The purpose of this lesson is for students to learn about tubers and bulbs -- two parts of plants that, in addition to seeds, can grow new plants. Students will dissect seeds, bulbs and tubers to investigate what they have in common that allows them to reproduce. They will also make observational drawings about their dissection findings and plant seeds and/or bulbs.

At the end of the lesson, students will be able to explain different ways plants are able to reproduce.

**TIME**

90-120 minutes, depending on which activities are done. Can be done in one long block, or in 20-30 minute shorter lessons over multiple days by breaking small groups into individual lessons.

**GUIDING QUESTIONS**

What do seeds, bulbs and tubers have in common that enables them to grow new plants?

What are some plants you might save from our school garden that you could use to grow new plants?

Why does a seed, bulb or tuber grow when planted, but a leaf decomposes?

**MATERIALS**

1. Examples of seeds, bulbs and tubers for dissection. see note below
2. Pre-made chart for sorting/classifying
3. Copy of sorting chart
4. How Groundhog Gardens Grow for read aloud

**BOOKS**

*How Groundhog’s Garden Grows* by Lynne Cherry

**DEFINITIONS**

- **Tuber.** A swollen, fleshy usually underground stem of a plant.
- **Bulb.** A short underground stem surrounded by fleshy leaves, which contain stored food for the embryo inside.
- **Seed coat.** The covering that protects the seed/embryo.
- **Embryo.** The baby plant inside a seed. It has two tiny leaves and the beginnings of a root.
- **Cotyledon.** The part of the plant that provides food for the embryo.

**NOTE**

Soak enough lima beans for the entire class overnight before beginning this lesson. It is also necessary to have potatoes that have begun to sprout. You can leave potatoes in a sunny spot for a few days to help them begin to sprout.
**ENGAGE / EXPLORE**

Draw a picture of a plant on the board and quickly review its parts -- stem, leaf, root, flower, and fruit -- and the function of each one. Then show students examples of seeds, bulbs and tubers and ask if they know what they are and how they are part of a plant’s life. Students are likely to be familiar with seeds as responsible for growing a new plant. Share that both bulbs and tubers have the same function with different plants. Onions and garlic are examples of bulbs. A potato is an example of a tuber.

Explain that in today’s lesson they will dissect, or take apart, seeds, bulbs and tubers. We will look inside of them to see what makes it possible for them to reproduce and in what ways they are similar and in what ways different.

<table>
<thead>
<tr>
<th><strong>Plant Part</strong></th>
<th><strong>Purpose/function</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>stem</td>
<td>supports the plant, carries water and minerals from the roots to the leaves, carries food from the leaves to the rest of the plant</td>
</tr>
<tr>
<td>leaf</td>
<td>makes food for the plant</td>
</tr>
<tr>
<td>root</td>
<td>absorbs water and minerals and nutrients from the soil; anchors the plant in the ground</td>
</tr>
<tr>
<td>flower</td>
<td>attracts pollinators; contains the reproductive parts necessary to make seeds</td>
</tr>
<tr>
<td>fruit</td>
<td>protects the seed, helps with seed dispersal</td>
</tr>
<tr>
<td>seed</td>
<td>food storage and reproduction</td>
</tr>
<tr>
<td>tuber</td>
<td>food storage and reproduction</td>
</tr>
<tr>
<td>bulb</td>
<td>food storage and reproduction</td>
</tr>
</tbody>
</table>
EXPLAIN / ELABORATE

A variety of different learning activities are listed below. Please choose those activities that fit best with your students, class time, and teaching style.

1. **Classroom - Science. Dissecting and Comparing.** Students will dissect seeds, bulbs and tubers and compare their different parts, looking for similarities and differences. Use the attached diagrams to identify the different parts. Prepare a large chart similar to the one below. As students complete the dissection, have them place each item on the correct place on the chart.

   In advance of the lesson, prepare the following items to be dissected:

   1) **lima beans** that have been soaked overnight. Students gently take apart the beans and identify the embryo, cotyledon and seed coat.

   2) **flower bulbs or garlic** Students (or other supervising adults) cut open bulbs and identify the embryo, food and protective layer.

   3) **sprouting potatoes** Students look for and identify embryo, food and protective layer.

<table>
<thead>
<tr>
<th>baby plant</th>
<th>seed</th>
<th>bulb</th>
<th>tuber</th>
</tr>
</thead>
<tbody>
<tr>
<td>embryo</td>
<td></td>
<td>flower bud</td>
<td>eye or embryo</td>
</tr>
<tr>
<td>food</td>
<td>cotyledon</td>
<td>scales</td>
<td>flesh</td>
</tr>
<tr>
<td>protection</td>
<td>seed coat</td>
<td>tunic</td>
<td>potato skin</td>
</tr>
</tbody>
</table>

2. **Classroom - Reading.** *How Groundhog’s Garden Grew* by Lynne Cherry. In this book, squirrel teaches groundhog how to grow his own garden. The book takes the two characters through the cycle of a gardening year. Use the illustrations in the book to highlight the different seeds, tubers and bulbs that he grows. This is also an opportunity to highlight the garden in each season of the year.

3. **Classroom - Science.** Students fill out the attached chart with examples of seeds, bulbs and tubers. Using either the attached diagrams or the plant parts they have dissected, they will then make observational drawings of a seed, bulb and tuber and label each part that they identified in their dissection: the baby plant, the food and the protection.

4. **Garden: Science.** Plant bulbs appropriate to the season. In November, you can plant either garlic or flower bulbs.

5. **Classroom - Cooking.** Prepare a recipe that uses seeds, bulbs and tubers. One example is Black Bean and Sweet Potato Chili; the beans are seed, the sweet potato is a tuber, and the onion is a bulb. See recipes section for more suggestions.
EVALUATE / ASSESSMENT
Ask Guiding Questions at the beginning and at the end of the lesson to compare gains in knowledge.

Observational drawings with labels can also be used to assess understanding.

RECIPES
The following recipes (and many more) can be found at http://freshfarm.org/foodprints-recipes.html.

Kale and White Bean Stew
Black Bean and Sweet Potato Chili
Cauliflower, Chickpea, and Potato Curry

UNITS, STANDARDS, CORNERSTONES -- check
Seed Diagram

cotyledon or plant food

embryo or baby plant

seed coat
Bulb Diagram

- flower bud
- tunic
- scales
# Seeds, Bulbs and Tubers

How many of each category can you list?

<table>
<thead>
<tr>
<th>Seeds</th>
<th>Bulbs</th>
<th>Tubers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Draw a picture of one of the items from each column and then label it with the words in the box below.

- embryo, cotyledon, seed coat
- flower bud, scales, tunic
- eye or embryo, flesh, potato skin