

Make New Plants and Keep the Old

Overview: What could be more exciting than turning one plant into 30 new plants for each of your students to take home? Learning the plant propagation technique of taking cuttings allows you to do just that. It also provides an opportunity to teach students about plant growth, especially the factors affecting root development.



Grade Level/Range: K – 5th grade

Objective: Students will:

- Learn about vegetative (asexual), propagation of plants
- Observe the growth of roots on cuttings
- Compare different rooting media for cuttings

Time: lesson and activity – 30 minutes; growing time – 3 to 4 weeks

Materials:

- Stock plants such as coleus, pothos, begonias, geraniums or wandering jew. You'll need enough plant material to let each student make two cuttings.
- Clean scissors
- Clean plastic water or soda bottles with the tops cut off
(Note: Cutting plastic can be tricky and should be done by adults ahead of time.)
- Water
- Moistened soilless potting mix
- Dark colored construction paper (optional)

Background Information

Making plants from cuttings is a form of asexual propagation, also called vegetative propagation—one that doesn't rely on pollination and seeds. It produces clones—new plants that are genetically identical to the parent plant from which the cuttings were taken. Both plants and people can propagate through sexual reproduction, but obviously, this isn't true of asexual propagation: A severed human toe doesn't sprout a new person, nor does the person sprout a new toe! The most common types of asexual propagation methods are cuttings and division:

Cuttings

Taking a cutting involves removing a piece of a leaf, stem or root and placing it in a growing medium where it then develops the other parts that were left behind (i.e., a stem will then grow roots, a root will then grow a stem).

Rates of success with cuttings generally are lower than seed germination rates. For the best chance of success:

- Take cuttings with clean instruments

- Place them in moist, sterile, soilless potting mix
- Choose plants that root easily (see table below)
- Cuttings of some plants root easily in vases of water, but others will rot before making roots if you place them directly in water. Pot those stem cuttings, as well as any root and leaf cuttings, in a moist, soilless, potting mix. Listed in the table below are plants that grow well from cuttings and should provide you with a good success rate even in tough classroom conditions.

Taking Cuttings

Set up your rooting medium before taking cuttings. Use clean scissors and make sure that each cutting measures 4 to 6 inches long and has at least 4 leaves. Remove the bottom leaves from the cutting and immediately insert it in water or soil.

Caring for Cuttings

Cuttings need high humidity and warm temperatures to help them grow. Nursery professionals have mist beds that spray cuttings intermittently throughout the day to keep humidity high. You can create a similar effect by creating a tent using a plastic bag (prop the tent up using pencils or craft sticks so that the leaves are not touching the sides) and then misting cuttings throughout the day with a spray bottle to keep the soil and the air around the cutting moist -- but not soaking wet. You'll need to experiment to find the perfect balance for the humidity levels in your classroom.

Most of the plants listed in the table below root within a few weeks, but cuttings of some plants can take weeks or even months to develop the missing parts. Monitor plants regularly to check on progress.

Are new leaves appearing? If the cutting is in water, can you see roots growing?

Plant	Plant Part	Propagation Medium
Coleus	Stem	Water or soil
Pothos ivy	Stem	Water or soil
Geranium	Stem	Water or soil
African violet	Leaf or stem	Soil
Jade plant	Stem or leaf	Soil
English ivy	Stem	Water or soil
Wandering Jew	Stem	Water or soil

Division

Some plants grow in a clumping habit, sending out roots and or stems (above ground or underground) that then produce new stems and leaves. As the term division implies, once the clumps exceed their original size, you can dig them up, divide the plant into smaller clumps of roots, stems and leaves, and replant the smaller divisions.

Clumping plants are excellent for children's gardens because they need frequent division, giving more students the chance to have the planting experience. (Plus, you can sell divisions at plant sales to raise money to support the garden!)

Here are a few examples of plants that are easy to propagate through division:

- Clumping Plants: Lamb's ear, mondo grass, daylilies, chives

- Some plants grow new plants on aboveground stems. Although the new plants may or may not develop roots while on the parent plant, you can remove the new baby plants easily, plant them in soil, and new roots will appear quickly.
- Plants that produce “babies” on above-ground stems: Spider or airplane plant, strawberry geranium, mother-of-thousands.

Which Method to Use?

A plant’s response to different types of asexual propagation varies. You can take a leaf of an African violet and plant it in soil to get a new African violet, but if you plant a leaf of a maple tree, you will end up with a shriveled up leaf. For asexual reproduction of a maple tree, you need to cut and plant a portion of stem that has 2 or 3 leaf buds on it.

So how can you find out which asexual propagation method to use with a certain plant? You can discover it through trial and error or search published resources for advice. An excellent source of information for common landscape plants is *The Reference Manual of Woody Plant Propagation: From Seed to Tissue Culture: A Practical Working Guide to the Propagation of over 1100 Species* by Michael Dirr and Charles Heuser. Additional resources are available via Internet searches.

Other Methods

There are many other forms of asexual propagation. Two that you can use to challenge older students are **layering** and **tissue culture**.

Propagation by layering involves coaxing a stem to grow roots while it is still attached to the mother plant. This happens naturally for some plants, such as black raspberries, when their stems touch the ground and produce new roots.

Tissue culture involves growing an entire plant from just a few cells! The cells grow on nutrient medium until they have differentiated into leaf, stem, and root tissue and you can transplant them to potting soil. Tissue culture kits for school classrooms are available from many science educational supply catalogs.

Laying the Groundwork: Ask student to think about the following questions:

- What happens if you cut off a person’s toe? Will it grow back? Will it grow into a new person?
- What happens if you cut off a stem from a plant? Will it grow back? What will happen to the cutting?

Exploration

1. Explain to students the concept of vegetative propagation and how to take a cutting.
2. Give each student 2 plastic bottles with the tops removed. Instruct students to fill one of their bottles with water (call it “the vase”). Fill the second with moistened soilless mix (call it “the pot”).
3. Show students how to take stem cuttings from the stock plant and then let them each take two cuttings. Use clean scissors and make sure that each cutting measures 4 to 6 inches long and has at least four leaves. (For fair comparisons, each student should use two cuttings from the same stock plant.) Have students remove the bottom leaves so that you can see the stem. Next, have them place one cutting in the vase and one in the pot.

Note: The point at which the leaves attach to the stem is called the node. For many plants, the node is where roots will first emerge, so make sure at least one node is below the water or soil surface.

4. In the vase, only the stem should be submerged in the water. Students may need to adjust the water level to make leaves are above the surface. In the pot, students should insert the cutting against the side of the pot so they can easily observe root growth.

5. Monitor the plants daily and check for root growth, and record any changes. Have students add more water to their vases if it dips below the original level. They should also make sure the soilless mix in the pots remains moist.

6. Guide students in using statistics or creating graphs to document and compare various data such as:

- Number of days between making cuttings and when roots first appear

- Root data: After 2 to 3 weeks of growth, they can remove the plants from the soil and the water and use other measurements to compare root growth
 - count and compare the number of roots on each cutting
 - measure the length of the roots of plants on the two cuttings
 - remove the roots and weigh the roots to see if there is a difference between the two cuttings (this will require a fairly sensitive scale and keep in mind that it will obviously result in not having a new plant to keep)

7. Wrap up the activity by giving students time to prepare a summary of their findings including discussion of their conclusions.

8. Once roots are established, students can pot up their cuttings (for those grown in water) to keep in the classroom, take home, or give to family and friends.

Making Connections

Extend the exploration by testing the effect of light on root growth. Divide the class in half. One team can cover their pots with removable, dark-colored construction paper sleeves while the other team covers their vases. Does light affect root growth?

Branching Out

English: To reinforce the process of taking a cutting and practice communication skills, ask students to write down instructions on how to take cuttings. The instructions could be written in paragraph form or as an itemized list.

History, Social Sciences or Geography: Explorers and plant collectors of the past and present use the technique of taking cuttings to document and move plants around the world. Lead students in brainstorming why cuttings are useful tools for plant transportation. Check out the Plant Hunters (<https://www.ars.usda.gov/oc/kids/plants/story4/hunters/>) article from the USDA to begin your discussion. Also challenge them to consider some of the dangers of introducing plants into new environments. Use examples of invasive exotic plants in your area (e.g., kudzu, eucalyptus trees, purple loosestrife).

Community Connections - Take a field trip to visit a local nursery to see propagation practices and equipment in person. If a field trip is not feasible, contact the nursery to see if a speaker can come to visit the classroom for a hands-on demonstration.