figure A

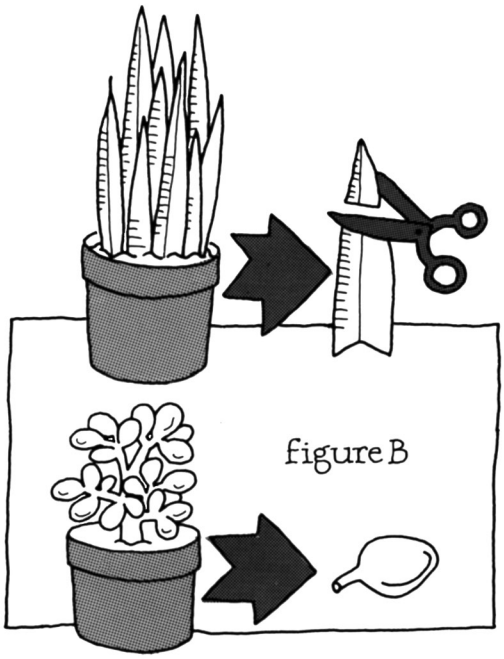


figure B

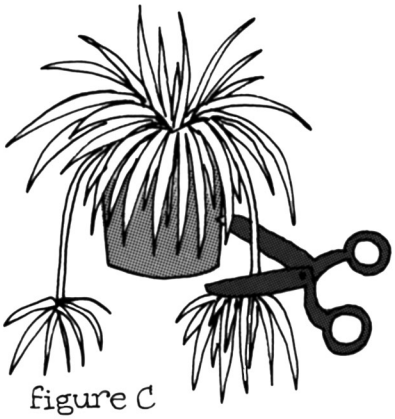


figure C

Note:

Many people root cuttings in water. Although some plants will develop many roots with this method, the roots often have fewer root hairs, are more brittle, and transplant poorly. Your class can conduct an experiment comparing the growth of cuttings rooted in water and other rooting mixes.

Houseplant Cuttings

Rooting plant cuttings is an easy way to increase your collection quickly, and to teach about vegetative propagation. Many common houseplants root nicely in a light garden or on a windowsill. You can repot these new plants for your classroom or send them home with the children. Here's a list of houseplants we recommend for this purpose.

Stem Cuttings

impatiens
coleus
chrysanthemum
African violet
geranium
philodendron
wandering jew
Swedish ivy

Leaf Cuttings

snake plant
jade plant
begonia
African violet

Plantlets

aloe
spider plant
piggyback plant

How to Root Cuttings

1. **Water plants well the day before taking cuttings.** This reduces dehydration after cutting.

2. **You can root many cuttings in one container to save space and soilless mix.** Repot them once the cuttings have rooted. Use your soilless mix (or a mixture made from equal volumes of perlite and vermiculite) as a rooting medium. Make sure the mix is moist, but not soaking wet, or your cuttings will rot.

3. **Fill the container with mix, gently firm it in place, and make small holes** (1/2 inch to 1 inch deep) **with your finger or pencil,** spaced as close as 2 inches apart.

4. **Next, take cuttings as described below.** Be sure to hold a cutting by the leaf, not by the stem. If a leaf is damaged, a new one can grow, but a damaged stem can kill a plant.

   Stem cuttings — Take cuttings from newer, faster-growing stems by snipping with scissors just below the third or fourth pair of leaves. Strip off the lower pair of leaves (roots will probably grow from here) leaving two to three sets of healthy leaves above (see figure A).

   Leaf cuttings — Cut a leaf with its stem (petiole). If you're propagating a snake plant, cut a two-inch section from the middle of the leaf (see figure B). Plant as described in Step 5.

   Plantlets — Some plants grow tiny plantlets at the end of runners (spider plant), or at the base of the stem of the mother plant (aloe). Carefully cut these offshoots from the mother plant (see figure C) and treat them as described below.

5. **Carefully place the cutting into the hole and firm the soil around it.** You can dip the cutting in a commercial rooting hormone (available at most garden centers) to speed rooting and prevent stem rot. It's not necessary to use rooting hormone, but it offers an opportunity for students to design experiments (like the one described in the Classrooom Profile on page 79) to test its effectiveness.

6. **Place individual containers inside plastic bags a**nd tie each one closed

to retain moisture for rooting. Use stakes or plant labels to keep the plastic from touching the leaves.

7. **Place the containers under lights in a warm area.** A light garden offers a perfect environment for rooting. If you don't have a GrowLab or other light setup, place containers in a warm, bright area, but avoid direct sunlight, which can result in a "greenhouse effect" that can cook your cuttings!

8. **Check the containers occasionally to ensure that the soilless mix is moist.** You should see some droplets of water on the inside of the bag, indicating high humidity, but the bag should not be soaking wet. If the soil appears too wet, punch a few holes in the plastic bag or open it slightly to allow excess moisture to evaporate.

9. **After about two weeks, check for the presence of new roots by tugging very gently on the cuttings.** When you feel resistance the cuttings have developed roots and are ready for transplanting. If they haven't yet rooted, keep checking at regular intervals. Once you feel resistance, gently lift the cuttings using a spoon or other tool and transplant them into separate pots.

Stimulating Rooting

A fifth-grade class, curious to find out which techniques might hasten the process of rooting in houseplant cuttings, set up an experiment to test various rooting methods. These methods included: dipping the cuttings in a commercial rooting hormone, providing bottom heat to the cuttings, feeding the cuttings with a fertilizer high in phosphorus, and even playing music for some cuttings! They compared the results of these trials with one another and with the control group and measured the total length of roots for each treatment after three weeks.

Bulbs

A bulb is a living "storehouse" that contains the embryonic stem, leaves, and flower of a plant. The bulb itself is a thickened underground stem that stores food for the growth of the plant. Bulbs have food reserves that enable them to grow and flower with no additional nutrients during the first year. Once a bulb flowers, the plant must take in nutrients and photosynthesize in order to develop reserves to flower again the following year.

Bulbs that you can easily grow or force in the classroom include crocuses, grape hyacinths, tulips, daffodils, and paperwhite narcissus.

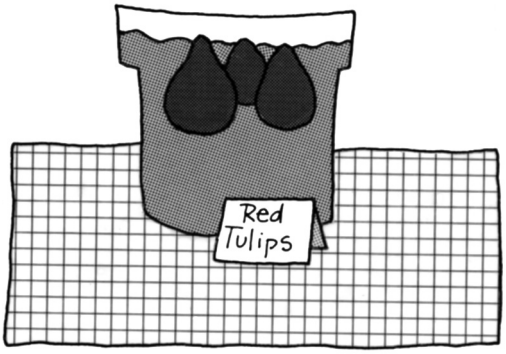
How to Force Bulbs

1. **Purchase bulbs for forcing in the fall when hardy types are commonly available from garden centers and nursery catalogs.** If you can't plant them right away, store them in a cool (40° to 50°F), dry, dark spot. Because bulbs are living plants, you shouldn't leave them unplanted for long. Try to plant the bulbs by the end of October.

2. **Plant bulbs in 6-inch pots filled with moist soilless mix** (three bulbs per pot). Bury the bulbs to their tips, with pointed ends facing up. You don't need to add fertilizer.

3. **Put the pots in a place where the temperature will remain between 35° and 45°F,** such as an unheated garage, cold frame, or refrigerator, for a minimum of eight weeks. Since these bulbs are generally planted outdoors in fall for a spring bloom, this cold treatment will simulate the winter conditions necessary for them to form roots.

4. **Next, move containers inside and keep them in normal classroom light for two weeks,** then put them under your indoor garden lights or on a bright windowsill. The bulbs should bloom in two to four weeks. Once they begin blooming, move the plants from the bright light of the indoor garden to another bright, but cool, spot. This

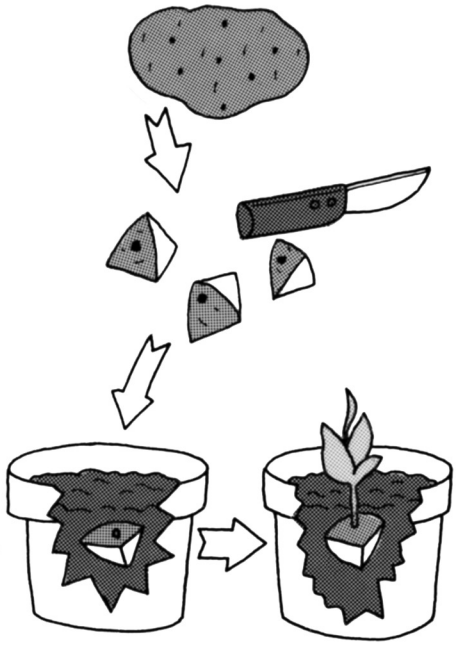


Paperwhite narcissus are the only bulbs recommended here that do not require a chilling period. Plant as directed in step 2 at left and place the potted paperwhites in a window. They should set roots, grow leaves, and flower in just 6 weeks.

Growing Garlic

Garlic is another type of bulb that you can start indoors. Plant separate cloves with the flatter end down, 2 inches deep and 3 inches apart in soilless mix. Garlic doesn't like too much moisture, so allow the soil to dry thoroughly between waterings. It also isn't picky about lighting and will grow well in a GrowLab or on a windowsill.

Have children crush and smell some of the leaves and describe the characteristic smell. The bulbs form underground and are ready to harvest after the tops yellow, in three or four months. Use the garlic as an ingredient in your garden salad dressing or experiment with garlic juice as a pest remedy!



Sweet potatoes produce beautiful vines. To start a sweet potato in water, leave it whole. Poke three toothpicks an even distance apart into the potato. Suspend the potato, purple-budded end up, one-third of the way into a jar of water.

will prevent blossoms from fading too quickly.

5. **If you want to save your bulbs,** remove the spent blooms, leave the foliage in place, and fertilize the plants every two weeks with plant food diluted according to the label instructions. During this time the bulbs produce and store food for next year's flowers. Rather than attempting to force these bulbs the following year, plant them outside. It may take two or more years before they'll produce another flush of blooms.

Tubers

A tuber is another type of underground stem that acts as a food storage organ. Tubers don't contain embryonic leaves and flowers as bulbs do but new plants grow from them. The most familiar example of a tuber is the potato. The surface of a potato has "eyes" that are actually buds. You can start new potato plants by planting pieces of tuber that contain eyes (explain to the children that this is exactly how farmers plant their potatoes.) Some grocery store potatoes have been treated with a chemical to discourage sprouting. To ensure that your potatoes sprout, start cuttings from several different potatoes or buy certified "seed potatoes" from a garden center.

Although you won't be able to grow potatoes to maturity in small containers indoors, students will be able to observe the early development of plants. (If you could grow potatoes to maturity indoors, you would find that the new tubers develop above the old ones and are attached by smaller stems to the main plant).

How to Grow a Potato Plant

You can start potatoes in growing mix, or sprout them in water so that you can view root development. The class can even design an experiment comparing the growth of potato plants in water versus in potting mix. In either case, cut potatoes so that there is at least one eye on every piece.

1. **To start potatoes in potting mix,** place each piece in a 6-inch pot so that the eyes are about 3/4 inch below the surface.

2. **To start potatoes in water,** you'll need toothpicks and a clear glass container. Poke three toothpicks an equal distance apart into a piece of potato, keeping the eyes on top. Set the potato, suspended by the toothpicks, over the mouth of the container. Add water to the container until it reaches the potato, but keep the eyes above the surface of the water.

Place pots or containers in the classroom light garden or on a window-sill. Remember, you won't be able to grow potatoes to maturity indoors in such small containers, but the class can observe early stages of development.