










# *Sow It, Grow It, Know It*

A Garden Study
Program For
Grades 2-6
Integrating Hands-On
Science, Math, and
Language Arts

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## TABLE OF CONTENTS

## Overview

Before beginning, it is important to set one thing straight. I have never owned a plant that I did not kill. It is by pure luck alone coupled by the dedication and love my students put into this garden program that made it such a huge blossoming success. It all started one summer when I took a botanical gardening course. It was offered over the summer for two weeks at Fairchild Tropical Garden and led by Chris Migliacio, a Miami-Dade Professor. I like many in the course took the course because it looked interesting and carried a stipend at its summer completion. Boy was I in for a huge surprise. I was one of a few elementary teachers in the group. Most of the others in the course were high school science teachers or plant geeks. The bad news was it was the hardest inservice I ever took. The good news, I was inspired to take what I learned into my classroom, or should I say outside my classroom.

We started by putting a cute picket fence around a 50' x 60' area in the back of the school by the portables. We started learning about plants from the seed on up. We planted seeds in cups and when they grew, we planted them in the ground. We couldn't dig into the ground because all we found was coral rock. So, we threw dirt on the ground and transplanted our seedling plants. To our amazement, vegetables grew and grew and grew. Students participated in field studies and without even knowing it; they were learning math and science, the fun way. We grew two kinds of tomatoes, radishes, carrots, turnips, green beans, broccoli, cauliflower, cucumbers, bell peppers, jalepeno peppers, squash, cabbage, and herbs. We had no luck with the strawberries.

Students tasted it all! Many of them had never eaten most of the vegetables before. None of them realized that tomatoes are green before they turn red. We made salsa with the tomatoes, peppers, and herbs and coleslaw from the cabbage. We didn't learn science out of a book. We learned science and math by participating in a hands-on inquiry based way. Students took part in field studies. They measured the length of the tallest broccoli stalk and the longest green bean. They compared the ratio of green to red tomatoes and the diameter of the cabbage. They found the length and circumference of squash, peppers, radishes, and cucumbers. They even measured the height of the sunflowers and made sketches of several other plants. Student predicted, recorded data, and analyzed it with graphs and charts. Finally, they wrote about their findings. They participated in science to take them to the FCAT and beyond.

On this CD, you will find 13 hands-on, inquiry based science activities to teach your students about plants. Feel free to leave your textbook behind. These lessons will teach your students far more than they will learn in any old textbook. Activities teach science and throw in math and language arts at no extra charge! All lessons can be adapted up or down for students in grades 2-6. You will also find two "scrapbook pages" that will show you photos and descriptions of students participating in the activities. You can also view an overview of the program on the *Sow It, Know It, Grow It Video*. Just pop it into your computer and double click. It will play automatically. Sit back, and enjoy the show! All lessons are MS Word Files so that you can adapt them to fit the needs of your students and the materials you have at hand. So It, Grow It, and I guarantee, your students will KNOW IT. Please send me e-mails at kids4kidsclub@hotmail.com and let me know how you used this program in your classroom.

## Parts Of A Seed

Students spent part of the year in the science lab studying plants. For their first lab, our botanists compared a soaked seed to a dry seed. They learned that the food for the growing plant is stored in the cotyledon. They removed the seed coat and took a careful look at the cotyledon and the embryo. Students also wrote a list of comparisons about the two seeds and made detailed drawings identifying the seed parts.

## Seed Sort

For this activity, students sorted 8 different beans into groups by characteristics. After predicting how many were in each group, they counted and graphed their results. Next they estimated how many of each bean would equal the weight on one dinosaur gram counter. After estimating, students put one counter on the scale and added beans to the other side until the scale was balanced.

## Planting In The Garden

To continue their study of plants, students began their own garden. They mixed their own potting mix with equal parts of peat moss, perlite, and potting soil. Next they planted bell peppers, jalepeno peppers, three types of tomato, broccoli, cabbage, and cauliflower. After adding fertilizer, they planted marigolds to be a natural pesticide. Finally, students predicted how long it would take for the seedling plants to bear vegetables. Over the next few weeks, they visited the garden to water, weed, and observe.

## Conditions For Growth

Students learned that there are certain conditions that all plants need to grow. They tested to see if a peanut seed would grow in the dark. Students soaked a paper towel and removed the seed coats from two peanuts. Next they placed one in the dark and one in the light for two weeks. After discussing variables, students made predictions as to which one would have the longest stem. For two weeks they made daily observations.

## Seed In A Bag Part Two

After two weeks, students removed their seed from the bag and made comparisons with the seed in the dark. They measured the roots, stems, and counted the leaves. Students observed that the one in the dark had yellow leaves. They discussed the role light plays in photosynthesis. They also observed that the one in the light had longer roots and more leaves.

## Planting Seeds In Cups & Pots

**Home Depot** donated wonderful planting tables. Students planted seeds in cups and pots and predicted how long they would take for three leaves to grow. They observed weekly.

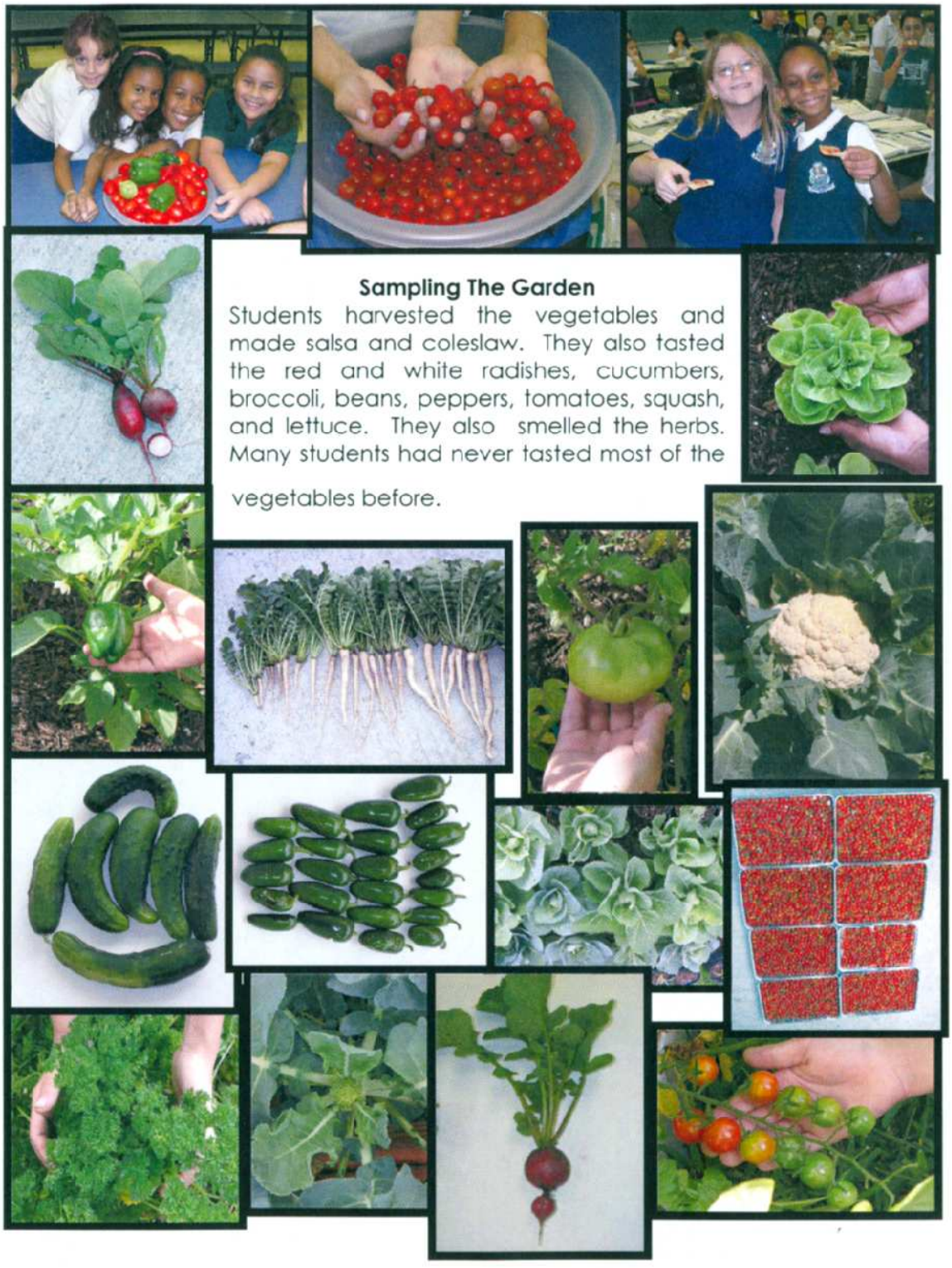
Once the leaves grew, students made plots by laying potting mix on top of the grass. They transplanted their seedlings in the bed and predicted how long it would take for the vegetables to be full grown. Students made weekly observations. Special thanks to The **Dade County Farm Bureau** and **Hines Miami** for donating funds and plants to help our garden grow.

## Field Studies

Once plants started to grow, students took part in field studies. They measured the diameter of the cabbage, the height of the tallest broccoli plant, the width of the leaves, and counted the number of red and green tomatoes on each vine, and drew sketches. Students recorded data and graphed their findings.




The best way to teach FCAT science skills is to simply teach hands-on inquiry based science. Students at Jack Gordon participate in science experiments in the school lab and in the "outside lab", the garden. Our garden is 50' x 60'. Students make predictions, observations, record data, take measurements, graph, and write about their findings.



**Sampling The Garden**

Students harvested the vegetables and made salsa and coleslaw. They also tasted the red and white radishes, cucumbers, broccoli, beans, peppers, tomatoes, squash, and lettuce. They also smelled the herbs. Many students had never tasted most of the vegetables before.



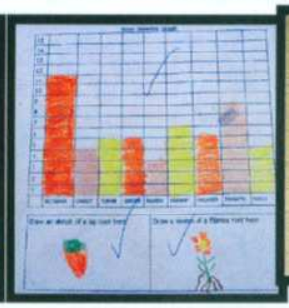


## Comparing Plant & Human Cells

Students made wet mount slides of cheek cells and onion skin cells. They predicted whether they would look similar. Then they viewed them under a microscope and drew what they saw. Students learned that cells carry out specific functions both in plants and humans.

## Edible Roots

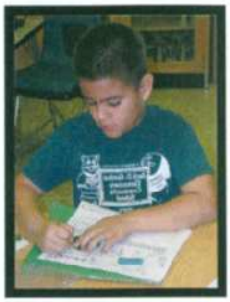
Students discussed that roots are used to anchor the plant in the ground and to send water to the plants. They examined several edible roots. Students took a cross section of each and used a tape measure to find the diameter. They recorded the results on a data table and graphed their findings. They also drew color illustrations. They also learned the difference between a tap root and a fibrous root


## Leaves, Bulbs & Using Plants For Medicinal Purposes


In this lesson, students learned the functions of leaves and that there are different kinds of leaves. They examined the papery thin outer layers of the onion as well as the thicker inner layers. They learned the terms epidermis and the dermis. Then they predicted how many layers the onion would have. They found their results by peeling away each layer and counting the leaves. Next, they looked at the aloe leaf and discussed some of the ways it is used for medicinal purposes. They looked at a cross section under the microscope and identified the vacuoles as the place where water is stored. Finally, they rubbed the aloe on their hands to feel what the inner layer felt like.

## Learning More About Leaves



For this activity, students learned about the role photosynthesis plays with leaves. They learned about different leaf types and went on a nature walk to collect leaves. Next, students traced their leaf on a grid and found the area and perimeter. After answering several questions about their leaves, they placed their leaves on a card that was put it in a leaf press. Students discussed the reasons why pressing leaves would be important to scientists.

## Herbicides, Pesticides, &The Food Chain

Students discussed the harmful affects of pesticides on animals by playing *The Food Chain Game*. In the game, students pretend to be grasshoppers, mice, and hawks. They found out that pesticides can keep away pests, but they also have environmental consequences on animals. Several weeks later, students were upset to see that several Tomato Horned Worms has eaten all our tomato plants bare. They opted to use organic pesticides on the next crop.

NAME:_____DATE:_____

CLASSIFICATION OF PLANTS

BACKGROUND **INFORMATION: Flowering seed plants** can be divided into two groups. **MONOCOTS** are plants whose seeds have one section. Corn, oats, wheat, and apple are examples of seeds with one section; they are monocots. **DICOTS** are seeds that have two sections. Peanuts, almonds, and peas split into two sections; they are dicots. Another way to classify monocots and dicots is to count the flower petals. Monocots have petals in groups of three. Dicots have petals in groups of four or five. A tulip is a monocot and a hibiscus is a dicot. Some seed plants have cones and are known as **CONIFERS.** Some examples include pines, firs, spruces and cedar. Conifers, like flowering plants, need seeds to reproduce. Most flowering plants have broad leaves and most conifers have needle-shaped or scale like leaves. The four types of **nonseed plants** include **FERNS, MOSSES, FUNGI, and ALGAE. Ferns** have no seeds and reproduce through **SPORES** found on their underside. The second group of nonseed plants consists of plants that have no true roots, stems or leaves. This group includes mosses, fungi, and algae. **Mosses** are found in damp places and often grow on rocks, trees, and soil. Fungi cannot make their own food; they must get their food from living or dead plants and animals. Examples include mold, mushrooms, and slime. **Algae** are the simplest of all food producing plants and are grouped by color. Examples include blue-green, green, brown, and red algae.

**PROBLEM STATEMENT:** How many days will it take for a seed to sprout (be visible above the soil)?

**HYPOTHESIS:**

**MATERIALS:** 4-5oz.cups, potting soil, corn, radish, pea, and bean seeds, water, sticky dots.

**PLANTING THE SEEDS**

**PROCEDURE:**

1. Label 4 blue sticky dots and stick one on each cup: 1. corn, 2. radish, 3. pea, 4. bean
2. Fill 4 cups with soil. Poke a hole in each cup and place the proper seed in each.
3. Measure 10 ml of water and place it in each cup.
4. Take cups with seeds home and complete the activities below:
5. Keep your four seedlings where they are exposed to some form of light. Be sure keep the seedlings moist. **RECORD** your observations.

DAY 1_____

DAY 2_____

DAY 3_____

DAY 4_____

DAY 5_____

DAY 6_____

DAY 7_____

**Results:** Look at the cups and describe what you see in each cup. Be sure to tell which ones grew better.

**MATH APPLICATION:**
Mrs. Davis planted 3 plants on Monday, 5 plants on Tuesday, and 7 plants on Wednesday. At this rate, how many plants would she have planted at the end of 8 days? Write a number sentence and solve:_____

1. **Flowering seed plants** can be divided into two groups:_____ & _____

2. Plants whose seeds have one section are called_____.

3. Seeds that have two sections are called _____.

4. Flowers with petals in groups of three are called_____.

5. Flowers with petals in groups of four or five are called_____.

6. Some seed plants have cones and are known as _____.

7. Most flowering plants have_____leaves and most conifers have _____leaves.

8. The four types of **nonseed plants** include _____, _____, _____, **and** _____.

9. _____ have no seeds and reproduce through **SPORES** found on their underside.

10. Three nonseed plants that have no true roots, stems or leaves are _____, _____, and _____.

Name_____ Date_____

## Parts Of A Seed

Seeds are alike in many ways. They develop in the ovary of a plant and contain a little plant called an embryo. Seeds are covered by a thin outer coating called a seed coat. The seed coat protects the seed. The tiny seed has its own food until it is able to make its own food in its leaves. The food storage of a seed is called the cotyledon. Seeds are different sizes and shapes. A corn seed is a monocotyledon and has a tiny embryo inside, but since it has only one cotyledon, it cannot be split in half. A bean seed is a dicotyledon meaning it has two cotyledons and can be split in half. The embryo is between the two cotyledons.

In this activity, you will have a chance to compare a dry and soaked bean seed. One lima bean has been soaked overnight. The other one is a dry seed that has not been soaked.

**Materials** (per person): one soaked seed, one dry seed, a hand lens, a ruler or tape measure

**Procedure:**

1. Lay out the soaked seed and the dry seed next to each other. Write down five observations of each seed on the chart below. Be sure to write down some physical properties to describe or compare the seeds.

| The dry seed.... | The soaked seed.... |
|---|---|
| | |
| | |
| | |
| | |
| Draw the dry seed here: | Draw the soaked seed here: |
| | |

(Procedure continued)

2. Carefully remove the seed coat.
3. Split the seed in two parts.
4. Look for the embryo in the middle. It may break off or fall out.
5. Draw the two cotyledons and the embryo here.

**Write about it:**

Pretend you found a bag of magic beans. Explain what happened after you planted the beans.

| |
|---|
| |
| |
| |
| |

Name_____ Date_____

**Seed Sort**

Seeds come in different sizes and shapes, most are surrounded by fruit. Different types of fruit have different types of seeds. Most plants grow from seeds. Seeds are planted in the ground and as long as the seed has water and sunlight, it will grow into a new plant.

**Problem Statement:** How many of each kind of seed or bean are in the cup?

**Materials:** Cups with seeds or beans

**Data Table:** Draw one of each kind of seeds in the boxes in the first column. Pour out the seeds and sort them into piles that look the same. Count how many there are of each and write the number next to the glued seed.

| Draw your seed here: | How many were there? |
|---|---|
| | |
| | |
| | |
| | |

**Seed Graph**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 | | | | | | | |
| | 19 | | | | | | | |
| N | 18 | | | | | | | |
| U | 17 | | | | | | | |
| M | 16 | | | | | | | |
| B | 15 | | | | | | | |
| E | 14 | | | | | | | |
| R | 13 | | | | | | | |
| | 12 | | | | | | | |
| | 11 | | | | | | | |
| O | 10 | | | | | | | |
| F | 9 | | | | | | | |
| | 8 | | | | | | | |
| | 7 | | | | | | | |
| S | 6 | | | | | | | |
| E | 5 | | | | | | | |
| E | 4 | | | | | | | |
| D | 3 | | | | | | | |
| S | 2 | | | | | | | |
| S | 1 | | | | | | | |
| | | Seed 1 | | Seed 2 | | Seed 3 | | Seed 4 |

**Seed Types**

Count how many seed you have in all. Write how many you have in the box below.

If you have a scale, weigh the cup of seeds and record how many grams were in the cup.

| Cup of seeds | Number of grams_____ |
|---|---|

Think about your favorite fruit. Tell which fruits are your favorite and how you like eat them. Draw pictures of your favorite fruits. Draw the seeds inside them.

Name_____Date_____

## What Plants Need To Grow

| | | |
|---|---|---|
| Plants are organisms that grow and reproduce their own kind. They need soil, air, water, light and space to grow. | **SOIL**<br>Water and minerals are taken from the soil through the roots. Soil also provides support for the plant and an anchor for roots to grow in. Decaying plants and animals leave minerals in the soil that help the plant to grow. | **LIGHT**<br>Plants need sunlight to grow properly. They use light energy to change carbon dioxide into food (sugars). This food making process is called photosynthesis. Only with light can plants make their own food. |
| **AIR**<br>Plants need clean air. Green plants take in carbon dioxide from the air and use it during a process known as photosynthesis. | **WATER**<br>Water is needed for all living things. Plants use water to carry nutrients and moisture from the roots to the leaves and from the leaves back down to the roots. | **SPACE**<br>Plants must have space in order to grow. If their space is small, plants will be small. Plants need space for their roots and branches to spread out. |

You can choose to use any type of seeds for this activity. Radish seeds however, grow a complete radish in a short period of time.

**Problem Statement:** (What you are trying to find out)

How long will it take food a plant to produce an edible food?

**Hypothesis:** (What is your guess of prediction?)

**Materials:** (List the things you will use in the experiment.)

**Procedure:**

List the steps you used in planting the plant.

| |
|---|
| Step 1: Place soil in a cup. |
| Step 2: |
| Step 3: |
| Step 4: |
| Step 5 |
| Step 6: |

Tell what type of plant you planted today. Also, tell whether you planted your plant from a seed or a seedling plant.

| |
|---|
| |
| |
| |

List the 5 things that all plants need. Be sure to use a complete sentence.

| |
|---|
| |
| |
| |

Do this part after the plant bear food.

**Results:** (The answer to your question)
When the plant bears food, tell how long it took.

| |
|---|
| |
| |

**Conclusion:** (Was your hypothesis supported?)

| |
|---|
| |
| |

Name_____ Date_____

## Conditions For Plant Growth: Peanut Germination

All plants need light, water, air, and space to grow. We can compare plant needs by placing some plants in the light and some in the dark to see if the amount of light a plant gets really matters. In this experiment, you will make predictions and chart the growth of peanuts.

In order to make an experiment fair, scientists use variables and controls.

| **Controlling Variable** Anything kept constant in the experiment is "controlled" so that is won't affect the results of the experiment. | **Independent Variable** The thing that is changed to determine its effect on the result of the experiment. | **Dependant Variable** What is changed in the experiment, the outcome or the results |
|---|---|---|
| 1. amount of water<br>2. paper towel<br>3. type of seed<br>4l plastic bag | 1. amount of light | 1. length of root<br>2. length of the stem<br>3. color of the leaves |

**Problem Statement:** Which plant will have a taller stem in one week, the plant in the light or the plant in the dark?

**Hypothesis:** (What is your prediction?)

**Materials (per student):** ziplock sandwich bag, paper towel, 2 teaspoons of water, 2 green peanuts (found in the produce section)

**Procedure:**

**Step 1:** Fold the paper towel in fourths and place the paper towel in the bag.

**Step 2:** Staple across the bag about 2 inches from the top, leaving small spaces between the staples.

**Step 3:** Remove 2 peanuts from their shell, remove the seed coat (skin), and place the two peanuts in the bag above the staples.

**Step 4:** Measure 20 ml (or one small portion cup) of water and pour it across the paper towel. Do NOT close the bag.

**Step 5:** Write your name on the bag using a label or piece of masking tape. Tape the bag in a window or on a door.

**Step 6:** Choose one bag to tape inside a closet or somewhere dark.

**Step 7:** Mark the growth daily.

Each day, write a comment on the growth of your seed (for example: no growth, stems sprouting, roots sprouting, leaves sprouting). At the end of the two weeks, measure the growth and complete the graph.

Day1:_____

Day 2:_____

Day 3:_____

Day 4:_____

Day 5:_____

Day 6:_____

Day 7:_____

**Data:** Use a ruler to measure the length of the root and stem of your plant. Also record the data from the plant in the dark.

| | Root length in centimeters | Stem length in centimeters |
|---|---|---|
| Plant in the light | _____ cm | _____cm |
| Plant in the dark | _____ cm | _____cm |

**PLANT GRAPH**

| | | DARK | | | LIGHT | |
|---|---|---|---|---|---|---|
| | 17 | | | | | |
| | 16 | | | | | |
| | 15 | | | | | |
| | 14 | | | | | |
| C | 13 | | | | | |
| E | 12 | | | | | |
| N | 11 | | | | | |
| T | 10 | | | | | |
| I | 9 | | | | | |
| M | 8 | | | | | |
| E | 7 | | | | | |
| T | 6 | | | | | |
| E | 5 | | | | | |
| R | 4 | | | | | |
| S | 3 | | | | | |
| | 2 | | | | | |
| | 1 | | | | | |
| | | Root | Stem | | Root | Stem |

**PLANT PART**

**Results:** After a week of observation, tell which one grew the biggest. Also summarize the length of the roots and stems on the lines below.

**Conclusion:** Was your hypothesis supported?

**ACITIVITY TITLE:** Super Stems!

**ACTIVITY OBJECTIVES:** Students will identify the function of stems as a transport system in plants. They will also compare stems in plants to veins in humans.

**SUNSHINE STATE STANDARDS:** SC.F.1.1, SC.H.1.1

**MATERIALS AND SOURCES:** a stalk of celery or a white carnation, a clear cup or jar, water 10 drops of food coloring.

**ACTIVITY STEPS:**

1. Ask students what they think the stem of the plant is good for. Some ideas might be to hold up the plant, to give the plant strength, or they bring water from the roots.
2. Tell students that stems have many important functions in the growth of plants. One thing a stem does is act as a support system holding the plant upright so that it can grow toward the sun. Another important function is that a stem acts as a transport system. Water and minerals are carried through the stem to the roots and leaves of the plant. Students can observe the movement of liquids through the stem in this activity.
3. Cut off the bottom of the carnation stem or the celery stalk. Pour about 3 oz. of water in the cup. Add 8-10 drops of food coloring to the water. Place the flower or celery in the cup and leave it overnight.
4. Have students predict what they will see the next day.
5. The next day, discuss why the carnation or celery turned color (the colored water was transported through the stem.

**EXTENSION:** Discuss that our veins carry blood through our body. Have students find a vein in their arm. Veins transport blood just like the stem transports water and nutrients to the plant.

**WRAP UP:** Invite students to try at home with either a celery stalk or carnation.

Name_____ Date_____

# Edible Roots

Background Information: Roots are the least seen of any other part of the plant. The root anchors the plant in the ground and keeps it upright. It also stores food for the plant's use. Water, nutrients, and minerals are taken in by the plant's roots. Tiny hairs grow on the roots that help absorb water. The root is the first part of the plan that develops. As the embryo develops, the roots push down into the soil. There are two main types of roots. They are called tap roots and fibrous roots. Carrots, radishes, and turnips are examples of tap roots. Some roots are edible. In this activity, you will take a look at some edible roots.

You will be given a slice of each root below. Use a ruler or tape measure to measure the diameter of each cross section. The diameter is the distance across the slice. Record the number of centimeters on the line next to each root type. In the box below, use crayons or colored pencils to draw the cross section. Be sure to use your hand lens to look at the markings on the cross sections.

| RUTABAGA _____cm | CARROT _____cm | TURNIP _____cm |
|---|---|---|
| | | |
| PARSNIP _____cm | MALANGA _____cm | BONIATO _____cm |
| | | |
| YUCCA _____ CM | GINGER _____cm | RADISH _____cm |
| | | |

Tell which root had the smallest diameter._____

Tell which root had the largest diameter._____

List the roots and diameters of each in order from smallest to largest.

| NAME OF ROOT | DIAMETER |
|---|---|
| 1 | _____cm |
| 2 | _____cm |
| 3 | _____cm |
| 4 | _____cm |
| 5 | _____cm |
| 6 | _____cm |
| 7 | _____cm |
| 8 | _____cm |
| 9 | _____cm |

Graph the diameter of each root from smallest to largest. Fill in the name of each root on the table below

**Root Diameter Graph**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| D | | | | | | | | | | |
| I | | | | | | | | | | |
| A | **20** | | | | | | | | | |
| M | **19** | | | | | | | | | |
| E | **18** | | | | | | | | | |
| T | **17** | | | | | | | | | |
| E | **16** | | | | | | | | | |
| R | **15** | | | | | | | | | |
| | **14** | | | | | | | | | |
| In | **13** | | | | | | | | | |
| | **12** | | | | | | | | | |
| C | **11** | | | | | | | | | |
| E | **10** | | | | | | | | | |
| N | **9** | | | | | | | | | |
| T | **8** | | | | | | | | | |
| I | **7** | | | | | | | | | |
| M | **6** | | | | | | | | | |
| E | **5** | | | | | | | | | |
| T | **4** | | | | | | | | | |
| E | **3** | | | | | | | | | |
| R | **2** | | | | | | | | | |
| S | **1** | | | | | | | | | |
| | | | | | | | | | | |

**Type of root**

NAME:_____ DATE:_____

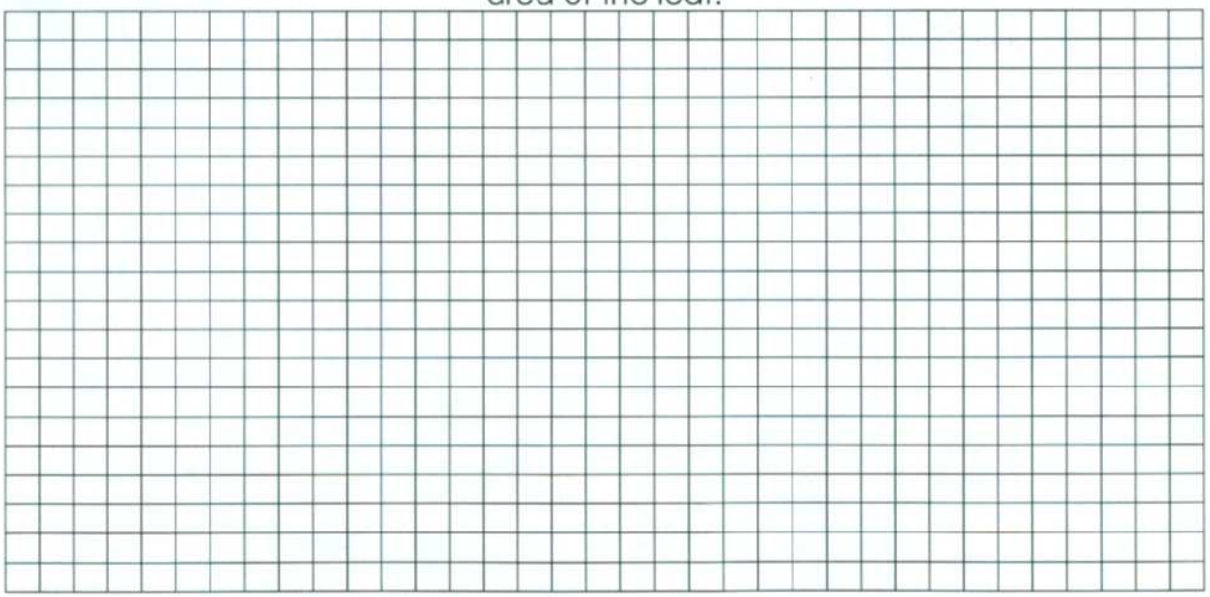
LEAVES

BACKGROUND INFORMATION: Green plants make their own food. That food is sugar. This process is called **photosynthesis**. Most of the food is made in the **leaves** of plants. Water is taken through the **roots** and carried to the leaf by the stems. Leaves need a gas called **CARBON DIOXIDE.** Carbon dioxide enters the leaf through small openings in the leaf's surface called **pores.** Plants also need energy that they get from the **sun.** Plants give off a gas called **oxygen.** Oxygen is needed by most living things to survive.

**MAKE A LEAF RUBBING BELOW:**

Place a leaf under the paper and gently rub the paper with the side of a crayon.

Place your leaf on the grid below. Trace the leaf and count the number of boxes it takes up by placing and "x" in each box. The number of boxes is the area of the leaf.



What is the area of the leaf?_____

Use a ruler or tape measure or ruler to measure the following:

Leaf length (how long is the leaf) _____
Leaf width (how wide is the leaf)_____

Make a sketch of the leaf. Use the hand lens to get a closer look at its veins. Be sure to show the veins in the sketch.

Tell why a leaf is so important to the plant.

Name_____ Date_____

Plant Leaves: Aloe

Plant leaves are very important. Leaves are the part of the plant makes food by photosynthesis. Leaves take in carbon dioxide from the air, water from the soil, and energy from the sunlight. During photosynthesis, the leaves use light energy to change carbon dioxide and water into food called sugar. Some plants are used for medicinal purposes. The leaf of the ALOE plant is often used to help heal burns. The ALOE leaf has a thick fleshy outer layer called the epidermis. The inner layer, the dermis has a gel like substance that can be put on burns. The leaf stores water for the plant in the vacuoles.

Activity 1:

Look at the cross section of the aloe leaf with a hand lens. Find the vacuoles where it stores the water. Make a drawing below and also describe how it feels.

| Draw the cross section here, label the vacuoles. | Describe how the inside of the aloe leaf feels. Use a complete sentence. |
|---|---|
| | |

Tell about how the aloe plant is used as a medicine.

| |
|---|
| |
| |

Name_____Date_____

BULBS

A bulb is a flowering plant that grows under the ground. An example would be an onion. Onion bulbs may be round, somewhat flat, or oblong and are 1 inch to 6 inches across. Under its thin, papery cover, the bulb consists of many layers surrounding one or more growing points. In this activity, you will peel away the thin outer skin of the onion and count its layers. The inner layers of the onion are the edible part.

Problem Statement: How many layers will an onion have?

Hypothesis: Predict how many layers the onion will have.

Materials: wax paper, onion, paper towel, plastic knife

Procedure:

Step 1: Carefully peel away the thin outer covering of the onion.

Step 2: Peel away each layer and count the layers. Record your data.

Results: How many layers did your onion have?

Conclusion: Was your hypothesis supported?

Tell three things you learned today that you did not already know.

1.

2.

3.

NAME:_____ DATE:_____

**HOW ARE HUMAN AND PLANTS SIMILAR?**

BACKGROUND INFORMATION: Plants and humans have similar functions. Plants and humans both need food, nutrients, water, and sunlight to survive. Humans get their food from plants and animals. Plants make their own food in a process known as **photosynthesis**. Most of photosynthesis takes place in the leaves of plants. **Carbon dioxide** enters the stomates. Plant leaves use **chlorophyll** to trap the light from the sun and make their food. During photosynthesis, oxygen is produced. Plants get energy from the sun and humans need the sun in order to survive. Both plants and humans **reproduce**. Humans reproduce through a process know as **fertilization.** Plants reproduce through **pollination**. During pollination, pollen grains move from the stamen to a pistil. Colorful and fragrant petals attract insects. The insect brushes up against the pollen grains on the **stamen.** Some pollen grains stay on the insect and as it moves from one flower to another, the grains stick to the flower's **pistil.** Both humans and plants are made up of **cells** that carry out functions needed for life.

TELL WHAT YOU ALREADY KNOW ABOUT CELLS:

**PROBLEM STATEMENT:** Are human cells and plant cells similar in appearance?

**HYPOTHESIS:**

**MATERIALS:** onions skin, slides, cover slips, cotton swabs, safety goggles, iodine, droppers, microscopes, paper towels, rubber gloves

TELL WHAT YOU WILL DO IN ORDER TO BE SAFE IN THE LAB TODAY:

**PREPARING A WET MOUNT SLIDE: CHEEK CELLS**

**PROCEDURE:**

1. Use a cotton swab to gently scrape the inside of your cheek.
2. Rub the swab onto a clean slide.

3. Put a drop of iodine on top of the specimen.
4. Touch one edge of the droplet with the coverslip and carefully drop it on the slide.
5. Blot any leaks and place the slide on the stage of the microscope.

**PREPARING A WET MOUNT SLIDE: ONION SKIN**

**PROCEDURE:**

1. Place a small piece of onion skin on the slide.
2. Put a drop of iodine on top of the specimen.
3. Touch one edge of the droplet with the coverslip and carefully drop it on the slide.
4. Blot any leaks and place the slide on the stage of the microscope.

Next, view each side and sketch it in the boxes below.

| ONION CELLS | CHEEK CELLS |
| --- | --- |
| | |

**RESULTS:** (Were the plant cells and human cells similar in appearance?)

**CONCLUSION:** (Tell whether you hypothesis was correct and why.)

How did your team work together during this lab? Would you do anything different next time? Tell what you learned in lab today.

NAME_____ DATE_____

**HOW ARE HUMANS AND PLANTS SIMILAR**
**MATCH THE PHRASE ON THE LEFT WITH THE WORD ON THE RIGHT**

1. Plants reproduce through _____.
2. Photosynthesis takes place in the _____.
3. Plants use _____ to trap light from the sun and make food.
4. The process of human reproduction is known as_____.
5. During photosynthesis, carbon dioxide enters the _____.
6. The food making process in plants is known as _____.
7. In both humans and plants, _____ carry out functions needed for life.
8. Both plants and humans depend on the _____ to survive.
9. During pollination, pollen grains move from the stamen to the _____.

A. leaves
B. cells
C. sun
D. stomates
E. photosynthesis
F. chlorophyll
G. fertilization
H. pollination
I. pistil

(You will need to personalize this to go along with what you planted in your garden)

Name_____ Date_____ #_____

Garden Field Study

Several weeks ago, you planted vegetables in the garden. Today you will use the garden to do a field study as you make careful observations about the plants.

Date the vegetable was planted:_____

Number of days since it was planted:_____

How many days did you predict it would take for the vegetable to be seen?__

Was your hypothesis supported?_____

Observation of the _____ plant.

| |
|---|
| |
| |
| |
| |

In planter #1 count the number of jalapeno peppers and record the total.

Measure the length of the longest jalapeno pepper and record it on the table.

In planter #2 measure the diameter of the cabbage and record it on the table.

In planter #3 measure the height of the tallest broccoli plant from the bottom to top and record it on the table.

In planter #4 count the number of green tomatoes and red tomatoes and record it on the table.

Look at the cabbage plant in planter #5. Tell what you saw and how it might have happened.

| |
|---|
| |

Data Tables:

| item measured | number of centimeters |
|---|---|
| longest Jalapeno pepper | |
| diameter of the cabbage | |
| height of the tallest broccoli plant | |

Sketch what you saw here:

| item measured | number of vegetables |
|---|---|
| Jalapeno peppers | |
| green tomatoes | |
| red tomatoes | |

Sketch what you saw here:

| | | | |
|---|---|---|---|
| 28+ | | | |
| 26 | | | |
| 24 | | | |
| 22 | | | |
| 20 | | | |
| 18 | | | |
| 16 | | | |
| 14 | | | |
| 12 | | | |
| 10 | | | |
| 8 | | | |
| 6 | | | |
| 4 | | | |
| 2 | | | |
| | longest Jalapeno | cabbage diameter | height of broccoli |

Vegetable measured

| | | | |
|---|---|---|---|
| 24+ | | | |
| 22 | | | |
| 20 | | | |
| 18 | | | |
| 16 | | | |
| 14 | | | |
| 12 | | | |
| 10 | | | |
| 8 | | | |
| 6 | | | |
| 4 | | | |
| 2 | | | |
| | Jalapeno peppers | red tomatoes | green tomatoes |
| | | | |

Name_____Date_____ #_____

**Garden Field Study**

Today you will use the garden as your lab. WALK through the garden and answer the following questions.

1. Go to the tomatoes in the wooden white planters. Measure the height of the tallest plant and count how many yellow flowers you see in one planter. Each flower will become a tomato.

Height_____cm # of flowers_____

2. Go to the CABBAGE patch. Count the number of plants. Use your tape measure to find the diameter of the one head of cabbage. Remember, the diameter is the distance across.

# of heads_____ diameter_____cm

3. Find the BELL PEPPERS. Count how many plants are in the bed. Then look on the top of four plants and count how many buds you see. Each bud will be a pepper. Add the total # of buds for all 4 plants you observed.

_____+_____+_____+_____=_____

4. Find the radishes. Write a one sentence observation about what you see. Gently look under the leaves as part of your observation.

5. In the beans, radishes, and corn, there is a RAPITEST water tester. If the line points to 1, the plant needs water. If it points to 2 or 3, the plant needs no water. Look at the indicator each planter and tell if the plant needs water or not.
   beans_____
   radishes_____
   corn_____

6. Find the JALEPENO PEPPER bed. Count the number of plants and record the color of the flowers. The flower is where the peppers will come out.

# of plants_____ flower color_____

7. Find the CAULIFLOWER bed. Choose one plant to observe. Count the number of leaves on one plant and measure the length of the longest leaf.

# of leaves_____ Leaf length_____cm

8. Find the BROCCOLI bed. Choose one plant to observe. Count the number of leaves on one plant and measure the length of the longest leaf.

# of plants_____ Leaf length_____cm

9. Find the BEANS. Sketch one leaf.

When you have finished the field study, sit on the sidewalk and respond to the following prompt.

Vegetables are good to eat, they help you to grow strong and healthy. Think about your favorite vegetables. Tell what they are and how you like to eat them.

Name_____ Date_____

## PUMPKIN SCIENCE

**PLEASE DO NOT SPIN, ROLL, OR BANG THE PUMPKINS ON THE TABLE**

Pumpkins are fruits that grow on leafy vines from pumpkin seeds. Yellow-orange flowers bloom on the vine, then they die and wither away. The flowers' ovaries (at the bottom of the flower), swell and become tiny green pumpkins. As they grow larger, they change color and about four months after planting, they are ready to harvest. Pumpkin colors can vary from white to yellow, to orange. Pumpkins contain vitamin A and potassium. Pumpkins are an ingredient in pies, breads, soups, and other foods. Pumpkin seeds can be roasted for a snack and some pumpkins are used as feed for farm animals.

Use the chart below to fill in information about your pumpkin and the pumpkins of the other members of your team. Graph your data.

**Count how many lines are on the outside of your pumpkins.**

**Pumpkin Lines**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 16 | | | | |
| | | | | 14 | | | | |
| **PUMPKIN** | **# of lines** | | | 12 | | | | |
| Pumpkin #1 | | | **#** | 10 | | | | |
| Pumpkin #2 | | | **Of** | 8 | | | | |
| Pumpkin #3 | | | **Lines** | 6 | | | | |
| Pumpkin #4 | | | | 4 | | | | |
| | | | | 2 | | | | |
| | | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

**Use the tape measure to find the circumference. Wrap the tape measure around the pumpkin and record how many inches it measures around.**

**Pumpkin Circumference**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 16 | | | | |
| | | | 14 | | | | |
| **PUMPKIN** | **# of inches around** | | 12 | | | | |
| Pumpkin #1 | | **#** | 10 | | | | |
| Pumpkin #2 | | **Of** | 8 | | | | |
| Pumpkin #3 | | **inches** | 6 | | | | |
| Pumpkin #4 | | **around** | 4 | | | | |
| | | | 2 | | | | |
| | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

**Use the tape measure to find the diameter. Wrap the tape measure across the top of pumpkin and record how wide the pumpkin measures.**

**Pumpkin Diameter**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 8 | | | | |
| | | | 7 | | | | |
| | | **#** | 6 | | | | |
| **PUMPKIN** | **# of inches wide** | **Of** | 5 | | | | |
| Pumpkin #1 | | **inches** | 4 | | | | |
| Pumpkin #2 | | **wide** | 3 | | | | |
| Pumpkin #3 | | | 2 | | | | |
| Pumpkin #4 | | | 1 | | | | |
| | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

**Place each pumpkin on the balance scale. Record how many grams each one weighed. Round your answer to the nearest ten.**

**Pumpkin Mass**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 350 | | | | |
| | | | 340 | | | | |
| | | | 330 | | | | |
| | | | 320 | | | | |
| | | | 310 | | | | |
| | | | 300 | | | | |
| | | | 290 | | | | |
| | | | 280 | | | | |
| | | | 260 | | | | |
| | | | 250 | | | | |
| | | | 240 | | | | |
| **PUMPKIN** | **# of grams** | **#** | 230 | | | | |
| Pumpkin #1 | | | 220 | | | | |
| Pumpkin #2 | | **O** | 210 | | | | |
| Pumpkin #3 | | **F** | 200 | | | | |
| Pumpkin #4 | | | 190 | | | | |
| | | **G** | 180 | | | | |
| | | **R** | 170 | | | | |
| | | **A** | 160 | | | | |
| | | **M** | 150 | | | | |
| | | **S** | 140 | | | | |
| | | | 130 | | | | |
| | | | 120 | | | | |
| | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

**Predict whether the pumpkin will sink or float.** _____

**If it floated, how did it float? Stem up, stem down, on its side.**_____

**List three physical properties to describe how your pumpkin looks.**

**Summarize the data for your pumpkin on the lines below.**

Name_____ Date_____

# PUMPKIN SCIENCE

## PLEASE DO NOT SPIN, ROLL, OR BANG THE PUMPKINS ON THE TABLE

Pumpkins are fruits that grow on leafy vines from pumpkin seeds. Yellow-orange flowers bloom on the vine, then they die and wither away. The flowers' ovaries (at the bottom of the flower), swell and become tiny green pumpkins. As they grow larger, they change color and about four months after planting, they are ready to harvest. Pumpkin colors can vary from white to yellow, to orange. Pumpkins contain vitamin A and potassium. Pumpkins are an ingredient in pies, breads, soups, and other foods. Pumpkin seeds can be roasted for a snack and some pumpkins are used as feed for farm animals.

Use the chart below to fill in information about your pumpkin and the pumpkins of the other members of your team. Graph your data.

**Count how many lines are on the outside of your pumpkins.**

**Pumpkin Lines**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 16 | | | | |
| | | | | 14 | | | | |
| **PUMPKIN** | **# of lines** | | | 12 | | | | |
| Pumpkin #1 | | | **#** | 10 | | | | |
| Pumpkin #2 | | | **Of** | 8 | | | | |
| Pumpkin #3 | | | **Lines** | 6 | | | | |
| Pumpkin #4 | | | | 4 | | | | |
| | | | | 2 | | | | |
| | | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

**Use the tape measure to find the circumference. Wrap the tape measure around the pumpkin and record how many inches it measures around.**

**Pumpkin Circumference**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 16 | | | | |
| | | | 14 | | | | |
| **PUMPKIN** | **# of inches around** | | 12 | | | | |
| Pumpkin #1 | | **#** | 10 | | | | |
| Pumpkin #2 | | **Of** | 8 | | | | |
| Pumpkin #3 | | **inches** | 6 | | | | |
| Pumpkin #4 | | **around** | 4 | | | | |
| | | | 2 | | | | |
| | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

**Use the tape measure to find the diameter. Wrap the tape measure across the top of pumpkin and record how wide the pumpkin measures.**

**Pumpkin Diameter**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | 8 | | | | |
| | | | 7 | | | | |
| | | **#** | 6 | | | | |
| **PUMPKIN** | **# of inches wide** | **Of** | 5 | | | | |
| Pumpkin #1 | | **inches** | 4 | | | | |
| Pumpkin #2 | | **wide** | 3 | | | | |
| Pumpkin #3 | | | 2 | | | | |
| Pumpkin #4 | | | 1 | | | | |
| | | | | #1 | #2 | #3 | #4 |

**Pumpkin**

Watch as your teacher weighs the pumpkin on the scale. Add up the gram masses and write how many grams the pumpkin weighed.

Pumpkin Mass _____

Predict whether the pumpkin will sink or float. _____

If it floated, how did it float? Stem up, stem down, on its side._____

List three physical properties to describe how your pumpkin looks.

Summarize the data for your pumpkin on the lines below.

My pumpkin has _____ lines. Its circumference was _____ inches. Its diameter was _____ inches. It weighed _____ grams. My favorite part of this activity was when

Draw a pumpkin below and illustrate how you might carve it for Halloween.

Name_____ Date_____

Garden Field Study

Several weeks ago, you planted vegetables in the garden. Today you will use the garden to do a field study as you make careful observations about the plants.

Choose one plant. Write a paragraph describing what you see. Include what the plant looks like, how many are in the area you are observing, are there any flowers? If so what color are they? Are there any vegetables on the plant? If so, how many?

| Observation of the _____ plant. |
|---|
| |
| |
| |
| |
| |

| Cherry tomatoes | Total number on one plant |
|---|---|
| | |

A fraction is used to compare a part to the whole. The bottom number called the denominator tells how many there all in all. The top number tells how many of a certain part you have. Look at the number of cherry tomatoes on one plant. Fill in that numbers to show a fraction to represent the red and green tomatoes.

| Numberator | red tomatoes _____ | green tomatoes _____ |
|---|---|---|
| Denominator | total tomatoes | total tomatoes |

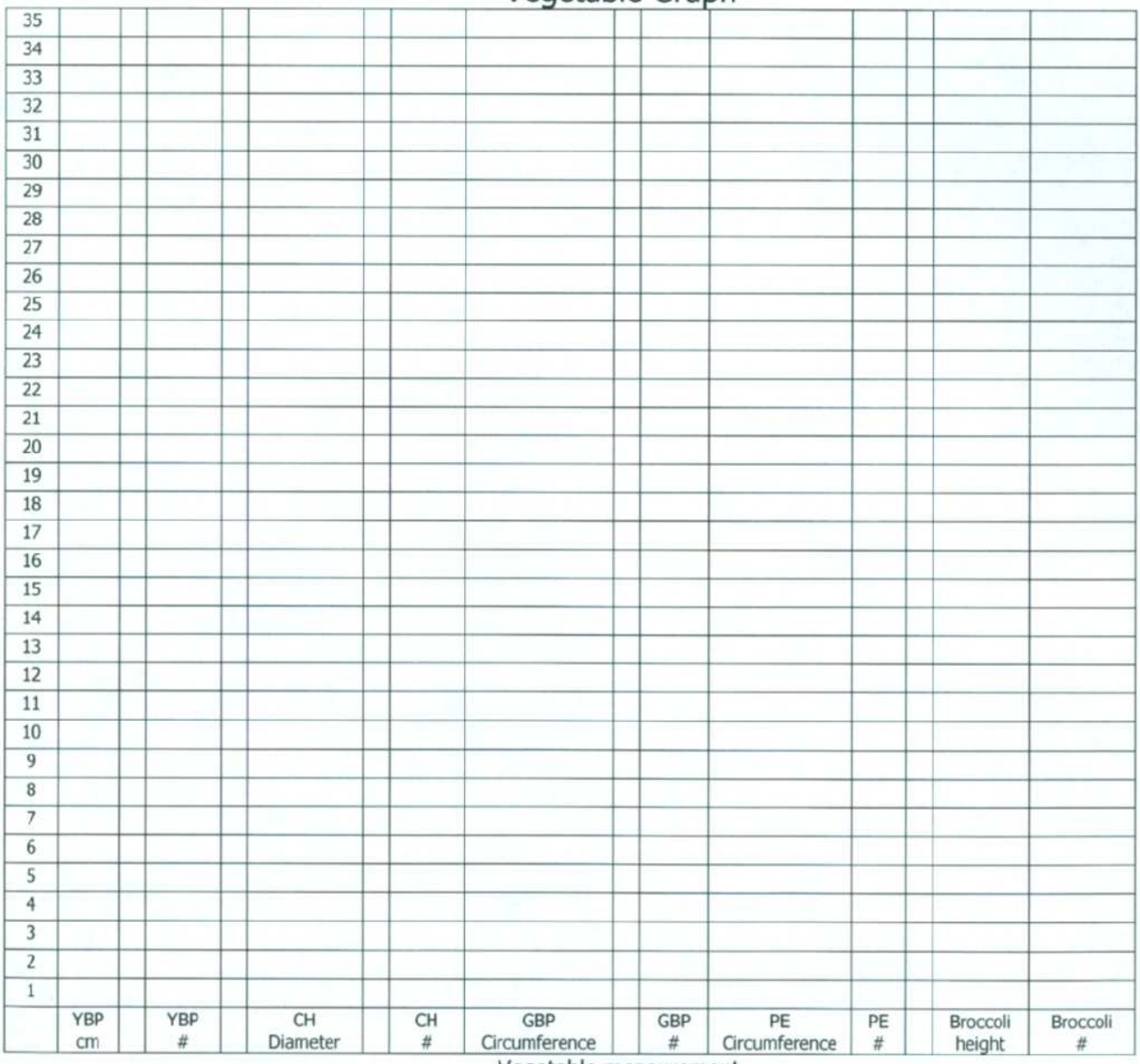
Look at the cucumber and the squash beds. Write a few sentences comparing the size and color of their flowers.

| |
|---|
| |
| |
| |
| |
| |

**Data Table**

| Item measured | Number of centimeters | Number of vegetables |
|---|---|---|
| **Yellow banana pepper (YPB)** (length-how long is it from end to end) | | |
| **Cabbage heads (CH)** (Diameter- the distance across) | | |
| **Green bell peppers (GBP)** (the circumference-the distance around) | | |
| **Purple eggplant (PE)** (the circumference-the distance around) | | |
| **Broccoli (BR)** (Plant height-how tall is it?) | | |

Vegetable Graph




Vegetable measurement