

Activity 1.1 Exploring Plant Parts with Grocery Store Plants

Background:

The plant structures focused on in this activity will use flowering plants typically found at the grocery store. The way botanists define plant parts is often different from everyday conversations. For example, some plant parts that we eat contain seeds, but are called vegetables. If they contain seeds then they are seed containers and therefore fruits. Refer to the previous pages for specific definitions of plant parts.

Objective/Goals:

Using science process skills (observing, analyzing, identifying, classifying) students will be able to distinguish and describe different plant parts (roots, stems, leaves, buds, flowers, and fruits) using grocery store plants.

Time to complete:

Approximately 60 to 90 minutes

CA Science Content Standards:

- K.1.a. *Students know* objects can be described in terms of the materials they are made of (e.g., clay, cloth, paper) and their physical properties (e.g., color, size, shape, weight, texture, flexibility, attraction to mag-nets, floating, sinking).
- K.2.c. *Students know* how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, legs).
- 1.2.c. *Students know* animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.
- 1.2.e. *Students know* roots are associated with the intake of water and soil nutrients and green leaves are associated with making food from sunlight.
- 2.2.f. *Students know* flowers and fruits are associated with reproduction in plants.
- 2.3.e. *Students know* rock, water, plants, and soil provide many resources, including food, fuel, and building materials, that humans use.
- 3.3. Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept:
 - 3.3.a. *Students know* plants and animals have structures that serve different functions in growth, survival, and reproduction.
- 5.2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept:
 - 5.2.a. *Students know* many multicellular organisms have specialized structures to support the transport of materials.
- 6.5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:
 - 6.5.a. *Students know* energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
 - 6.5.b. *Students know* matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
 - 6.6.c. *Students know* the natural origin of the materials used to make common objects.

Lesson Outline:

Pre-activities:

1. This activity could be done as a pre or post activity or done both as a pre and post activity and compared.

During Class:

1. Begin with a discussion on useful plants. Ask students to list all the plants they have recently used that they can remember. This may also be done as a homework assignment and reviewed during class.
2. Divide class into groups of 3-5 students and distribute bags of produce. Students name and identify plant parts.
3. Lead discussion with whole class on names of plants and plant parts.
4. Review as a class different plant parts using the PowerPoint slides.

Optional: End class with a food tasting session.

Preparation:

Plants need to be purchased at the grocery store before conducting this activity. The produce can be divided up based on plant parts (see Materials). Make several bags that include a mixture of different plants prior to class. All the bags do not need to be the same but could include an example of each plant part. One bag is needed per 3-5 students. A few plant examples should be left for the discussion and not included in the bags. Suggested produce (depending on availability and price) are listed under Materials. *Optional:* Clean and prepare produce that can be tasted by students.

Materials:

Caution: Individuals may be allergic to particular plants, such as peanuts or mangos. It is important to determine this prior to conducting the activity to select the appropriate produce for your class.

Flowers, stem: Broccoli, Cauliflower, Asparagus (flower buds), Cabbage (flower bud), Cactus pad (stem), Artichoke

Tuber: Potato

Rhizome: Ginger

Root: Radish, Carrot, Parsnip, Turnip, Jicama

Fruit: Unshucked Peanut, Sunflower seed, Green bean, Tomato, Red Pepper, Mango, Pineapple, Prickly Pear or Indian fig

Procedure:

Pre-Activity Discussion

- Begin class by asking students some questions about plants. Their answers could be written on the board. Here are some potential prompts:
 - Name some ways that humans use plants.
 - e.g. Food, oxygen, paper, wood, medicine, ornamentals
 - Name some plant parts that you are familiar with.
 - e.g. Root, fruit, seed, flowers, stem, leaves, trunk, wood

Hands-on Activity

- Divide class into teams of 3-5 students, depending on the number of produce bags you have prepared. One bag per team.
- Ask the teams to attempt to name the plants in their bag and group them based on plant part.

- As students are working, draw a picture of a plant or flower on the board (see flower diagram handout following lesson).
- The following prompts may be used with students as they work in groups to try to name and group the produce.
 - Why is this a root? Could this be more than one plant part? What do you know about fruits?

Group Discussion

- After the groups have classified the plants, lead a group discussion.
 - Select one of the grocery store plants and ask, what is the name of this plant?
- Next, take the plant and ask, where on the plant diagram should this plant go? Should it be held next to the root, stem, flower, or leaf? Go through the plants that the students have in their bags in a similar format.
- During this discussion other connections can be made. Here are some possible questions and answers:
 - What is the geographical origin of the potato?
 - A common answer may be Ireland
 - The origin of the potato is in the Andes, where are the Andes? (for further background information please see *Activity 1.3: Geographic Origins of Plants & Twelve Important Food Plants*)
 - Let's look at broccoli, cauliflower, and cabbage. They all come from the same plant species, *Brassica oleracea*. *Brassica oleracea* is the special name for these plants or the scientific or Latin name.
 - Think of dogs, there are big Saint Bernards and little Jack Russells, right? These dogs all come from the same species--- *Canis lupus familiaris*.
 - What species are we? *Homo sapiens*. What does this mean? *L. Homo* meaning man and *sapiens* meaning sapient or thinking.
- Following a discussion of the plants in a bag, show a few other plants or produce items that were not in the students' bags. Ask the students to determine what part they represent.
- Other questions that could be asked:
 - What is a tomato? ----- Based on a botanical definition it is a fruit.
 - What do you place in your mouth when you eat a sunflower "seed"?---- actually a fruit, remember it is a seed container.
 - What are some examples of nuts? ---- You might think of the walnut, pistachio nut, or almond. Could they be considered fruits? Why? ---- They too contain a seed within their hard shell.
 - What about other types of "seeds"?
 - What are we eating when we eat a peanut or ground nut (*Arachis hypogaea*)? ---- a seed. Why are peanuts also called ground nuts? ---- Because peanut plants bury their fruits in the ground.

Reviewing with PowerPoint

Using the Grocery Store Botany PowerPoint slides (which can be made into overheads), review with the class the plants that were observed and discuss some of the new plants in the slides. Highlight the concept that plants often have a common name as well as a scientific name or Latin name. Help students see patterns in scientific names, for example, turnip has the scientific name *Brassica rapa* and

rutabaga is *Brassica napus*. These plants are from the same genus *Brassica* but are different species. Ask the following questions about the vegetable salad, is this a vegetable salad? What is the difference between a fruit and a vegetable? How do we know that a vegetable is a fruit? Is a tomato a vegetable? Why did you say yes, or why did you say no? ---- Carrots and potatoes are initially taken from the ground. Are they both roots? ---- Why or why not? When you eat celery, what are you consuming? Are you eating part of a stem? Or a leaf? ---- Are beans a fruit or a seed? ---- What do you eat when you consume an artichoke?

Optional Tasting

Invite students to taste an assortment of produce. Have bite size samples to share with students. During the tasting, provide any additional information about the plant. Ask students to describe the taste and texture. Some suggestions for tasting plants: broccoli, cauliflower, carrots, cherry tomatoes, green beans, red bell peppers, jicama, yuca (needs to be cooked), asparagus (needs to be cooked), mango, prickly pear fruit, or papaya.

Extension Activities:

1. What About Nutrition? Talking about fruits and vegetables can lead to a discussion on nutrition and health. Healthy nutrition connections can be made with plants. Think about roots as a source of carbohydrates. What about seeds and nuts? They are rich in proteins, fats, and oils. Stems provide us with fiber. Fiber keeps our digestion systems healthy. Fruits contain vitamins such as Vitamin C and minerals such as potassium necessary to keep our body functioning. Leaves are also a source of minerals. Think of spinach leaves, kale, and collard greens. A useful resource for plant nutrition is the Harvest of the Month program, a joint project of the Los Angeles Unified School District Nutrition Network and the Los Angeles Unified School District Food Services Branch. Each month different produce is highlighted including historical, nutritional, and mathematical information as well as recipes, vocabulary, fun activities, and literature references. This program started in March 2001 and includes many fruits and vegetables which can enhance the study of grocery store plants. See their website: <http://www.lausdnutritionnetwork.org/>.

2. Is Starch Found in All Plant Parts? Like the carrot, beet, and sweet potato, parenchyma cells constitute the bulk of a potato tuber. These cells are replete with starch granules. Students may test for starch by adding iodine to a raw potato. A dark purple stain suggests a positive test for starch, a polymer (Gr. polys = many; meros = part) of glucose (Gr. glykis = sweet; -osis = suffix denoting full of, having quality of; -ose = in chemistry), a carbohydrate. This can lead to a discussion of nutrition and testing other plants for starch.

3. Observation and Writing. Using produce that students may be less familiar with can provide an opportunity for observation and writing. Students could be given a plant or plant part and asked to describe the plant in writing. For example, they could observe the color, texture, and parts, measure the size, record the smell, and possibly note the taste.

4. Food Journal. Have students keep a journal of what they consume over a week. As a class the journals can be reviewed to see the kinds of plants or plant products consumed by the class. Students could compare their current diet with that of a hunter-gatherer's diet? Can they calculate the calories consumed? How does the

number of calories differ? This offers another way to connect health and nutrition into a discussion of plants.

Guide Resources:

Exploring Plant Parts with Grocery Store Plants PowerPoint slides

References:

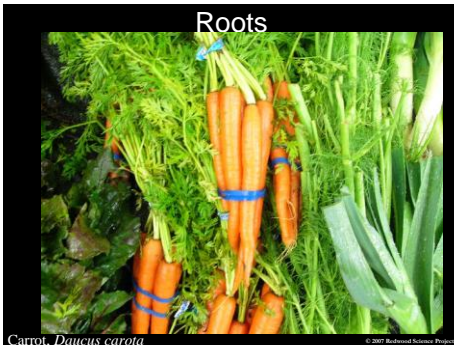
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PowerPoint slides for Unit 1: Activity 1.1 Exploring Plant Parts with Grocery Store Plants

What are Examples of Edible Roots?



Parsnips, *Pastinaca sativa*. *Sativa* = that which is planted.



Carrots, *Daucus carota*.



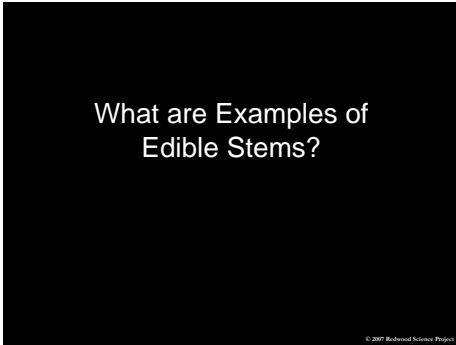
Turnips, *Brassica rapa*.



Radish, *Raphanus sativus*. Notice the scientific name or Latin name, next to the common name. It has two parts: genus and species epithet.



Rutabaga, *Brassica napus*. Notice turnips and rutabaga are in the same genus, *Brassica*.



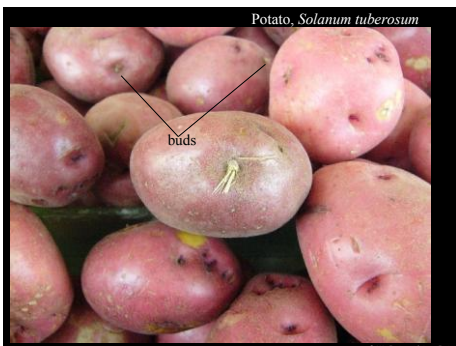
Ginger, *Zingiber officinale*
Ginger, *Zingiber officinale*.



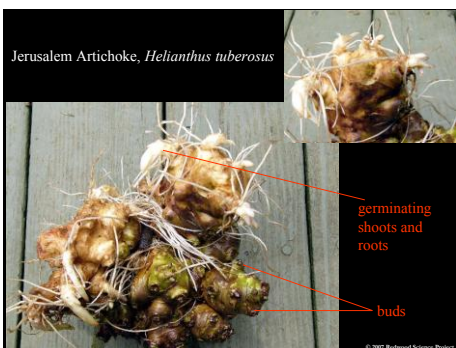
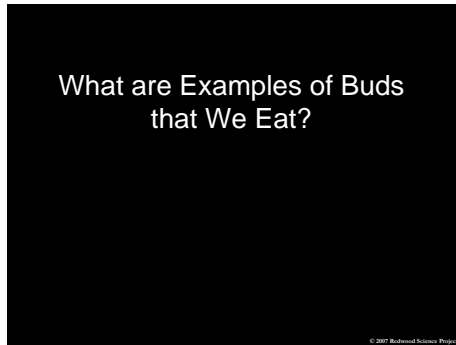
Asparagus, *Asparagus officinalis*. The apical portion of the stem bears immature flowers.



Indian fig or prickly pear, *Opuntia ficus indica*. The fruit of the Indian Fig is edible as is the cactus pad.



Potato, *Solanum tuberosum*. These buds could allow the potato to sprout into a plant.



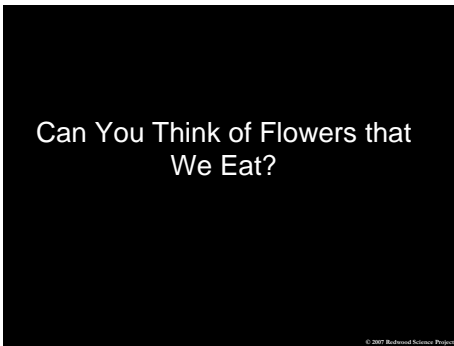
Jerusalem artichoke, *Helianthus tuberosus*.



Cabbage, *Brassica oleracea*.



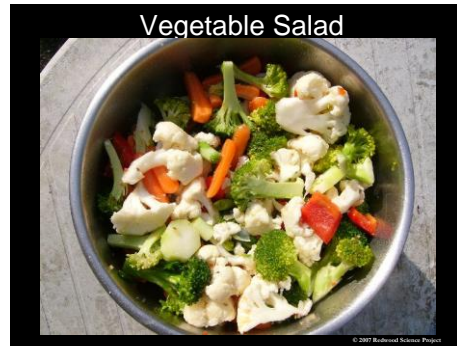
Brussels sprouts, *Brassica oleracea*. Notice Brussels sprouts and cabbage have the same scientific name, *Brassica oleracea*. This plant is adapted by humans to produce broccoli and cauliflower also.



Broccoli, *Brassica oleracea*.



Cauliflower, *Brassica oleracea*.



Is this a vegetable salad? Are there fruits in this salad? What are they? Red peppers.



Bell or Red peppers, *Capsicum annuum*.



Tomatoes, *Lycopersicon esculentum*. Tomatoes and green beans are also fruits. They are seed containers.



Green bean, *Phaseolus vulgaris*. Peas are the seeds.



Peanuts, *Arachis hypogaea*. These peanuts are fruits, we enjoy the seeds inside. Another name for peanuts is the ground nut. Why? Because they bury their fruits in the ground.



Pistachio nut, *Pistacia vera*. The same for pistachio nuts, they are fruits. We enjoy the tasty seed inside. The thin, papery wrap around the seed is the endocarp or the inner fruit wall.