, air—carbon dioxide, and nutrients; the green chemical, chlorophyll helps the process).
3. Discuss the role each part of the tree has in the photosynthesis (food making) process.
 - a. Leaves: place where food making takes place; these are like food making “factories” for the plant.
 - b. Roots: bring water and nutrients to the leaves
 - c. Stem (trunk): holds up leaves to sun
4. Or see Become a Tree below.

BECOME A TREE: A Celebration of Tree Parts

Be a seed: curl up in a tight ball near the ground.

Uncurl and kneel—you’ve sprouted!

Wiggle your toes and send down roots.

Stand and push up a stem, your trunk.

Pop out branches by spreading your arms.

Spread your fingers wide to grasp the sunlight—they are leaves.

Wiggle your branches again and spread your hands to sprout flowers.

Close your hands into a fist to make more seeds...and start all over again...you have survived.

Interesting Facts: A tree provides us with important materials: wood and paper from its “stem,” sugar (if it is a maple) from its sap—which comes from the “food making” leaves, seeds (if it is a walnut), AND oxygen (all trees). Two trees can supply all the oxygen you need in a year. Take a deep breath and THANK the tree!!!

Post-Walk Activities (To be led by teacher)

Review plant parts and their function; plant adaptations:

Discovery Videostreaming:

Parts of a Plant [03:34]

Roots [00:45]

Stem [01:21]

Leaves [01:05]

What Is a Flower? [02:08]

Where Do Seeds Come From? [00:52]

How Plants Reproduce [01:21]

Date:_____ Class Code:_____

Name:_____

Draw the tree. Label the parts. DRAW WHAT YOU SEE. Look for shapes and sizes of parts.

Station:

Name of ADAPTATION (plant part you are observing): _____

Make a scientific drawing of this part. OBSERVE CLOSELY (use a magnifier if you want).
DRAW WHAT YOU SEE. Use arrows to point out interesting features.

If you have time, draw more than one sample.

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How do you think this part helps the plant to live?

What makes you think this? (What is your evidence?)