



W 1073-A

# PLANTS

# SCIENCE



# PERSONAL GROWTH

## TENNESSEE 4-H ROOT CURRICULUM FACILITATOR GUIDE

INSPIRING SCIENTIFIC EXPLORATION AND  
PERSONAL GROWTH THROUGH PROPAGATION.

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# Tennessee 4-H Root Curriculum Facilitator Guide

Written by: Anna Duncan  
Extension Agent, Coffee County

# The 4-H ROOT Curriculum

The 4-H ROOT Curriculum uses the propagation of houseplants as a lens through which students can observe scientific concepts in a concrete and exciting way. This curriculum was developed for use with 4-H members in grades 4-12 and can be adjusted for students on the older or younger end of that range as explained in each lesson plan.

Prior to starting this program, reach out to volunteers, Extension Master Gardener Volunteers, nurseries, or others who may have plants that can be used for cuttings. This will reduce costs and possibly encourage volunteer support of the program. Plant and lesson pairing suggestions have been included in this curriculum, but any plant that is easily propagated can be used for these lessons. Use what is readily available in your area. Other costs associated with this program are minimal. Cuttings can be planted in small peat pots that can be found seasonally in multi-packs at dollar stores or even plastic cups with drainage holes.

While planning a 4-H ROOT workshop series, consider the biological processes at play when timing the workshop dates. Some plant species take root faster than others, and a regular bi-weekly or monthly schedule may not be appropriate for this curriculum. Also consider including time for participants to get feedback on their plants and their care. They may look to the program facilitator for help troubleshooting common plant problems such as browning or wilting. Additional resources have been included to help with this.

Finally, plant journals with writing prompts have been included with this curriculum. These journal entries are excellent evaluation tools and can be used in discussions or activities as well.

# 4-H ROOT Plant Shows

After spending many hours propagating and caring for their plants, many 4-H members would like to showcase their healthy plants. The local county fair may allow the 4-H members to enter their plants into the fair or even provide a space for them to have their own plant show. Or, a standalone show can also provide this opportunity.

A few basic rules for any plant show include:

- Plants entered in the show must have been propagated and cared for by the exhibitor.
- Plants shall not bare any personal identifiers that signal to the judges the identity of the exhibitor.

As the show coordinator, one may use plant markers or other means of marking the plants with exhibitor numbers so that plants will be matched with the owners for due credit after judging.

Different plant species may require varied judging criteria, but a basic judging rubric is provided here.

<b>Category</b>	<b>Points</b>	<b>Explanations</b>
<b>Size of the Plant</b>	20	<u>Quality</u> - lack or presence of browning or disease
<b>Vegetation</b>		<u>Vigor</u> - fullness, presence of runners, etc.
• <b>Color</b>	20	
• <b>Quality</b>	20	<u>Form</u> - even growth pattern, not leaning toward sunlight, etc.
• <b>Vigor</b>	20	
• <b>Form</b>	10	
<b>Soil</b>	10	<u>Soil</u> - loose, not packed, adequately watered and draining

# Unit 1 | Introduction to Propagation

## OBJECTIVES

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- Establish vocabulary and plant science foundations.
- Spark interest in the overall goals of the program.

Time: 1 hour

## MATERIALS

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- \$1 Bill
- Journal Pages (optionally in folders)
- Plant Diagrams (copies for each student)
- Pencils
- Dry Erase Board and Markers or Large Paper, Markers and Tape
- Water
- Scissors
- Index Cards or Scrap Paper
- Basil or Other Herb That is Easily Propagated in Water
- Basil Care Guides (copies for each student)
- Clear Plastic Cups
- Markers
- 4-H ROOT Terms List

## LESSON INTRODUCTION

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Hold up the \$1 bill, and ask the group, "what happens if I cut this dollar in half? ... What about just the corner?... Why is it not \$2?... What if it could be? With plants, that is what we can do. We can snip one and get two through propagation!"

## INSTRUCTION

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### Vocabulary

Using the plant diagram handouts, review key plant structures and their functions with participants. Based on the groups' base knowledge of plant anatomy, choose to use the handouts in one of two ways.

- Ask participants to complete the blank handout to the best of their ability first. Then, give them the answer key. Review the answers and explain each part's function and significance.
- Give participants the answer key first, and discuss the parts as discussed in option 1. Use the blank handout later in the lesson or on another day to check for understanding.

## INSTRUCTION, CONTINUED

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### Activity

Utilize the plant diagram and terms that have been discussed to facilitate a game of Pictionary to enhance participants' memorization and understanding of the material. Pictionary rules and term cards have been included with this lesson.

- If short on time, use this activity to start the next lesson and review the terminology.
- Older participants may be given more complex terms to adjust the activity for their knowledge levels.

### Propagation

Demonstrate how to take a stem cutting of basil and place it into a cup of water. Explain that roots will form in about two weeks.

Instruct students to take their own stem cuttings and supervise them. Once they are finished, advise them to label their cups with the markers and to keep their basil near a window and to change its water every 3-4 days.

Distribute the Basil Care Guide, journal pages, and record sheets. Instruct students to keep records of their plants' progress in their journals and ask them to bring their basil and completed journal entries with them to the next session.

## INSTRUCTOR'S NOTES

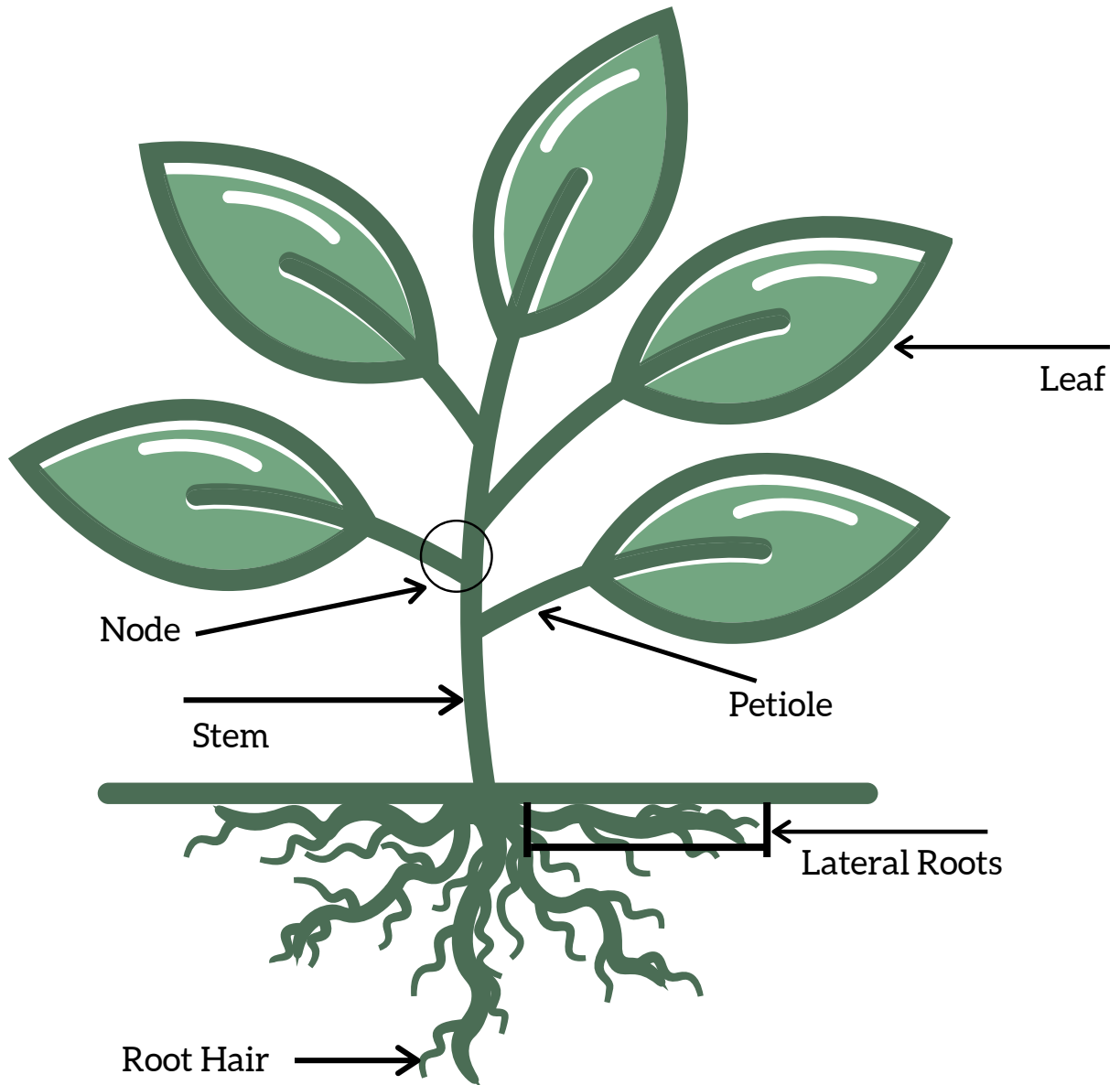
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Be sure to root a few extra cuttings and bring them to the next session in case some of the participants' cuttings do not survive or if a new participant joins the program later on.

When giving final instructions for caring for their plants, review the day's lesson if time allows.

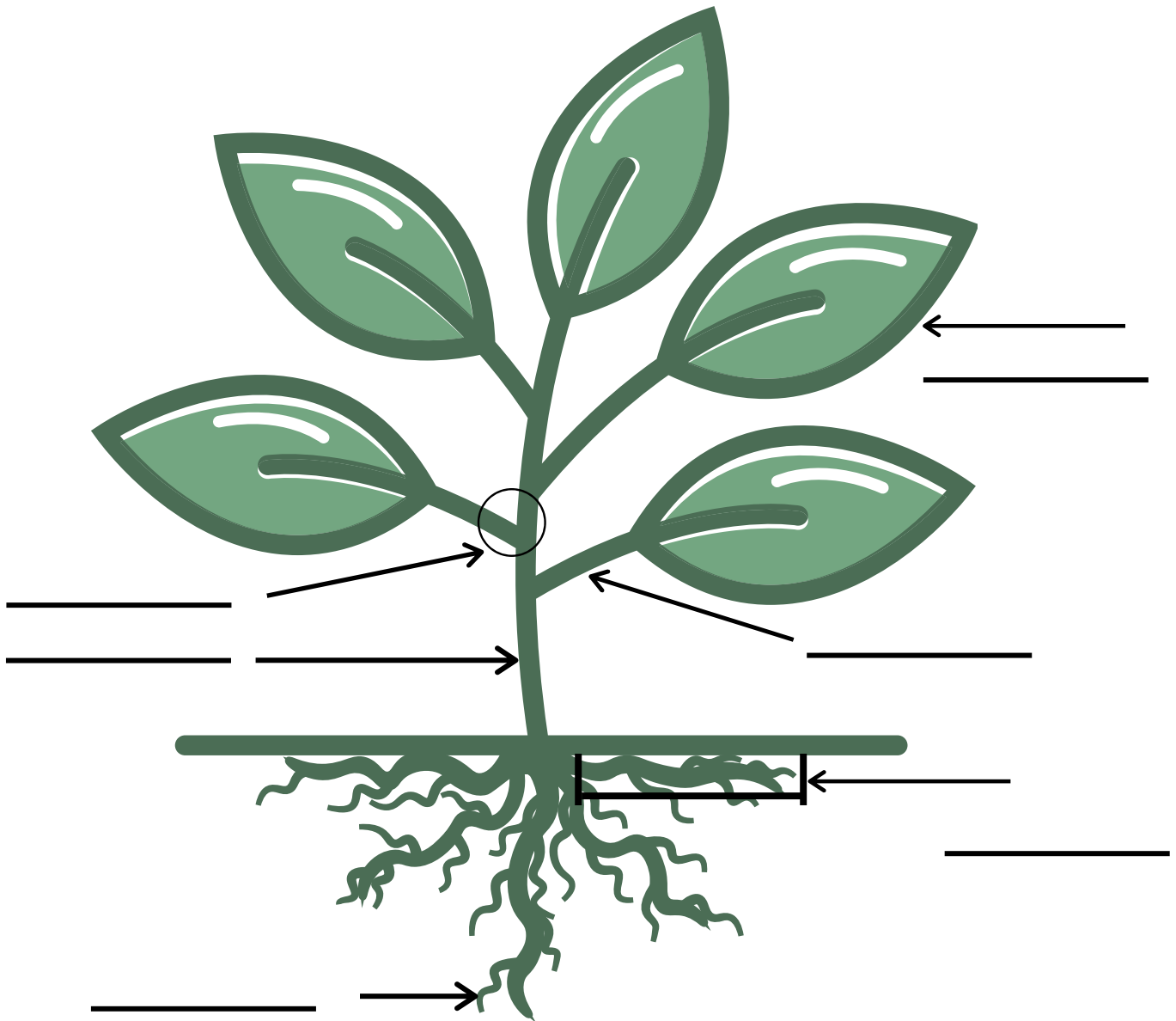
Journal pages, care guides, diagrams, etc. are best kept in a folder or binder. If possible, providing these for participants may assist with organization and record-keeping.

# Basic Plant Parts

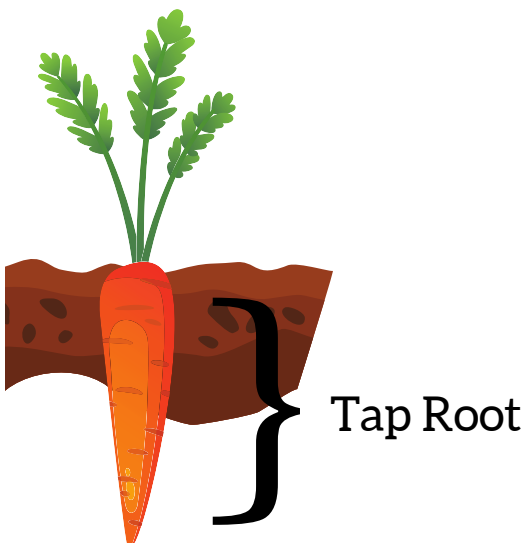
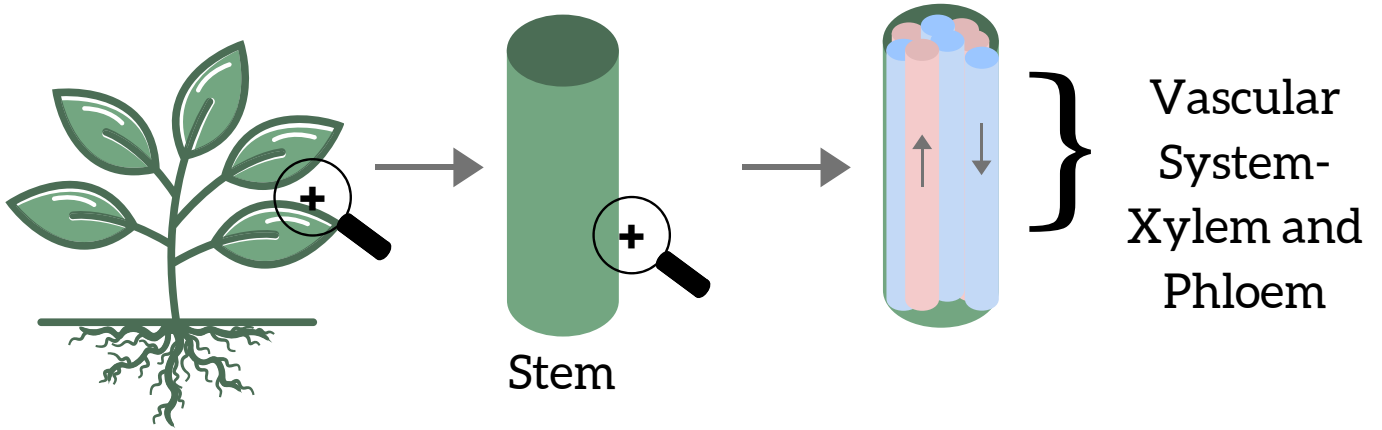
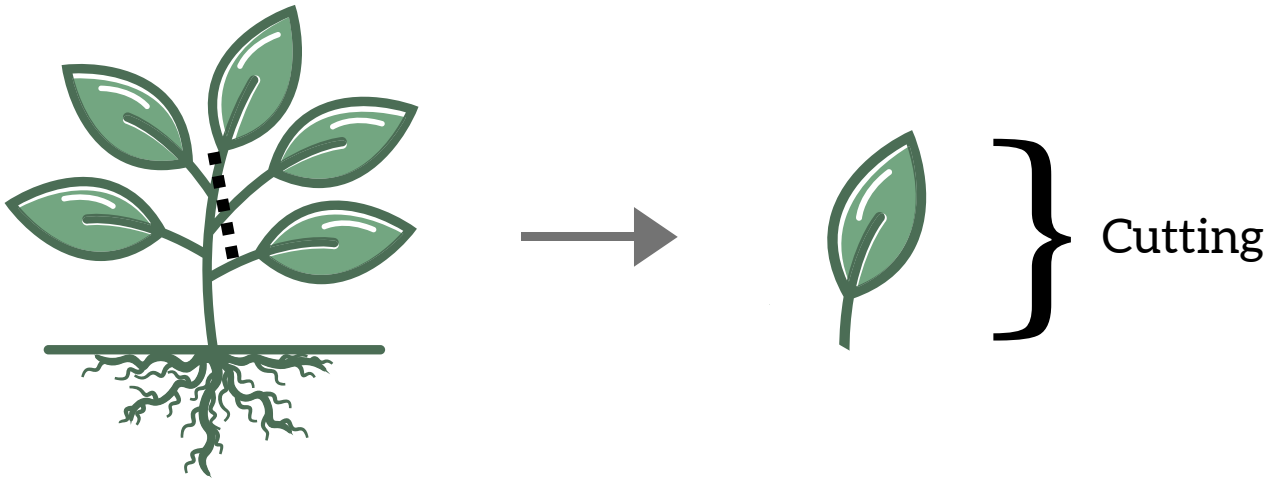




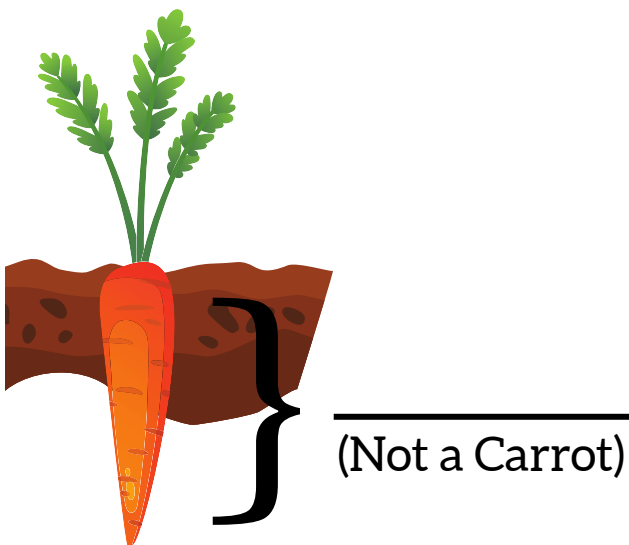
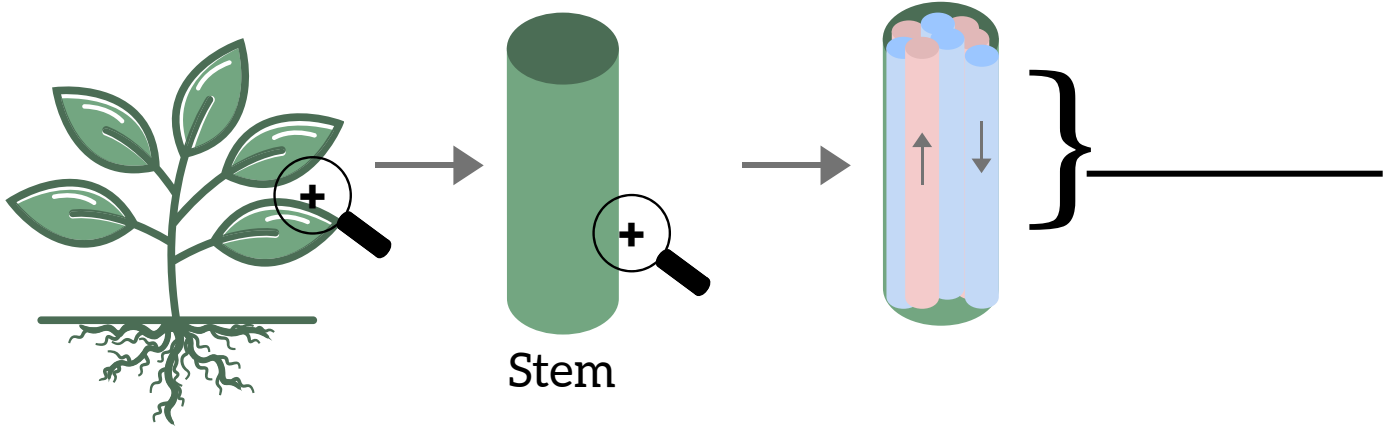
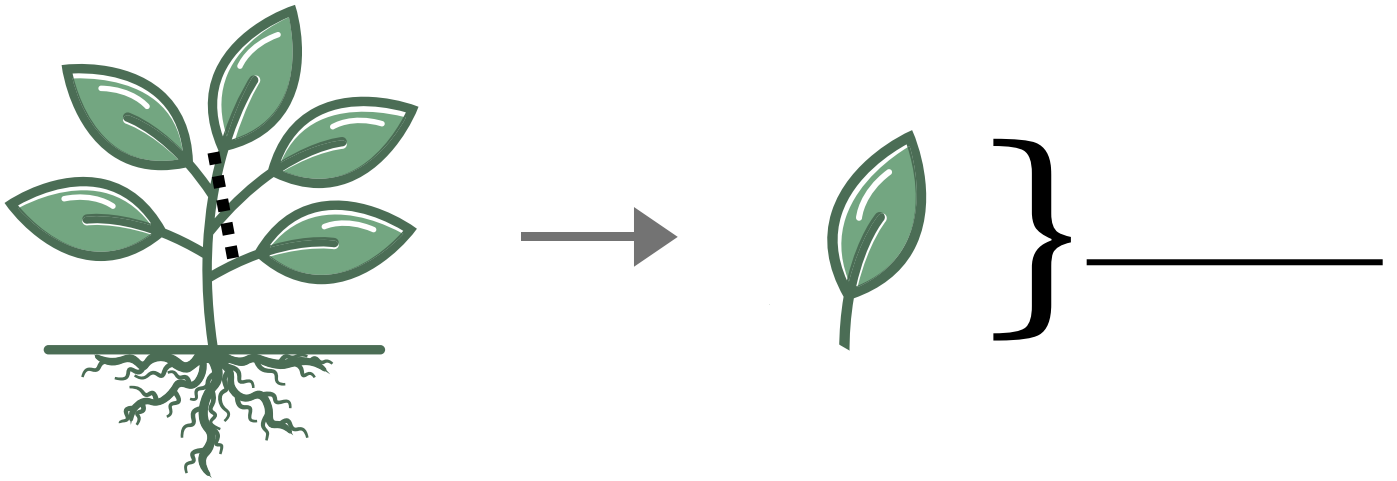
# Basic Plant Parts



# Basic Plant Parts



# Basic Plant Parts



# 4-H ROOT Vocabulary

- Aerial Root- roots that develop above ground often on stems or plantlets.
- Flower- the reproductive and often colorful portion of the plant.
- Lateral Root- the smaller roots that branch out to the sides and help to stabilize the plant while absorbing water and nutrients.
- Leaf- the vegetative portion of the plant that conducts photosynthesis.
- Node- the point at which the leaf or branch joins the stem.
- Petiole- the stem of the leaf that connects it to the plant.
- Phloem- the vascular structures that transport sugars made by photosynthesis from the leaves to the rest of the plant.
- Plantlet- the offspring of a plant that may be planted through propagation.
- Propagate/ Propagation- utilizing a piece of a larger parent plant to create a new plant.
- Root Bound- when a plant's roots become constricted by the plant's container.
- Root Hair- extensions of the lateral roots that absorb water and nutrients from the soil.
- Runner- vegetative structures formed by plants that may become new stems or form plantlets for propagation.
- Soil- the living, evolving ecosystem of organic matter, microscopic organisms, minerals, water, plants, animals, and more that supports all life.
- Stem- the vegetative structure of a plant that provides structure and support.
- Tap Root- a straight root that anchors a plant.
- Vascular System- the system of xylem and phloem that allows water and nutrients to be moved throughout the plant.
- Variegated- Having lighter and darker portions of leaves not caused by stress or disease.
- Xylem- the vascular structures that transport water and nutrients absorbed through the roots to the rest of the plant.

# 4-H ROOT Pictionary

Adapted from the classic boardgame, Pictionary, this game will use drawing and competition to test students' knowledge of the terms covered in the 4-H ROOT Curriculum.

## Materials

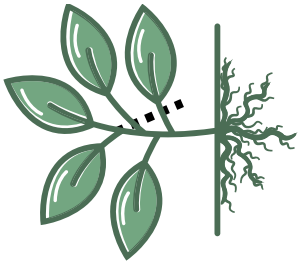
- Dry Erase Board Space or Large, Blank Paper
- Writing Utensils
- Term Cards

## Instructions

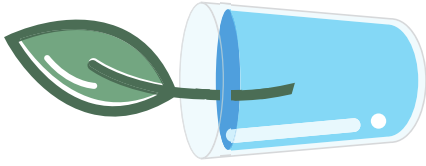
1. Divide students into teams as appropriate, and decide which team will draw first.
2. Designate one team member as the first artist, and allow this team member to draw a card from the term card deck. Remind them not to show this card to anyone else. Give them 5 seconds to consider the meaning of this term.
3. Give the artist 1 minute to illustrate the term that they drew while their team tries to guess the answer. Words may not be used or written by the artist.
4. If the team guesses the correct answer, they score a point. If they do not guess the answer within the minute given, the other team may try to guess the answer to steal the point.
5. Continue playing until all term cards have been used.

Stem	Leaf
Petiole	Root Hair
Lateral Root	Vascular System
Phloem	Flower
Xylem	Tap Root
Node	Propagate/ Propagation

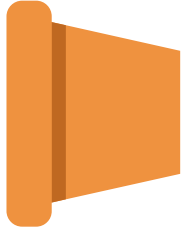
# How to Propagate Basil



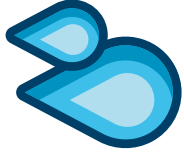
Using sharp scissors or pruners, cut a 3-4 inch section off at a node.



Place your cutting in a glass of water for 2-3 weeks or until roots appear. Keep the glass in bright, indirect sunlight. Change the water every 3-4 days.



Once the roots are about 1 inch long, prepare a pot with drainage holes and potting mix. Dig a hole deep enough to contain all of the roots . Place the cutting in the hole and pack the soil around it until it is secure and stands upright.



Water the basil lightly at planting. Then, check the soil moisture every few days by inserting your finger into the first inch of soil. If the soil is dry, water the plant. If not, leave it be.



Keep your basil in bright, indirect sunlight as direct, hot sunlight can scorch the delicate leaves of the plant. Pinch off flowers and buds as they appear, and harvest the leaves for cooking as needed!

## Basil Walnut Pesto

From Clemson University

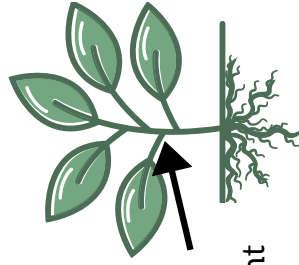
### Pesto Ingredients:

- 2 peeled, medium-sized garlic cloves
- ½ cup walnut pieces
- 1 cup Parmesan cheese
- 4 cups packed basil leaves
- ⅓ cup extra-virgin olive oil

In a food processor, briefly mince two garlic cloves. Add ½ cup walnuts and process until thoroughly ground. Add 1 cup Parmesan cheese and briefly mix with garlic and walnuts. Add 2 cups basil leaves and half of the ⅓ cup olive oil. Pulse the food processor until leaves are ground. Add the remaining 2 cups of basil leaves and remaining olive oil. Again, pulse leaves until ground. Cook ½ pound pasta and drain well. Return the drained pasta to the cooking pot. Add half of pesto, and mix thoroughly with the pasta. Pesto tends to adhere best to either angel hair or rotini pasta. Serve hot.

Scrape the remaining half of pesto from the food processor into a quart-size freezer bag, label and date, and immediately freeze. Pesto freezes well without loss of flavor or color. To use frozen pesto, thaw in refrigerator or defrost in microwave. Don't allow pesto to overheat in microwave, as it should not cook. Once pesto is warm, spoon onto hot pasta, mix thoroughly and serve.

Williamson, J. (2019, May 1). Basil. Retrieved February 27, 2020, from <https://hgic.clemson.edu/factsheet/basil/>



### Node

The point where a leaf or branch joins a stem forming a V shape.



### Cutting

After a piece of the stem has been removed to be used to start a new plant, it is called a cutting.

# How to Propagate and Care for Basil

Anna Duncan  
Extension Agent  
Coffee County



# Unit 2 | Inter-Cellular Communication

## OBJECTIVES

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- Define propagation.
- Understand inter-cellular communication.

**Time: 45 minutes- 1 hour**

## MATERIALS

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- Pencils
- Extra Herb Cuttings
- Water
- Plastic Cups with Drainage Holes or Small Pots
- Potting Soil
- Index Cards, Sticky Notes, or Scrap Paper
- Masking Tape or Popsicle Sticks
- Markers
- Paper Towels/ Wipes

## LESSON INTRODUCTION

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Using the index cards or sticky notes and pencils, ask each participant to “tweet” the definition of propagation in their own words with 280 characters or less. Give them a minute to write. Then, collect the note cards. If using sticky notes, they might stick them to the board or wall when they are finished to “post” their tweet. Review the tweets out loud with the group and reinforce the true definition of propagation. Then, share today’s learning objectives.

## INSTRUCTION

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### Observations

Ask students to find a partner. With their partners, they will observe their herb cuttings from the last workshop, review their journal notes, and discuss these observations and notes. After a few minutes ask pairs to share any interesting findings they discussed with the whole group.

Note: It may be helpful to pair younger and older students together to provide leadership opportunities for the older students and to enrich the learning experience for the younger ones.

## INSTRUCTION, CONTINUED

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### Inter-Cellular Communication

Explain that inter-cellular communication is vital to plants' survival and contributes to root growth in stem cuttings and is essential to most plant functions.

*Refer to the Inter-cellular Communication Overview for more information.*

Demonstrate this concept with a quick game of telephone.

*Telephone rules have been included with this lesson.*

### Planting

Demonstrate and supervise the planting of the rooted herb cuttings.

Advise students to use the tape or popsicle sticks and markers to label their plants.

Remind students to continue keeping records of their plants' progress in their journals.

## INSTRUCTOR'S NOTES

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Consider providing snacks using the herbs that have been propagated during one of the workshops. Many students have not knowingly eaten many herbs before and may enjoy experiencing their plants in this way.

Encourage older students to take on leadership roles throughout the workshop when appropriate. High school students can be excellent mentors to younger students who may be too shy to ask for help. They may find themselves assisting with planting, proper watering, note taking, etc. These activities build confidence in all the students involved in the peer mentorship and fosters responsibility, leadership, and teamwork. As the facilitator, be sure that this mentorship is productive and does not entail the older student simply doing things for the younger. Coach them to encourage the younger students, to ask questions, and to assist rather than to do.

# Inter-Cellular Communication Overview

Adapted from Biology Junction, Chapter 11 Cell Communication Lecture Outline

## Overview

- Cell-to-cell communication is vital for the survival of multi-cellular organisms.
- Cells must communicate to coordinate their activities.
- Cells most often communicate using chemical signals.
- What messages are passed from cell to cell?
- How do cells respond to these messages?

## Cell Signaling

- Messages are transmitted in the form of chemical signals and are converted into a specific response through signal-transduction.
- When one cell needs to send a message, it dissolves a specific chemical into its cytoplasm.
- This chemical and cytoplasm is then passed onto another cell through cell membranes.
- When the signal arrives, it is picked up and interpreted by the other cell's receptors.
- Depending on the type of receptor the other cell has, the cell's response may be the final intended response, one function of the overall intended response, or the cell may produce a secondary signal that will result in the final intended response.
- For long distances, plants and animals use hormones.
  - In plants, these hormones, called growth regulators may travel through vessels, but can also travel by air diffusion.
  - If a signal molecule is small enough, such as ethylene  $C_2H_4$ , it can pass right through the cell wall.

## Transduction

- Multi-step transduction has many benefits
- Amplify signals
- Diversify responses
- Increased responses

- Each receptor plays a role in the response and acts as a gear in a system.
- Perhaps the most important receptors are those that signal an end to a response.
  - These can use the byproducts or excess of products of a response to begin the signal to the entire system that the response is no longer needed. This allows the plant to reset itself and prepare for the next signal.

## Illustration

These concepts can be explained using a text messaging analogy.

Toward the end of the lesson, the instructor may say to the class, “we have about 10 minutes left if you need to let your parents know when to pick you up, you may do so.” This is like the first signal from one cell to another that prompts another action and signal from that cell to others.

The message (chemical) was passed through the air to the students’ ears (receptors in the cell wall) where it was interpreted.

The students will then text their parents. Another message (chemical) is created (typed) and sent to another person (cell) and received by the other person’s phone (cell wall receptor).

This message prompts the parents to come and get the students just like a chemical message from one cell can prompt another cell to begin an action.

Once the students have all been picked up, no more messages are being sent from the instructor, and the transduction process is complete.

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# 4-H ROOT Telephone Game

In the game of telephone, all the participants stand in a line shoulder to shoulder. The facilitator whispers a short phrase to the first participant who then turns to their neighbor and repeats the phrase in a whisper to them and so on.

Once everyone has heard the phrase, the last person announces what the phrase is for the whole group. Most likely, the phrase will have been altered by this point as there will have been some miscommunication along the way. Share the original phrase with the group, and conclude the game.

# Unit 3 | Cacti and Communication

## OBJECTIVES

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- Learn a variation of propagation by stem cutting.
- Develop strong communication skills.

Time: 45 minutes- 1 hour

## MATERIALS

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- Pencils
- Copy Paper
- Messenger Game Instructions and Image
- Holiday Cactus
- Holiday Cacti Care Guide (Copies for Each Student)
- Cactus Soil
- Plastic Cups with Drainage Holes or Small Pots
- Water
- Masking Tape or Popsicle Sticks
- Markers
- Wipes/ Paper Towels

## LESSON INTRODUCTION

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Ask the students, “based on what you have learned so far about propagation, do you think you can cut off a piece of any plant and it will root in water?”. Wait for a response. Then, explain that many plants can be propagated, but the steps that need to be taken might be different.

Introduce today’s lesson on propagating holiday cacti.

## INSTRUCTION

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### Propagation

Ask the students if they think a cutting of the cactus can be rooted in water. Explain that while it can be done, the preferred method is to plant the cutting directly in the soil. Ask the students why they think this method is more successful for cactus cuttings. Explain that when caring for a plant, one must consider its natural habitat and growth habits.

*The cactus thrives with very little water and would not naturally reproduce in a moist environment. Therefore, it will respond well to being placed in well-drained soil and indirect sunlight.*

## INSTRUCTION, CONTINUED

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### **Propagation, Continued**

Then, demonstrate how to break off a cutting of the cactus at a joint and to plant it. Supervise the students as they propagate their own, and advise them to use tape or popsicle sticks and markers to label their plants.

Distribute the Holiday Cacti Care Guide, and remind students to keep notes in their journals and to answer the journal prompts.

### **Personal Development**

Ask participants to reflect on the previous lesson on inter-cellular communication. Then, ask them to reflect on the importance of communication in their own lives.

Give instructions for the messenger game included in the curriculum resources.

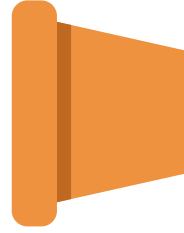
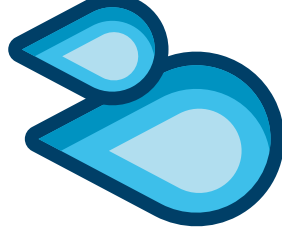
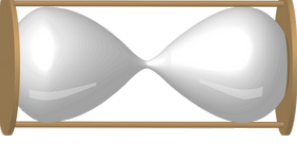
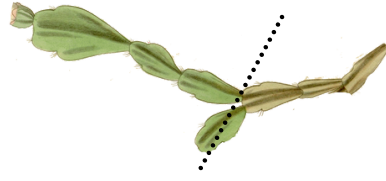
Debrief the game by tying the concepts of interpersonal and inter-cellular communication and their roles in growth and function together.

## INSTRUCTOR'S NOTES

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Be sure to root a few extra cuttings and bring them to the next session in case some of the participants' cuttings do not survive or if a new participant joins the program later on.

# How to Propagate Holiday Cacti



Find planter or pot with drainage holes. Fill the pot about 3/4 full with a soil mix for cacti and succulents.

Carefully break off a stem that has at least 3 segments when it is not budding or blooming. Be sure to break the stem at the joint. You can let the stem dry out for an hour or two or plant immediately.

Push the root end of the stem into the soil until it is 1-2 inches deep or until the stem is stable.

Place your cactus in a spot that receives bright light but no direct sunlight. Maintain warm temperatures, and avoid letting the temperature fall below 50 degrees Fahrenheit.

Water the plant thoroughly, allowing the excess water to run out through the drainage hole. Allow the soil to dry almost completely before watering again. Never let the soil sit wet. You will know if the soil is too dry if the leaves start to pucker and shrivel. The soil should be kept lightly moist during the growing season.

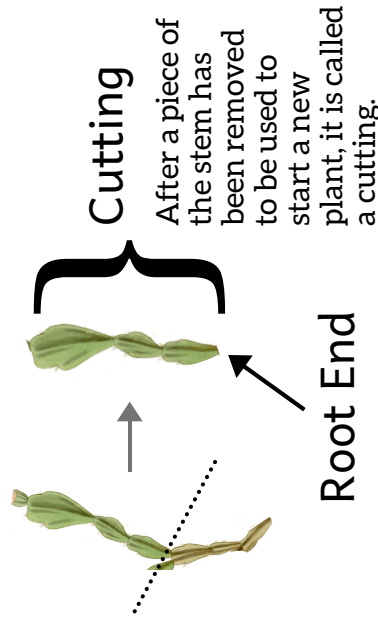
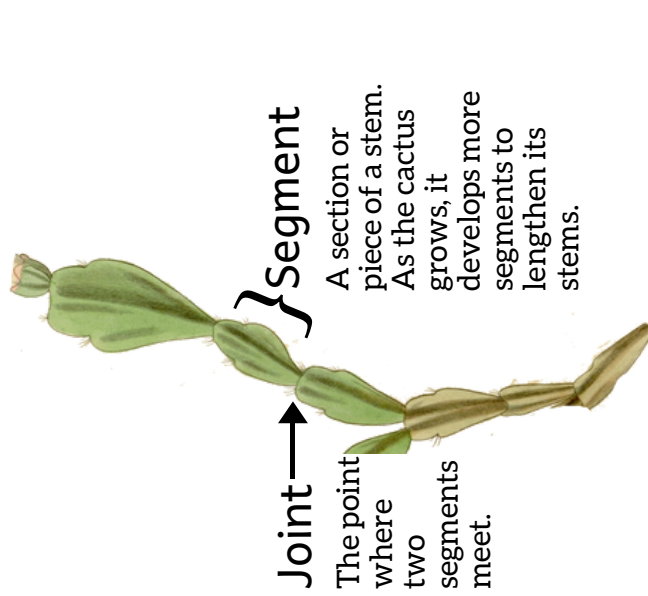
The cutting should start putting on new growth in 2-3 weeks. This comes in the form of a tiny segment forming on top of the previous segment, or maybe at the joint between two segments indicating that your cutting is making a side shoot.

Tip: Plants like to focus on roots first and leaves after. So, there might be a lot going on under the soil that you can't see. Be patient.

**Good news:** Holiday Cacti are NOT toxic to cats or dogs.

-University of New Hampshire Extension

## Getting Your Christmas Cactus to Bloom



The end of a cutting that now has an open wound from being removed from the parent plant will be the end that grows roots. Place this end in the soil.

**Tip:** The cactus will probably not bloom the year it is planted as it will need to grow first.

- In mid-October, reduce watering. Only water when the soil feels dry about an inch below the surface. Do not fertilize.
- Keep your Christmas cactus cool. Ideally, you want it at 50 to 55 degrees F.
- Begin to limit the amount of light the plant receives. The plant can remain in indirect light during the day, but it will need at least 12 to 14 hours of total darkness at night for the flower buds to develop. (If the room is warmer than the ideal 50 to 55 F, give your plant an extra couple of hours of darkness each day.) The easiest way to do this is to place the cactus in a room or closet with a door that does not get opened at night. In about 6 to 8 weeks, you should see flower buds developing on the stems.
- Once you see flower buds, move your cactus out of the darkness and near a bright window. Make sure it is not near any drafts, or the cold will cause it to drop its buds.
- The flowers should start opening within a couple of weeks. Each flower will remain open for at least 6 days, probably more, and the plant should continue to bloom for 4 to 6 weeks.

**Tip:** Holiday Cacti can bloom throughout the year.

## How to Propagate and Care for Holiday Cacti

**Annette Graham**

Tennessee Extension Master Gardener  
Crimson Clover  
Master Gardener Association

**Anna Duncan**

Extension Agent  
Coffee County



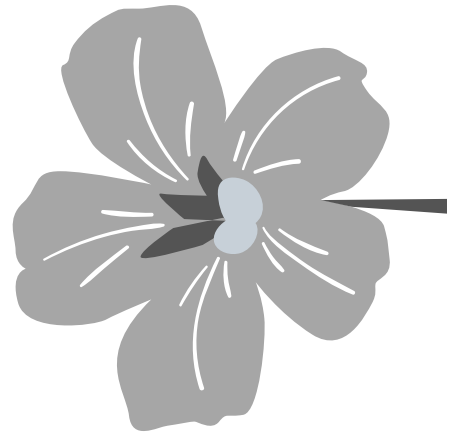
# 4-H ROOT Messenger Game

## Materials

- Copy paper
- Pencils or other writing instrument
- Messenger Game Image Sheet or other doodle
- A watch or timer

## Instructions

- Divide into teams of 3 or 4 people. Each team will have a viewer, an artist, and one or two communicators.
- The artists will be in a line along one end of the room with paper and pencil in hand.
- Each team will spread out throughout the room so that the communicators are near the middle and the viewers are near the end of the room opposite the artists similar to a relay-race arrangement.
- The game image will be placed at the end of the room nearest the viewers, and only the viewers are allowed to see it.
- The facilitator will set the timer for 3 minutes and allow the viewers to see the image sheet.
- The viewers will then go to the communicator and tell them what they saw.
- The communicator will then tell the artist what the viewer saw, and the artist will try their best to copy the original image.
  - If there are two communicators, the viewer will speak to one communicator who will relay that information to the other communicator who will then speak with the artist.
- The artist may ask questions of the communicators who then will come back to the viewers who may return to the image as necessary.
- At the end of the 3 minutes, compare the artists' drawings to the original image and congratulate the team whose image is the most similar.
- Debrief the activity.
  - What made this activity difficult? What details were missed? Were these important? What information was lost along the way? Is it hard to explain what you are seeing to other people? Why? Why is it important to be clear and intentional with our words? How does this relate to our lesson about inter-cellular communication?



# Unit 4 | All About Roots

## OBJECTIVES

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- Demonstrate the importance of roots to plant function.
- Develop self-awareness and respect for others.

Time: 45 minutes- 1 hour

## MATERIALS

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- Pencils
- Extra Cuttings
- Root Diagram (Copies for Each Student)
- Tree Handout (Copies for Each Student)
- Index Cards or Scrap Paper

## LESSON INTRODUCTION

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Ask students to find a partner and to have a discussion based on this question: “what is the most important part of a plant?”.

- *It may be helpful to pair younger and older students together to provide leadership opportunities for the older students and to enrich the learning experience for the younger ones.*
- *Coach older students to ask more questions and to do more listening rather than providing all the answers.*

Give them a few minutes to discuss. Then, ask each group to share their answer and reasoning. Praise critical thinking and creative responses. Then, share your answer (roots) as you introduce today’s lesson.

## INSTRUCTION

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### ROOTS

Ask students to recall that much of their time lately has been spent hoping and watching for roots!

Using the root diagram, explain the parts of a root and their functions.

- Compare this to a human foot. Everyone knows people have feet, but what are the individual bones called? The tendons and muscles? What do they do? Each piece serves the plant in its own way.

### Slogans

Using an index card or scrap of paper, ask each student to write a slogan for roots. This should be short, fun, and highlight the amazing things that roots do.

### Personal Development

Transition into the personal development portion of the lesson by saying, “Now that we know how our plants stay grounded and how they get the support and nutrition that they need, let me ask you, what keeps us grounded? What supports us in our daily lives? What are our roots?”. Give them time to ponder this.

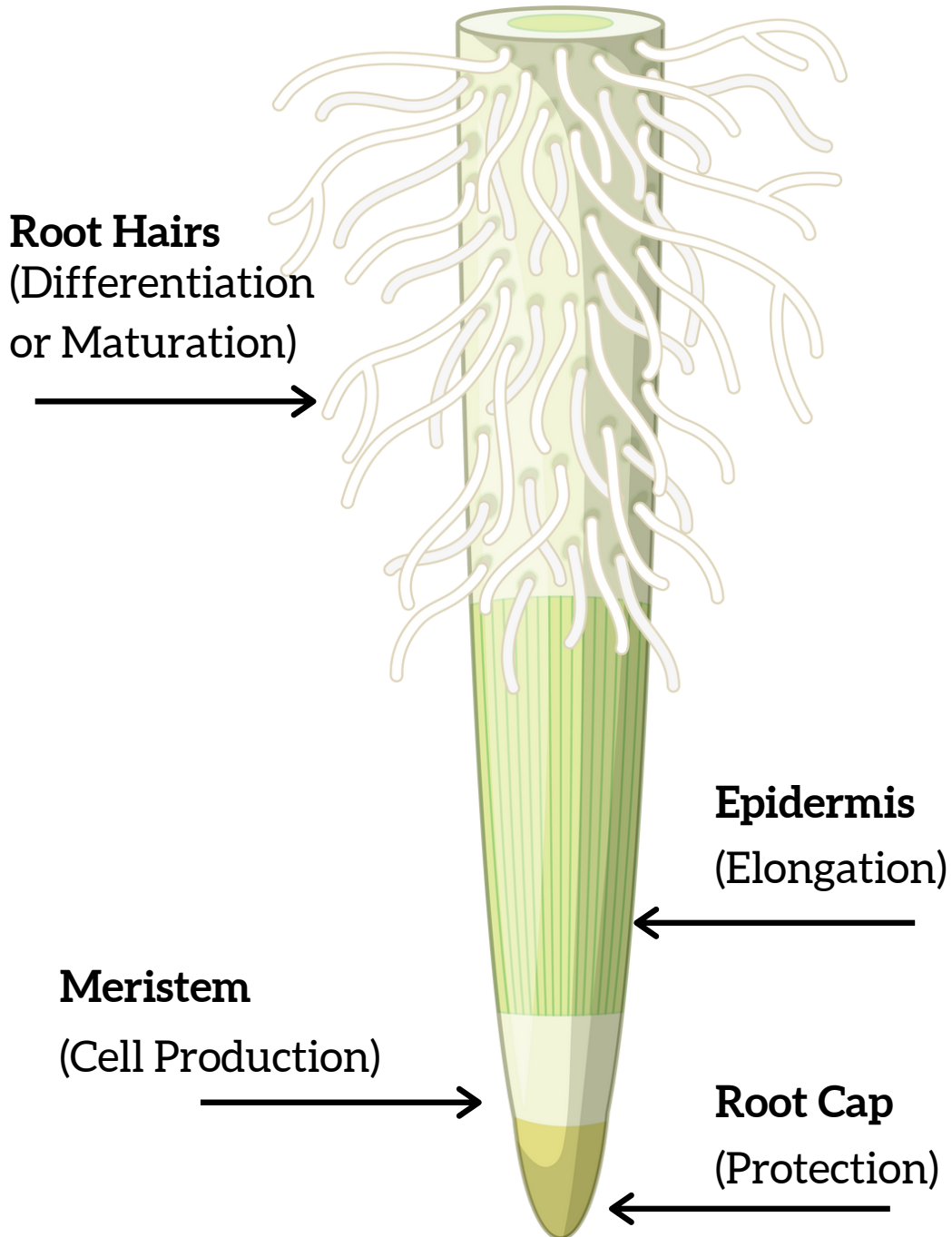
Pass out a tree handout to each student. Ask them to write things or people that support, nurture, and ground them around the roots on the picture. Then, ask them to write things about themselves that they are proud of such as kindness or friendliness in the branches of the tree.

Ask if anyone would like to share, or share your own to start. Note the similarities and differences in everyone’s roots and compare them to the roots of different plants.

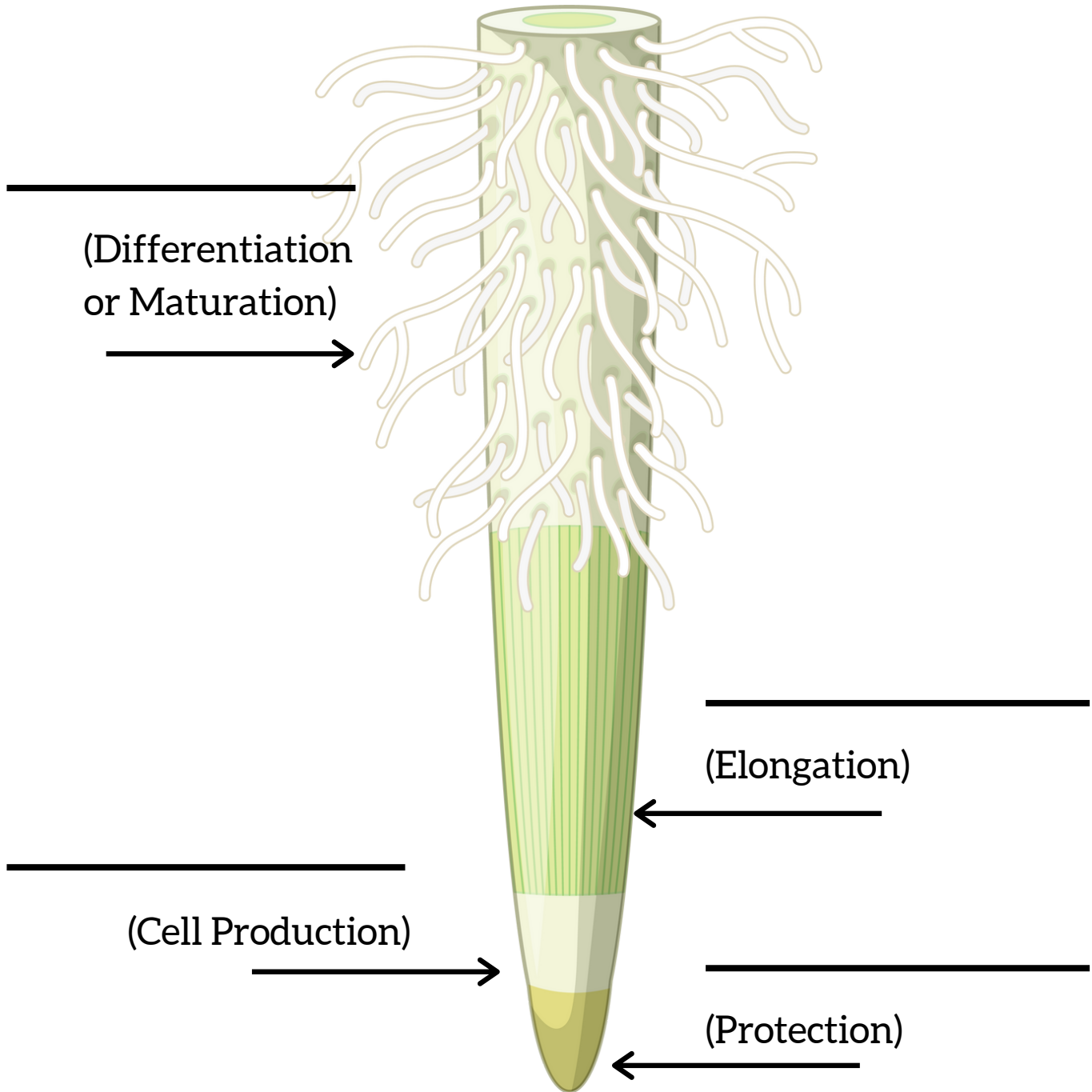
- *i.e. Some plants’ roots can find stability in sandy soil while others are made for clay, but that’s what those plants need just as we all need and have different families, friends, experiences, etc. that keep us grounded and help us to stand tall.*

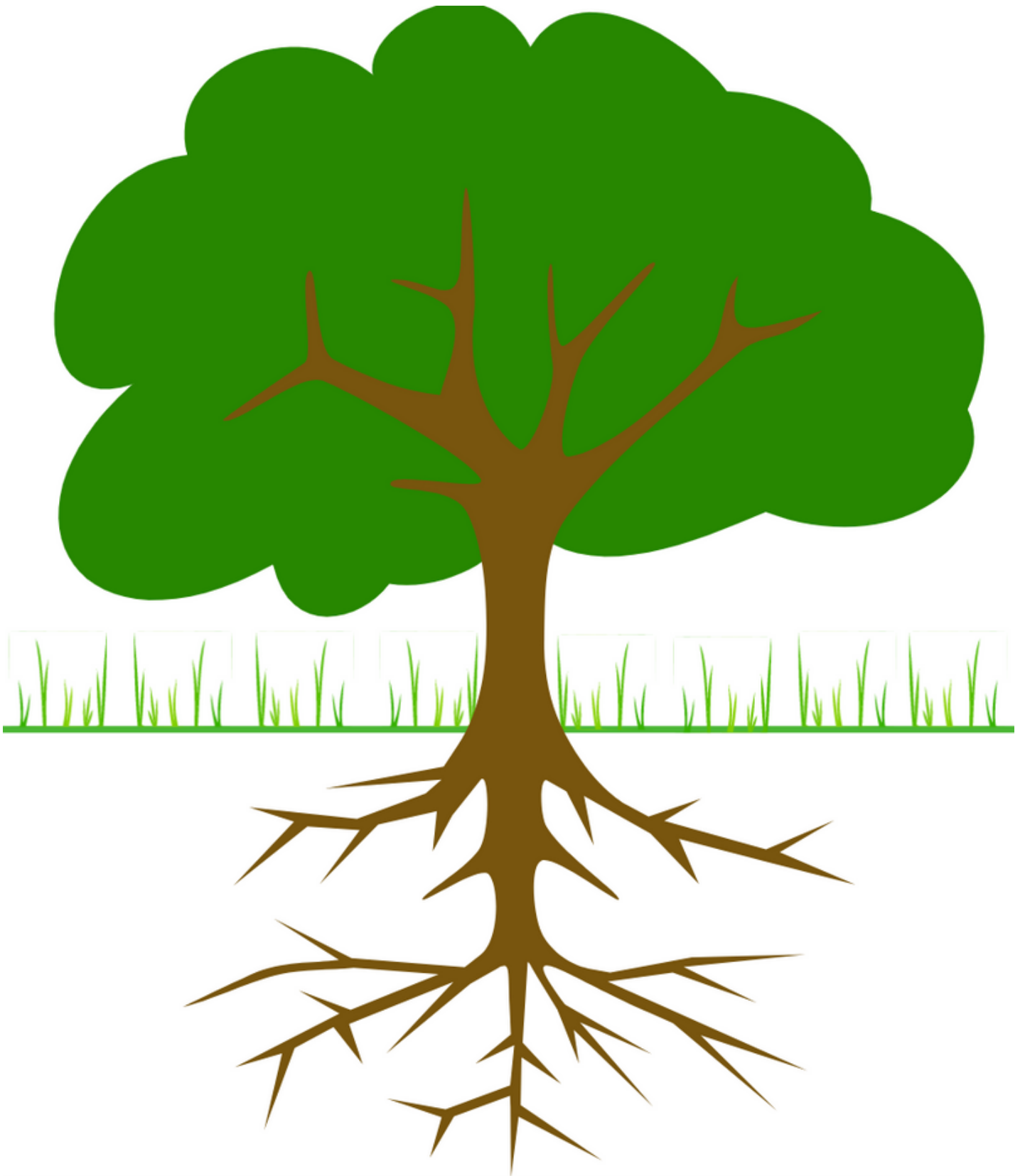
Remind the students that a plant cannot stand tall without a strong support system, and neither can we. Encourage them to be supportive of one another especially if they notice someone else beginning to wilt.

# Root Parts and Functions



# Root Parts and Functions





# Unit 5 | Aerial Roots

## OBJECTIVES

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- Define aerial roots and associated structures.
- Learn to propagate using runners.

**Time: 45 minutes**

## OBJECTIVES

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- Index Cards or Scrap Paper
- Spider Plant Care Guides (Copies for Each Student)
- Spider Plant Diagrams (Copies for Each Student)
- Spider Plant(s) with Plantlets
- Popsicle Sticks or Masking Tape
- Pruners or Scissors
- Clear Plastic Cups with Drainage Holes
- Solid Colored Plastic Cups
- Potting Soil
- Water
- Markers
- Wipes/ Paper Towels

## LESSON INTRODUCTION

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Ask students to recall the previous lesson on root development. Then, ask them what they think will happen when the roots need more space than the pot or cup can provide.

Share with the students that some plants use this situation as a signal to start reproducing and create what are called runners which we will learn about today.



## INSTRUCTION

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### Vocabulary

Pass out the diagram of a spider plant. Use it and the live plant to teach the definitions and functions of runners, aerial roots, and plantlets.

Explain what it means for a plant to be “root bound”.

### Propagation

Demonstrate how to remove a plantlet from the mother plant and to plant it in moist soil in the clear cup. Place the clear cup in the solid cup and explain that this will allow the observation of root development.

Then, supervise the students as they plant their own plantlets. Advise students to use the tape or popsicle sticks and markers to label their plants.

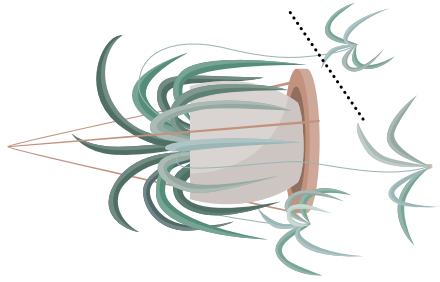
Distribute the Spider Plant Care Guide. Remind students to continue writing in their journals, and ask them to bring at least one young spider plant to the next workshop.

## INSTRUCTOR'S NOTES

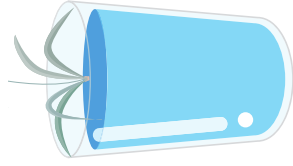
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Be sure to root a few extra plantlets and bring them to the next session in case some of the participants' plantlets do not survive or if a new participant joins the program later on.

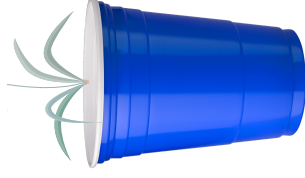
# How to Propagate Spider Plants



When aerial roots form on the plantlets, use clean scissors or pruners to remove the plantlet from the runner.



If the aerial roots are very small, you can place them in a glass of water for a couple weeks. Be sure to keep the leaves out of the water. When the roots have grown a few inches, you can pot the plantlet.



Dig a hole large enough for the roots to spread out in, and place the plantlet's roots in the hole. Pack the soil around the plantlet, and place the clear cup in a solid colored cup.

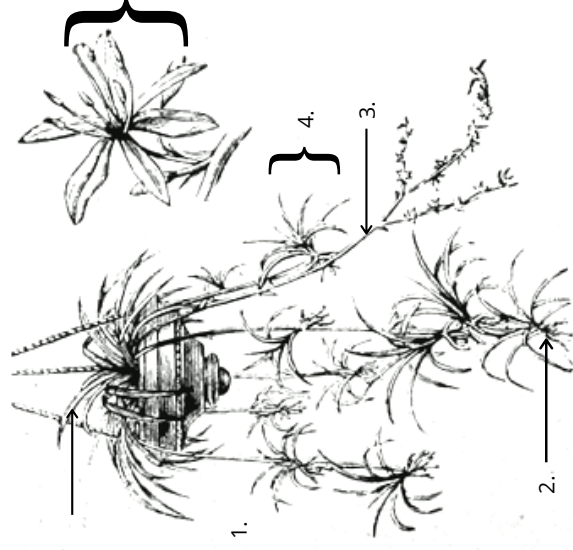


Keep your new spider plant in bright, indirect sunlight as direct, hot sunlight can scorch the delicate leaves of the plant.

Water when the top inch of soil begins to feel dry.

Using the clear cup, check for root development periodically. When your plantlet becomes root bound, it will form a runner of its own.

## Terms to Know



- 1. Leaf
- 2. Aerial Root
- 3. Runner
- 4. Plantlet
- 5. Flower

**Variegated-** Having lighter and darker portions of leaves not caused by stress or disease.

**Root Bound-** when a plant's roots become constricted by the plant's container.

## Spider Plant Tips

### Fertilizing

Fertilize your spider plant once a month during the growing months (spring through mid-fall) to encourage root and vegetative growth.

### Browning/ Brown Tips

Browning of the leaves may be caused by a lack of nutrients or water. Assess your fertilizer and watering schedule and make adjustments as needed.

### Winter Care

It is best to keep spider plants indoors during the harsh winter months. Also, reduce watering and stop fertilizing during the winter to help the spider plant enjoy its dormant period.

# How to Propagate and Care for Spider Plants

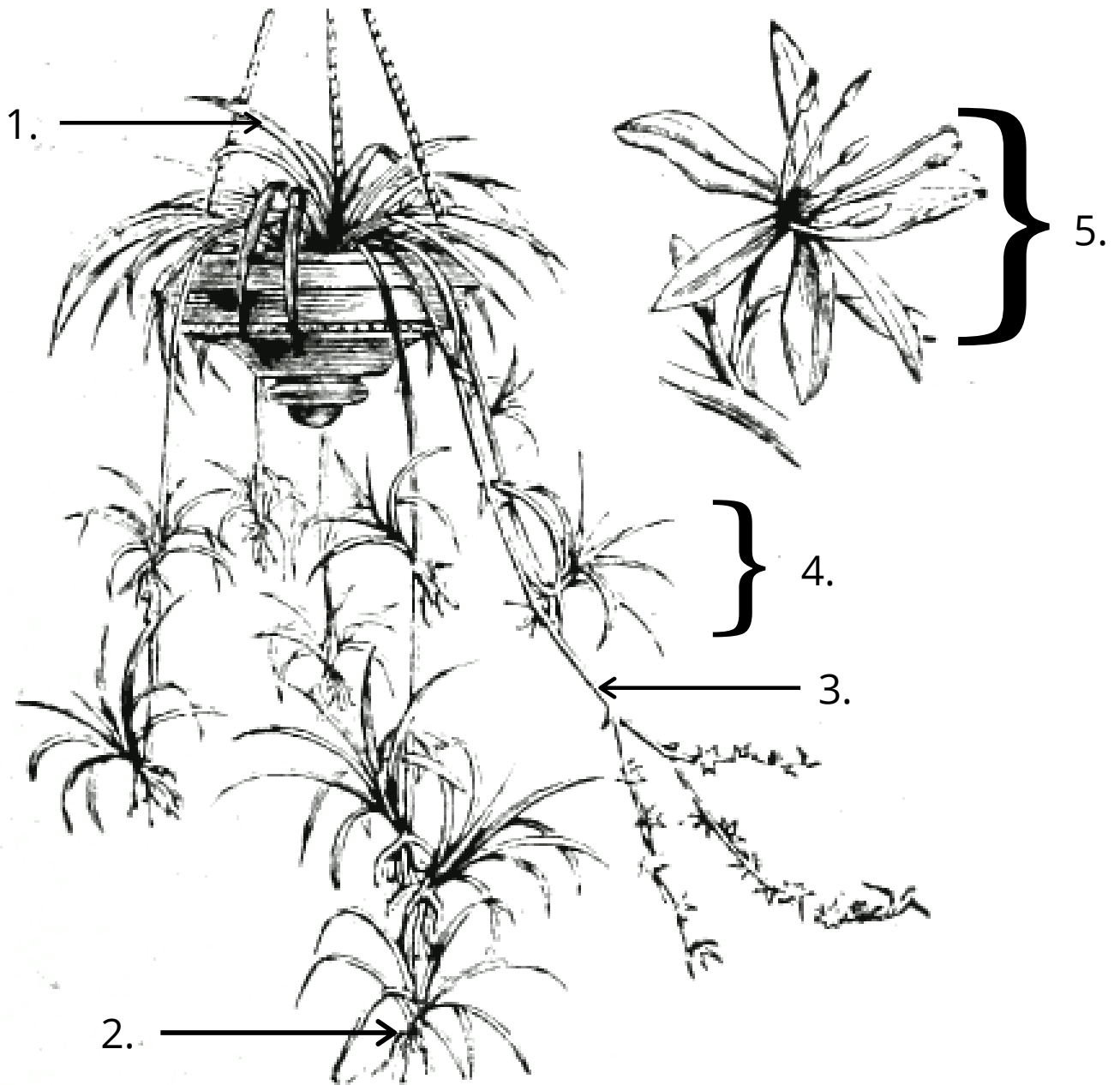
*Chlorophytum Comosum*

**Anna Duncan**  
Extension Agent  
Coffee County

Dammer, U. (2007, October 3). Chlorophytum comosum [Figure from book]. Retrieved May 28, 2019, from [https://commons.wikimedia.org/wiki/File:Chlorophytum\\_comosum.png](https://commons.wikimedia.org/wiki/File:Chlorophytum_comosum.png)

Knight, T. (n.d.). Chlorophytum (Spider Plant). Retrieved February 27, 2020, from <https://www.ourhouseplants.com/plants/spiderplant>

# Spider Plant Parts



1. Leaf

2. Aerial Root

3. Runner

4. Plantlet

5. Flower

Dammer, U. (2007, October 3). *Chlorophytum comosum* [Figure from book]. Retrieved May 28, 2019, from [https://commons.wikimedia.org/wiki/File:Chlorophytum\\_comosum.png](https://commons.wikimedia.org/wiki/File:Chlorophytum_comosum.png)

# Unit 6 | Root Bound

## OBJECTIVES

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- **Observe spider plant roots.**
- **Review previous lessons.**
- **Develop public and interpersonal communication skills.**

**Time: 45 minutes**

## MATERIALS

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- Individual dry erase boards and markers or copy paper and pencils
  - Or, storyboard templates have been included with this lesson if needed.
- Young Spider Plants
- Extra Plantlets
- Wipes or Paper Towels

## LESSON INTRODUCTION

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Demonstrate how to lift the young spider plants gently from the clear cup to observe the roots if they cannot yet be seen through the sides of the cup.

Instruct students to check on their roots and see if they are white, dry, and growing.

Depending on the length of time since planting, some may be root bound

Ask students to recall the meaning of being root bound and how spider plants behave when they are root bound.

## INSTRUCTION

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### Storyboards

Divide the students up into groups, and pass out 8-12 individual white boards or pieces of copy paper per group.

Instruct the groups to use the white boards or paper to create one storyboard that illustrates the spider plant propagation process using each board or piece of paper as a frame. Each group member should participate in the drawing and creation of the storyline.

Once the storyboards are complete, ask each group to present their stories. Praise creative, accurate portrayals of the propagation process and ask clarifying questions if something in their story is unclear.

Depending on the dynamics of the group, it may be better to mix older and younger students or to separate them.

- If older students are grouped with younger, coach the older students to ask more questions and to do more listening rather than providing all the answers.
- If they are separated, the older group may be given more paper or white boards and therefore expected to provide more detail and create more frames for their storyboard.

Debrief by reviewing the stories and highlight exceptional portions that demonstrated understanding.

4-H Member (s) \_\_\_\_\_

Project Name \_\_\_\_\_ Date \_\_\_\_\_ Page Number \_\_\_\_\_

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# References

- Chapter 11 Cell Communication Lecture Outline. (n.d.). Retrieved from [https://www.biologyjunction.com/chapter\\_11\\_\\_\\_\\_cell\\_communication.htm](https://www.biologyjunction.com/chapter_11____cell_communication.htm)
- Dammer, U. (2007, October 3). Chlorophytum comosum [Figure from book]. Retrieved May 28, 2019, from [https://commons.wikimedia.org/wiki/File:Chlorophytum\\_comosum.png](https://commons.wikimedia.org/wiki/File:Chlorophytum_comosum.png)
- Growing Herbs at Home. (n.d.). Retrieved from <https://extension2.missouri.edu/g6470>
- Knight, T. (n.d.). Chlorophytum (Spider Plant). Retrieved February 27, 2020, from <https://www.ourhouseplants.com/plants/spiderplant>
- McLaurin, W. J., & McLaurin, S. R. (n.d.). Publication.
- Spider Plant. (n.d.). Retrieved from <https://hgic.clemson.edu/factsheet/spider-plant/>
- Teacher, B. (2020, February 21). Structure of Flowering Plants. Retrieved February 27, 2020, from <http://leavingbio.net/structure-flowering-plants/>
- Vegetative Propagation of Houseplants- Cuttings. (n.d.). Retrieved from [https://extension.illinois.edu/houseplants/propagation\\_cuttings.cfm](https://extension.illinois.edu/houseplants/propagation_cuttings.cfm)
- Vegetative Propagation of Houseplants- Specialized Structures. (n.d.). Retrieved May 28, 2019, from [https://extension.illinois.edu/houseplants/propagation\\_special.cfm](https://extension.illinois.edu/houseplants/propagation_special.cfm)
- Williamson, J. (2019, May 1). Basil. Retrieved February 27, 2020, from <https://hgic.clemson.edu/factsheet/basil/>





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