

GROW YOUR PALS PROGRAM GUIDE



THE NATIONAL FFA MENTORING PROGRAM

Sponsored by



LESSON 1.13

Creating a New Plant from Cuttings

Unit:
PLANTS AND GARDENING

PRECEPTS

- G. Physical Growth
 - G1. Practice healthy eating habits



Lesson Type:
Small Group

NATIONAL STANDARDS

- CS.01.01.01.a. Work productively with a group or independently.
- PS.01.02.02.b. Identify root tissues and explain the pathway of water and nutrients into and through the root tissues.
- PS.01.02.03.c. Apply concepts associated with translocation to the management of plants.
- PS.03.01.03.b. Demonstrate proper procedures in budding or grafting selected materials.
- NL-ENG.K-12.12 – Applying Language Skills
- NS.K-4.3 Life Science

STUDENT LEARNING OBJECTIVES

As a result of this lesson, the student will ...

- Explain how a new plant develops from a single cutting.
- Explain that plants take in and give off water.





TIME

Instruction time for this lesson: **30 minutes.**



RESOURCES

National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success



TOOLS, EQUIPMENT AND SUPPLIES

- ✓ Small containers - two
- ✓ Potting soil
- ✓ Gravel
- ✓ A thin stick or pencil
- ✓ Several large plants to take cuttings
(*impatiens, jade plants or ivy*)
- ✓ Plastic bags
- ✓ Rubber bands
- ✓ Scissors
- ✓ A large plastic bottle
- ✓ A green plant
- ✓ A ruler
- ✓ A marker
- ✓ Plain piece of drawing paper – one per student
- ✓ Colored pencils/markers/crayons



KEY TERMS

The following terms are presented in this lesson and appear in ***bold italics***:

Cutting

Node

Transpiration

Translocation



CONTENT OUTLINE

Objective 1. | Explain how a new plant develops from a single *cutting*.

I. Define *cutting*

A. A *cutting* is taking an existing plant and removing a piece to create a new plant

II. Define *node*.

A. The place on a plant's stem where the leaf begins

III. Activity: Stem *Cuttings*

A. Materials Needed:

1. Several small containers
2. Potting soil and gravel
3. Container with water to stand *cuttings* in
4. A thin stick (or pencil)
5. Several large plants to take *cuttings* (impatiens, jade plants, or ivy works well)
6. Plastic bags (must be transparent)
7. Rubber bands
8. Sharp scissors

B. Procedures:

1. Carefully cut the large plant just below a leaf *node*
Cutting should be about 3-4" long
2. Stand *cuttings* in water until they grow roots
3. Fill several containers with gravel and potting soil
4. Use the stick to make one or more holes in the soil
5. Place one *cutting* carefully in each hole. Put a little more soil around the *cutting*. Press down around base of *cutting*
6. Cover with a plastic bag. Hold the bag in place with a rubber band

Objective 2. | Explain that plants take in and give off water.

I. Define *translocation*

A. *Translocation* is the movement of water and food up the phloem of the plant

II. Define *transpiration*

A. *Transpiration* is the release of water from the leaves of a plant

III. Activity: How Plants Drink.

A. Materials Needed:

1. A large plastic bottle
2. A green plant
3. A plastic bag
4. A rubber band
5. A ruler and marker

B. Procedures:

1. Fill the bottle with water
2. Mark the water level on the outside of the bottle, using the marker
3. Place the plant into the bottle, making sure the roots are in the water
4. Cover the plant with the plastic bag, and secure it with the rubber band
5. Place the experiment in a sunny location
6. In five days, check the water level and make observations on the inside of the plastic bag

INTEREST APPROACH

This lesson will be taught from the perspective that meetings with your PALS will be at least weekly. If meetings are less frequent, make sure to make adjustments to ensure that the activities will be successful.

This lesson is divided into two, 15-minute lessons to allow for plant growth. The interest approach will be completed at the beginning of the first lesson. When your PALS arrives, greet them and introduce yourself if necessary.



Do you know how we create new apple trees or strawberry bushes?

Allow PALS to respond. They may not have any idea, which is fine.



Plants can be created through a few different methods. What is one way you know how new plants grow?

Allow your PALS to respond. If they struggle, have them think of fruit, like an apple, and that seeds come from places like these. What is the purpose of a seed? Allow your PALS to say that it is to turn into a new a plant. If they have trouble, or think of seeds as something we eat, help direct them to understanding that a seed turns into a new plant.



That's right. A seed becomes a new plant. Did you know that not all plants actually use seeds as a way to reproduce?

Allow students to respond. Some may not know what the word "reproduce" means. Help your PALS understand it means to create something new.



Well, today let's look at how plants reproduce through a different method from seeds, and how water plays an important role in the process. Get ready to follow directions to get two cool experiments together!

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Prior to meeting with your PALS, make sure that you have all supplies listed in the 'Tools, Equipment, and Supplies' section.



I am really excited today to show you a neat secret about plants. Today, we're going to start an activity that will help us see that plants can actually reproduce from what we call **cuttings**. A **cutting** is taking a plant we already have, removing a piece of it, and helping it to start a brand new plant. Please help me take a **cutting** from our plant.

OBJECTIVE 1. | Explain how a new plant develops from a single *cutting*.



I. Define **cutting**

A. A **cutting** is taking an existing plant and removing a piece to create a new plant.



We are going to carefully take our scissors (*hand the scissors carefully to your PALS*) and cut right above what we call a **node**. The **node** is the place on a plant's stem where the leaf begins.

*Show your PALS the exact location of the **node** on the plant. Plant portion initial cut should be at least 3-4" in length). What questions do you have? Answer any questions there might be.*



Carefully cut the plant.

II. Define **node**

A. The place on a plant's stem where the leaf begins.

Assist here where needed. Be extra careful with the scissors and monitor your PALS as they make a cut.



Great job **cutting**! So what is this piece of plant called again?

*Allow your PALS to respond, "a **cutting**." If they cannot remember, help them.*



And we cut the plant at the location on the plant called a what?

*Allow your PALS to respond, "the **node**." Again, if they cannot remember, help them.*



Excellent! Great job **cutting** our plants at the nodes! Let's switch gears and think about ourselves. Have you ever thought about what your daily requirements are in order to have a good day?

Allow PALS to respond. If they get stuck, guide them toward, food, water, sleep and shelter.



What would happen if you didn't have enough food or water everyday?

Allow PALS to say they would be tired, or have no energy to play and do well in school.



Well, a plant is the same way. Can you think of anything a plant might need in order to grow?

Allow your PALS to respond. If they struggle, help them focus on water, sunlight, air and temperature.



If that's the case, what do you think we need to give this **cutting** we just made in order to make sure it grows?

*Allow your PALS to say that the **cutting** will need the water, sunlight, air and proper temperature to grow.*



Since our plants need water to grow, help me take our **cutting** and stand it up in a cup of water so it can grow.

Allow PALS to assist in task.



Thanks for helping! We will leave them in the water for a few days, give them a little sunlight and wait for them to grow. When we return in a few days we'll prepare them to be planted into some soil so they can grow even bigger!

III. Activity: Stem Cuttings

B. Materials Needed:

1. Several small containers
2. Potting soil and gravel
3. Container with water to stand cuttings in
4. A thin stick (or pencil)

5. Several large plants to take cuttings (impatiens, jade plants, or ivy works well)
6. Plastic bags (must be transparent)
7. Rubber bands
8. Sharp scissors

C Procedures:

1. Carefully cut the large plant just below a leaf node. Cutting should be about 3-4" long.
2. Stand cuttings in water until they grow roots
3. Fill several containers with gravel and potting soil
4. Use the stick to make one or more holes in the soil
5. Place one cutting carefully in each hole
6. Put a little more soil around the cutting
7. Press down around base of cutting
8. Cover with a plastic bag
9. Hold the bag in place with a rubber band



Do you think that while we leave our **cuttings** to grow that they are going to take in any of the water in the cup?

Allow your PALS to respond. They will probably say yes because it was just discussed about what plants and people need in order to grow.



When a plant takes in water and moves it up its stem to give to other parts of the plant (*Illustrate this action to your PALS with the **cutting** and your finger, showing how the water would move from the cup up the stem*), we call this **translocation**. It's a big word, but it's just another way of saying that a plant drinks like you and me!



CTIVE 2: Explain that plants take in and give off water.

I. Define **translocation**

A. **Translocation** is the movement of water and food up the phloem of the plant.



Not only can a plant take in water, but it also gives off water. Did you know that plants release water from their leaves?

Allow PALS to respond. They probably did not know this concept.

II. Define **transpiration**

A. **Transpiration** is the release of water from the leaves of a plant.



When a plant releases water from its leaves we call this **transpiration**. It's hard to see sometimes, so the activity that we are going to put together will let us better see the plant at work. Let's set it up to help us see both of these concepts in our plants.

III. Activity: How Plants Drink

B. Materials Needed:

1. A large plastic bottle
2. A green plant
3. A plastic bag
4. A rubber band
5. A ruler and marker

C. Procedures:

1. Fill the bottle with water
2. Mark the water level on the outside of the bottle, using the marker
3. Place the plant into the bottle, making sure the roots are in the water
4. Cover the plant with the plastic bag and secure it with the rubber band
5. Place the experiment in a sunny location
6. In five days, check the water level and make observations on the inside of the plastic bag



OK. The first thing we need to do is take this plastic bottle and fill it up with water.

Hold up the empty plastic bottle.



Please help me in completing this task.

Assist your PALS in filling the plastic bottle up with water. It does not have to be completely full, but the water needs to be reached by the plants roots.



Next, let's take this marker and draw a line on the bottle to represent where the water is now in the bottle. Please draw the line now.

Hand your PALS the marker and show them where the best place on the bottle would be to place a mark to represent the water level. Make sure it will be obvious to be seen in a few days.



We are now going to take this green plant and we're going to place it in the water. We have to make sure the roots reach the water in the bottle so we can see if they really do perform **translocation**. What does **translocation** mean again?

Allow PALS to respond. If they have forgotten, remind them this is when the plant moves food and water up the stem.



This will be a great example for us to see **translocation** occurring.

The last step of our experiment is to take this plastic bag

Hold up the plastic bag



Cover our plant that we have in our bottle full of water. Please help with this step.

Allow PALS to place the plastic bag over the plant. Assist only if needed and answer questions if they have them while completing the task.



To make sure this stays securely on the bottle, we need to take a rubber band around the bottom of the plastic bag to make sure it doesn't move. Please grab the rubber band and place it on there for us.

Allow PALS to put the rubber band around the base of the plastic bag. Again, help as needed and guide if necessary.



Great job! We have set up our experiment that will help us see **translocation** and **transpiration** take place. Let's move our bottle to a sunny spot in the room to make sure our plant receives the sun it needs in order to grow.

Allow PALS to move the bottle to a place in the room that will receive plenty of sunlight and be out of the way.



Our experiment will take about five days to complete. This will be a great time to come back and finish the first activity we started today as well. What questions do you have about what we completed today?

Answer any questions your PALS might have.



Great job setting up our two experiments today! I look forward to seeing you in a few days and seeing what has happened!

*At this point in the content lesson there needs to be around a five-day break to allow the plant **cuttings** in the first activity to grow and for **transpiration/translocation** to be evident in the second activity.*



When returning, greet your PALS and ask them how they have been over their five-day break. You will need the remainder of the materials: a few small containers, potting soil, gravel, a pencil or thin stick, plastic bags, rubber bands and a ruler.

INTEREST APPROACH — DAY 2



Are you excited to see what took place over the past five days?

Allow your PALS to respond. I know I am!



Before we go see what our experiments are doing, let's hypothesize what we will see! Share what you think the word, hypothesize, means?

Allow your PALS to take a guess. If they struggle help them out.



A hypothesis is making an educated guess about the outcome of a question we are asking. In this case, we want to see two things. What did we do in the first experiment?

*Allow your PALS to remember about making a **cutting** from a plant.*



That's right – we took a **cutting** from a plant and placed it in water to see if it would grow. What would be your hypothesis, or your educated guess, about what happened in the last five days?

*Allow your PALS to take a guess as to what has occurred in the last five days with the **cutting**.*



OK – before we see what is going on with that experiment, what did the second experiment we set up involve?

*Allow your PALS to remember about **translocation** and **transpiration**.*



Good! We set up our bottle with water in it and a plastic bag so we could see **transpiration** and **translocation** taking place.

Are you excited to see what has happened? Those were great hypotheses and I'm interested to see what has happened. Please go and grab your **cutting** and let's take a look at what has happened in the last five days!

*Have your PALS go carefully retrieve the first activity; the container of water with the plant **cuttings**.*



What is different about these **cuttings** from the other day?

Allow your PALS to respond there are roots now. They may just point if they do not know the correct terminology. Help them understand that those are plant roots.



Our plant **cuttings** have grown roots in the last few days! They are ready to become plants of their own! Let's prepare a few containers to place them in.

Gather the following supplies to put the containers together: containers, potting soil, and gravel.



In front of us we have containers, potting soil, and gravel. Together, this will make a great new home for our plants! Let's put these new homes together.

Allow your PALS to respond.



Great! In your container place a layer of gravel at the bottom. This will help make sure that there is not too much water for our plants. *Assist PALS in completing this task.* Next, fill the remainder of the container with potting soil. Potting soil has special nutrients and food that will help the plant grow. *Assist PALS in completing this task.*

Great job!

The last step before we put our plants into the container is to give them a place to go! Take the pencil and in the middle of the container make a hole.

Assist your PALS in completing the task.



I think it's ready! Go ahead and add your plant **cuttings** to the containers!

Assist your PALS in completing this task.



To make sure they are securely in the containers, pack the soil around the base of the plant so that it is more firm.

*If needed, add additional soil to the container to help with stability of the **cutting**.*



Please water these plants well.

Allow your PALS to water all of the plants. Monitor this carefully. Plants need to be watered well, but not over watered. Use your best judgment.



To create an ideal environment for our new **cuttings**, we are going to place a plastic bag over them and secure it with a rubber band, similar to what we did with our plastic bottles the other day. Grab a rubber band and finish off their new homes!

Assist your PALS in finishing this task.



Great job! Five days ago we started with one plant and now we will finish with more! What makes this experiment fun for you?

Allow your PALS to respond.



Let's not forget our other experiment, though. Please go get the plastic bottle we placed in the sunny spot the other day.

Allow your PALS to go get the bottle.



Find the mark we made on the outside of the bottle the other day with our marker.

Allow your PALS to locate the mark.



With this ruler, measure the distance of the water level currently and where it was the other day from our mark. *Assist your PALS in completing this step.*



Did the water level rise or fall?

Allow your PALS to respond fall.



What does this tell you about our plant?

Allow your PALS to explain that the plant is drinking up the water.



That's right. The plant is drinking the water. Do you remember what we called that the other day?

Allow your PALS to respond **translocation**. If they have trouble remembering the terminology, assist them.



The process of the plant drinking up the water helps us see **translocation** occurring. What do you see inside the plastic bag?

Allow your PALS to respond drops of water.

If you had to guess, how do you think the water got there?

This is going to be a hard concept for PALS to understand. Help them think through the concept, bringing up the definition of **transpiration** again to help.



The drops of water we see in the plastic bag helps us see **transpiration**, or when the plant releases water from its leaves! Isn't that amazing! So not only do plants drink up the water, but they also release some as a part of their life cycle.



REVIEW / SUMMARY

For the review activity, a source of colored pencils/markers/crayons will need to be available to assist students in illustrating the words **node**, **translocation** and **transpiration**. Your PALS will need one piece of plain computer paper to complete the activity as well.



Great job with these experiments. Let's review what we have learned today.

Picasso e-Moment®

A great way to remember things is through drawing. If you had to illustrate **node**, **translocation** and **transpiration**, how could you do it? When you hear the word DRAW, take a plain piece of paper and draw a picture of what each of these words mean. Imagine if you had to tell a friend about what you have learned today. Think about the activities we have done and how that could help you show them through a drawing what a **node** was or what **translocation** or **transpiration** means. Where might you see these things occurring? Make your illustration different and unique. Please repeat for me what you will draw today.

Allow your PALS to repeat what they need to complete. After they have repeated the directions, tell them where to locate the colored pencils/markers/crayons needed to complete the activity.



What questions do you have before getting started? Great –

DRAW

Allow your PALS some time to complete this activity and, if there is time, discuss what they have drawn and why.



Keep up with the plant **cuttings** and they will turn into bigger plants that maybe some day you can use for more **cuttings**! Plants are pretty neat creatures! Hope you enjoyed our activities!

Wrap up any items with your PAL. Make sure they understand that they can continue to watch their plants that they planted and instruct them on how to properly take care of them.

APPLICATION



Large Group Idea

The activities can still be completed in large groups. To modify, groups could use cuttings from different plants to see how rate of growth is different and also use cuttings of plants that do not propagate well from cuttings. This will allow students to understand that not all plants propagate well from cuttings and that depending on the plant that some will propagate more quickly by taking cuttings than others.



Small Group Idea

More in-depth discussion can take place, such as talking more about why plastic bags were placed over the plants during the five-day period and why it is important that those bags are transparent. Also, discussion can follow on how a single cutting can become an entire new plant.

With the second activity, the PALS can formulate a hypothesis of what will happen to the water level in the bottle and then discuss reasons for the results in conclusions based on the data collected.