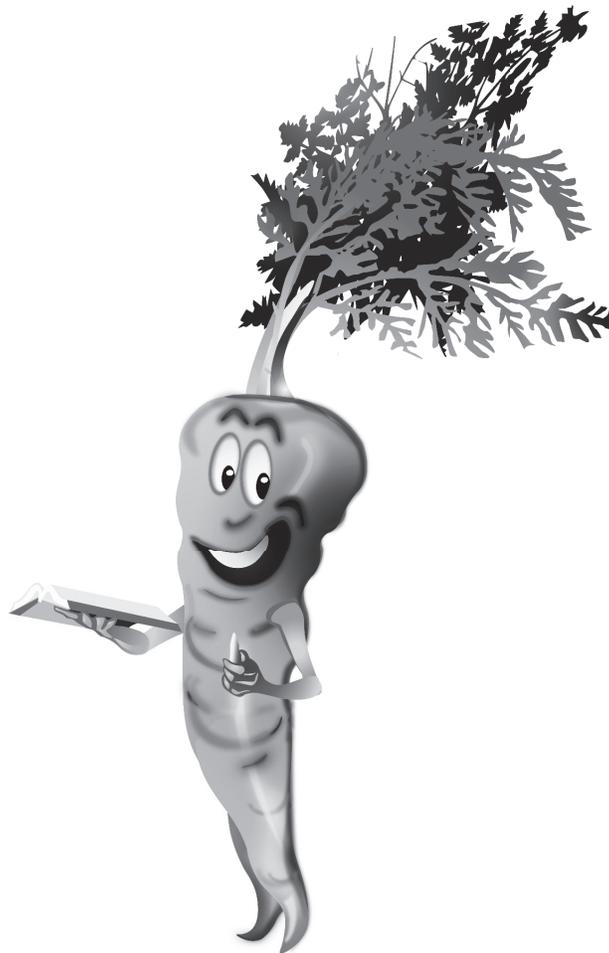
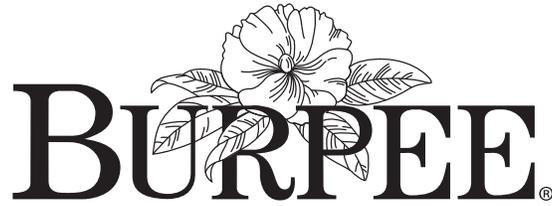


BURPEE®
**POWERFUL
PLANTS™**
Watch. Learn. Grow.



Download the Powerful Plants™ app for helpful growing tips.
Scan the Powerful Plants™ Mammoth Sunflower and Big Kahuna Garden Bean
seed packets and watch the characters come to life!





Dear Educator,

Congratulations! You've taken the first step toward experiencing one of the most amazing natural phenomena with your students!

The enclosed **Seeds for Schools™** educational kit, provided to you for free by Burpee and equipped with enough materials to grow up to 100 seedlings, is intended for your third and fourth grade classrooms to venture into the wonderful world of gardening. In developing the eight week program on which you are about to embark, Burpee partnered with Stephen Ritz, renowned gardener, educator and founder of the Green Bronx Machine, a nationally recognized program rooted in the belief that healthy students help drive healthy schools.

Burpee is excited to bring you the first **Seeds for Schools™** kit to include the new **Powerful Plants™** augmented reality seed packets. Download the **Powerful Plants™** app and your students will watch the characters 'Big Kahuna' and 'Sun Flower' magically come to life and introduce them to the benefits of gardening and the amazing power of plants. While they learn the fundamentals of how to grow plants, your students will then have the opportunity to watch first-hand as half inch sunflower and garden bean seeds grow into productive powerful plants.

Please review the **Table of Contents** and most importantly, before you begin, please read the **Preliminary Tips** on page four—they are designed to make your experience as seamless, manageable and engaging as possible. We've gone the extra mile to address all the details and planning particulars for both novice and expert gardeners.

We wish you success with your **Powerful Plants™ Seeds for Schools™** kit and encourage you to post classroom pictures on our **Powerful Plants™** Facebook page or email your classroom stories to us at **SeedsForSchools@burpee.com**.

Happy Gardening!

W. Atlee Burpee Company

Powerful Plants™

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Preliminary Tips

This section is designed to outline—week by week—what to expect, how to troubleshoot, and how to prepare for success. Read through all Preliminary Tips before starting Week 1.

SWBAT means “Students will be able to...”

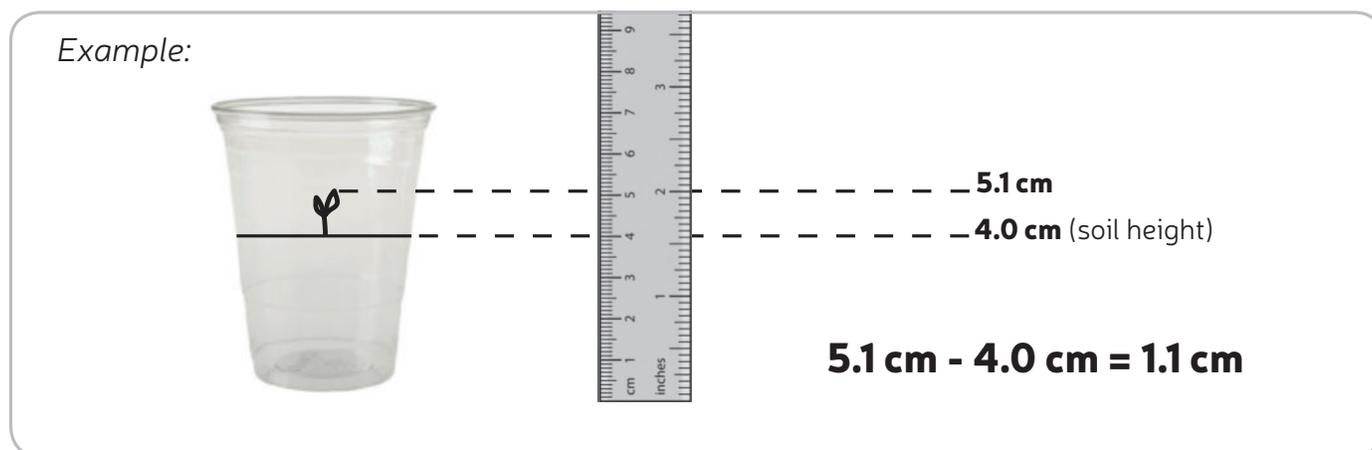
You will notice a deliberate evolution from objective language about plants to a personal and personified story about each plant

Plan to start this 6 to 8 week project based on location/USDA Plant Hardiness Zone Map.

(see page 6 for download)

WEEK ONE

When measuring plants, measure from outside of cup to prevent spillage. Measure from the desktop to the top of seedling then deduct the height of the soil.



Visit powerfulplants.net/seedsforschools to:
Download a Weekly Observation Log Template
Download a Growth Over Time Chart Template
Download a Bulletin Board Template

Plant marker vs. cup label

Plant marker is the rigid plastic tag that is inserted into the soil and indicates the student’s name (on front), variety of the plant (“BK” or “SF”) and the planting date (MM/DD) (on back).

The cup label indicates the student’s name and the variety of the plant. Teacher or students simply fill in the blank lines.

Preliminary Tips

About the Seeds

Mammoth sunflowers are a better choice for students who have available garden space at home. Because Mammoth sunflowers can grow to more than 10 feet high they cannot be grown to maturity in a container.

Big Kahuna garden beans can thrive in either available garden space or container gardens. They are a good choice for those students who do not have access to garden space around the home.

These two varieties are both considered “direct sow” seeds which means that they are usually planted directly into garden soil after the last frost. They have been selected for the Seeds for Schools™ program because they are large, easy-to-handle seeds that germinate quickly and are generally easy to grow.

“**Companion planting**” refers to growing different crops in close proximity for their mutual benefit. A great example of this is the Native American “three sisters” technique of growing corn, squash and beans together. Corn provides a trellis for beans to vine on, while the beans fix nitrogen in the soil, benefiting the corn. Squash is then grown as a ground cover, with its spiny leaves deterring pests, while the leafy corn and beans provide moderate shade to the delicate squash below.

The concept of “**companion planters**” is introduced in Week 1 (page 8) to give teachers the option to pair students together throughout the project so they can compare results and learn together.

WEEK TWO

Visit powerfulplants.net/seedsforschools to download additional seed diagrams.

Anticipate that some plants will succeed and some plants may not. This is okay! You have a “Plan(t) B”—extra cups as described in **Planting Preparation Instructions** on page 7. Should students’ seedlings fail, give them backup plants to replace their own.

Extra seedlings may also be used to show root system development at the transplanting stage. Shake the soil off the rootball to show the root system.

Preliminary Tips

WEEK THREE

Visit powerfulplants.net/seedsforschools to download a full size Seedling Diagram.

Week 3 is the only week with homework. In order to transplant in Week 4, students need to bring their own (recycled) containers into which they will transplant their seedlings. Make sure to assign this homework with enough time before the Week 4 activity begins.

WEEK FOUR

While bean and sunflower seedlings are robust, transplanting is a delicate process. The seedlings are at their most vulnerable when being handled and moved, and it is vital to protect the roots. Encourage students to handle them gently, and with care. You will need more potting soil for the transplanting process.

Week 4 is a learning experience in preparation for the next transplanting to an outside location during Week 6.

WEEK FIVE

A full color **Hardiness Zone Map** is available on powerfulplants.net/seedsforschools to allow you to determine which zone you are in. Also use local weather reports and data to review the high and low temperature for the previous 10 days and the next 10 day forecast. **One frost can kill all seedlings—err on the side of caution!**

Hardening off seedlings acclimates them to the outdoor environment. It is best to start the “hardening off” process on a Monday. Hardening off is an inexact science. Pay attention to the seedlings after they are placed outside. If they begin to look stressed, take them back inside to recover and try again in more moderate weather conditions. Too much direct sunlight will burn the seedlings—just like a sunburn on the beach.

WEEK SIX

Visit powerfulplants.net/seedsforschools to download a full size Plant Life Cycle Diagram.

If students do not have access to a small space of their own in which to plan a garden, encourage them to seek their parent/guardian’s help in locating a community garden or area around the school where their plant will thrive.

WEEK EIGHT

Visit powerfulplants.net/seedsforschools to download the Seed Packet Templates.

Preliminary Tips

PLANTING PREPARATION INSTRUCTIONS (recommended)

(PRIOR TO WEEK 1 ACTIVITY)

1. To keep messiness to a minimum you may choose to prepare for sowing with your students in advance.
2. Identify a location in your classroom with ample natural light. Avoid radiators and drafty areas.
3. Determine how best to get water to your classroom (pitcher, jug of water, etc).
4. **Seeds for Schools** kits include one of two different size coir pellets. There are either (200) 1" diameter coir pellets, or (100) 1.5" coir pellets.

If you have the smaller pellet, then two pellets should be used per cup. If you have the larger pellet, then only one pellet should be used per cup.

5. For best results determine how many pellets you will need for your classroom and then place them into a pot or bowl. Slowly pour warm water over them. The pellets should start to absorb the water quickly. Continue adding warm water until the pellets appear to have fully expanded. The expanded pellets can then be broken apart. (A metal fork helps!)

We recommend expanding the pellets in a bowl because they are easier to work with.

6. Once pellets have been broken down into evenly moist soil the soil can be scooped into each cup. Each cup should be filled about half way.

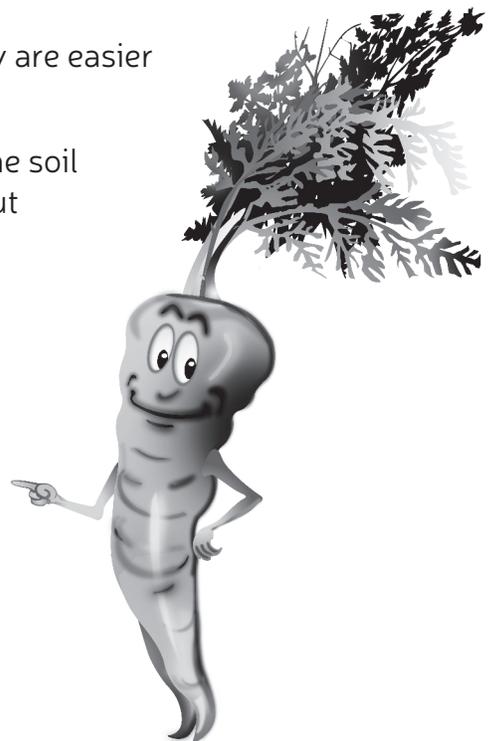
Take label sheet and pre-populate with students' names. Leave labels on the sheet. When students decide what seed to grow, fill out the seed field and distribute labels to students.

NOTE: You may have extra materials. This is a good problem!

Prepare extra cups and coir pellets to sow additional seeds should any student plants fail.

It is always a good idea to have a backup plan(t)!

Any extra coir may also be used for transplanting in Week 4.



WEEK ONE

Introduction to Planting

The Choices We Make

SWBAT - Students will be able to...

- Make an informed decision which seed they want to grow and articulate why
- Sow seeds according to instructions

Guiding Questions

1. What do you want to plant? Why?
2. What do you think it will look like? How big do you think it'll be?
3. What will you do with your plant? Ultimately, where will your plant go and why?

Step 1: Compare Plants

NOTE: Let the plant come to life!

Download Powerful Plants™ App to a smartphone or tablet from either the **Apple App Store** or **Google Play** to learn more about each plant.

Mammoth Sunflower Facts

Once transplanted outside plants will require 6-8 hours of full sun per day.
Grows up to 12 feet tall in approximately 100 days.
Produces massive flowers with edible seeds.
Will attract many birds, bees and other pollinators.

Big Kahuna Garden Bean Facts

Once transplanted outside plants will require 6-8 hours of full sun per day.
Grows up to 2 feet tall after 60 days.
Produces 11" beans you can eat raw, cooked or pickled.
Will do well in a container garden.

Step 2: Decide which Seed to Grow

Based on the information students discover about each plant, let them decide which of the two plants they would like to grow.

*Pair/share activity: students can partner with another student to discuss why they chose their plants. These students will then be **companion planters** for the duration of the project.*

Step 3: Read a Seed Packet

What information is found on a seed packet? Why?
What information do you need to know before choosing a plant to grow?
What is the best way to ensure the success of your plant?

WEEK ONE - Introduction to Planting
The Choices We Make

Step 4: Create a Plant Marker

Distribute a blank plant marker to each student. Have them write their names on the front of the marker, and the type of plant with an initial (BK for Big Kahuna or SF for Sun Flower), along with the day and month of planting on the back.

Step 5: Create a Weekly Observation Log

Distribute a sheet of letter size (8.5 x 11") paper to each student. Instruct them to:

- Hold the piece of paper in landscape format.
- Take left side of paper and fold it to the right side in half to form a booklet.
- Holding the booklet, fold top to bottom in half.
- Take left side and fold to right in half again.
- Open the paper. You should have 8 sections.
- At the top of the sheet, write "Weekly Observation Log" and the student's name.
- At the top of each section, write "What I See:"
- Add a week label to each section. From upper left section to upper right section, Week 1, Week 2, Week 3, Week 4. From lower left to lower right, label Week 5, Week 6, Week 7, Week 8.

Example:

Weekly Observation Log				Name: _____			
WEEK 1 <u>WHAT I SEE</u>	WEEK 2 <u>WHAT I SEE</u>	WEEK 3 <u>WHAT I SEE</u>	WEEK 4 <u>WHAT I SEE</u>				
WEEK 5 <u>WHAT I SEE</u>	WEEK 6 <u>WHAT I SEE</u>	WEEK 7 <u>WHAT I SEE</u>	WEEK 8 <u>WHAT I SEE</u>				

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WEEK ONE - Introduction to Planting
The Choices We Make

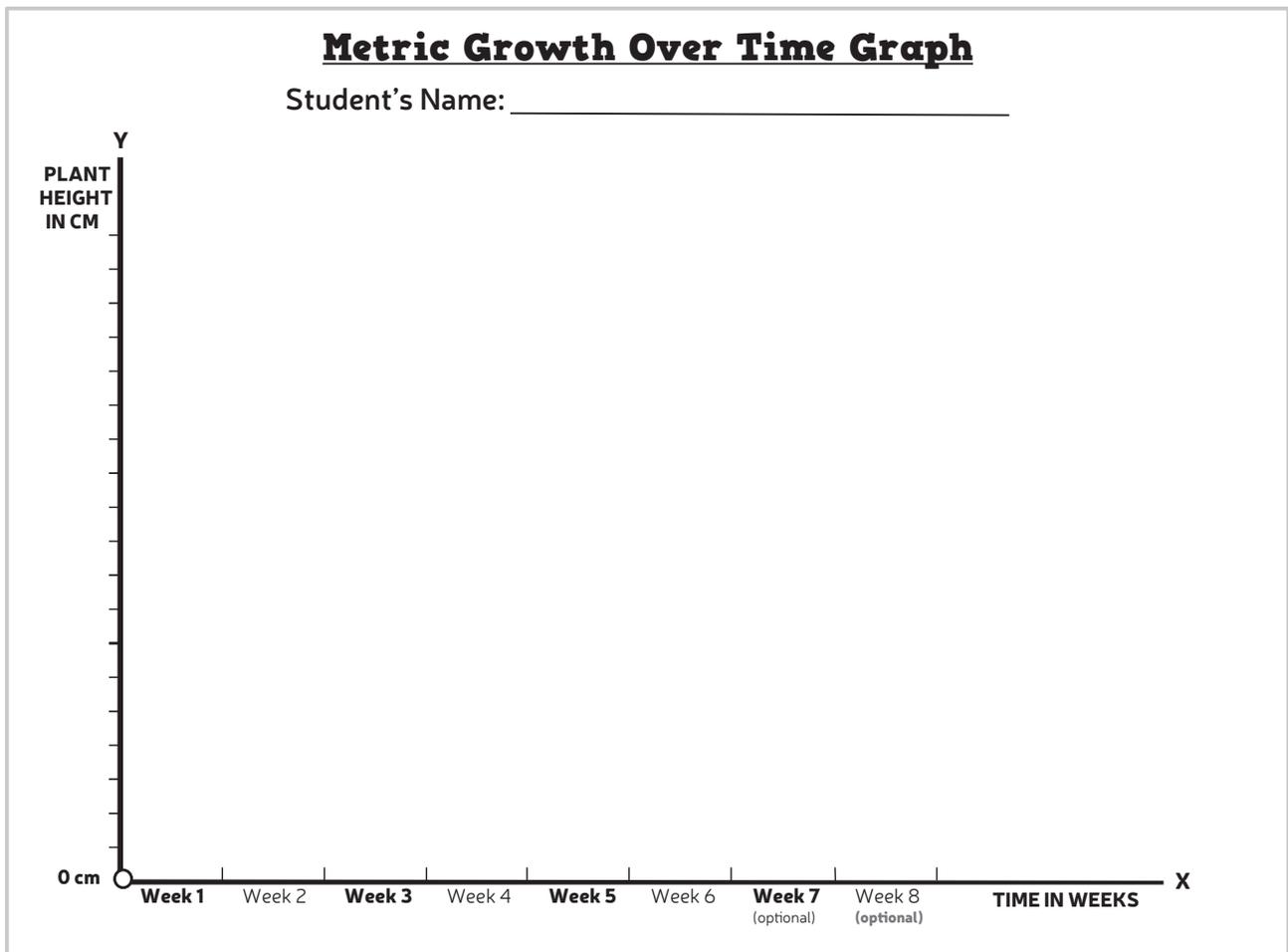
Step 6: Create Growth Over Time Graph

Distribute a sheet of letter size paper to each student. Instruct them to:

- Hold the paper in landscape format and create an “L” shaped XY graph.
- Label the horizontal X-axis in 1 inch increments from Week 1 to Week 8.
- Label the vertical Y-axis in 1 cm increments that represent the height of the plant.

NOTE: The round dot on the diagram below indicates the starting point on Day 1.

Example:



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WEEK ONE - Introduction to Planting
The Choices We Make

Step 7: Plant!

Distribute a prepared cup to each student.

(see Planting Preparation on page 7 for further instructions)

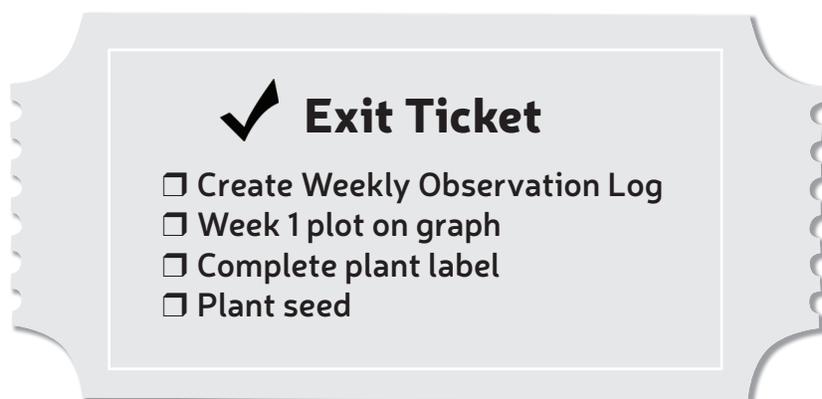
Have each student:

- Make a small hole in the evenly moist soil with a pencil, about 1" deep.
- Place one seed into the hole.
- Use fingertips to gently cover seed with soil.
- Lightly press soil with fingertips to make good soil to seed contact.
- Moisten soil with a small amount of water. Do not soak soil.
- Do not pack soil.
- Place cups in a warm location, free of drafts.
- Use your **Weekly Observation Log** to sketch your potted seed.
- Use the **Growth Over Time Chart** to identify Day 1 starting point.

TEACHER NOTE: Option to Create a Bulletin Board

Download and fill out the Bulletin Board Template. Find a bulletin board to showcase progress over time. Throughout the project, share a photo of your bulletin board with Burpee and thousands of classrooms and teachers growing their own plants!

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WEEK TWO

Germination

It's Alive!

SWBAT - Students will be able to...

- Distinguish between soil and dirt
- Identify and describe essential elements of a seed
- Distinguish between healthy/unhealthy seedlings
- Predict if we should resow or replace

Guiding Questions

1. Why did we put seeds in moist soil? (*Hint: So that seeds can absorb moisture.*)
2. What are the essential elements of plant growth? What made me grow? (*Hint: Water, warmth, light*)
3. What would happen if I didn't have soil? (*Hint: No anchor for my roots!*)
4. Water? (*Hint: To make my nutrients accessible!*)
5. Light? (*Hint: It's dark under the soil!*) Warmth? (*Hint: Seeds need warmth to germinate.*)
6. Nutrients? (*Hint: They were all in my seed!*)

7. What is a seed? (*Hint: An embryonic (baby) plant enclosed in a protective covering.*)
8. What are the three main parts of a seed? (*Hint: testa, cotyledon, embryo*)

9. How do I know if I'm doing well? Are my leaves bright green?
10. Am I growing tall and strong? Do I have good posture? Am I wilting?

11. If I didn't grow, what held me back? Light? Water? Warmth?
12. Do we need to resow or replace?

STEP 1: Discuss Difference Between Soil & Dirt

Definitions

Soil

- The upper layer of earth in which plants grow, a black or dark brown material typically consisting of a mixture of organic remains, clay and rock particles.
- The upper layer of earth that may be dug or plowed in which plants grow.
- A medium in which trees and other plants grow.

Dirt

- A filthy substance, a coating, grime.
- Something that gets behind your ears or ruins your clothing.
- What we sweep off the floor when we clean the classroom.
- Lead a class discussion comparing and contrasting healthy soil and dirt.

WEEK TWO - Germination
It's Alive!

Difference Between Soil & Dirt

SOIL

Contains live organisms and organic matter

Nutrient rich

Water is retained and moves slowly through soil



DIRT

Depleted of organisms

Nutrients move with water and are not retained in dirt

Water moves rapidly through dirt or carries it away

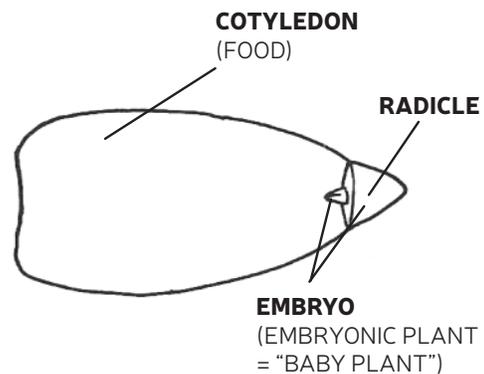
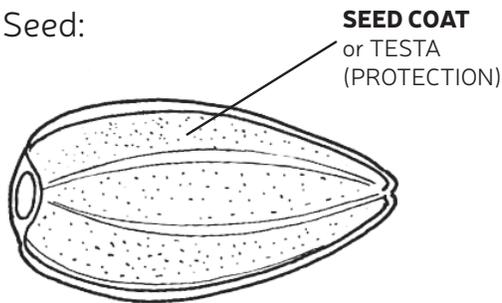


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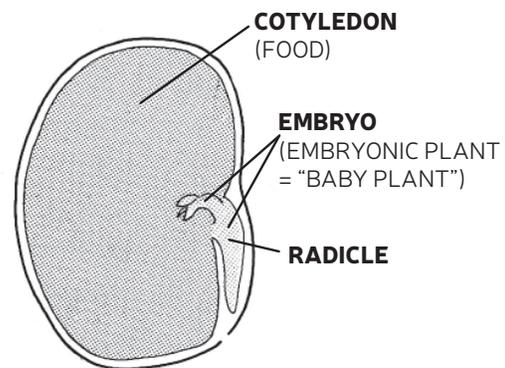
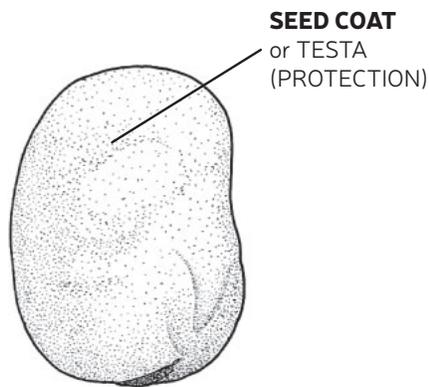
WEEK TWO - Germination
It's Alive!

Seed Diagrams

Sunflower Seed:



Bean Seed:



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STEP 2: Diagram a Seed

Have students draw a diagram of their seeds.
Identify and discuss the following three parts:

Testa (or Seed Coat) - Provides protection and security until germination

Embryo - Will grow to be the plant

Cotyledon - The food supply for the seed and the first leaf to emerge when the seed germinates

Radicle - Part of the embryo in a seed that becomes the primary root

WEEK TWO - Germination

It's Alive!

Step 3: Discuss “What is a seed?”

NOTE: This is a great opportunity to go over “micro” and “macro”.

A seed is: an embryonic plant enclosed in a protective outer covering, a flowering plant’s unit of reproduction capable of developing into another such plant. Seeds contain all the information and materials they need to grow into a huge plant!

One small seed can grow to produce a Big Kahuna garden bean plant or a huge ten foot tall Mammoth sunflower with thousands of new seeds.

On a larger scale, seeds represent ideas, genetic potential, and concepts that students can talk about across all content and subject areas. Seeds, like ideas or thoughts, can grow into beautiful creations that can benefit others.

Videos introducing germination may be helpful and can be found on YouTube.

Step 4: Update Weekly Observation Log

Have students sketch their plants and describe what they see.

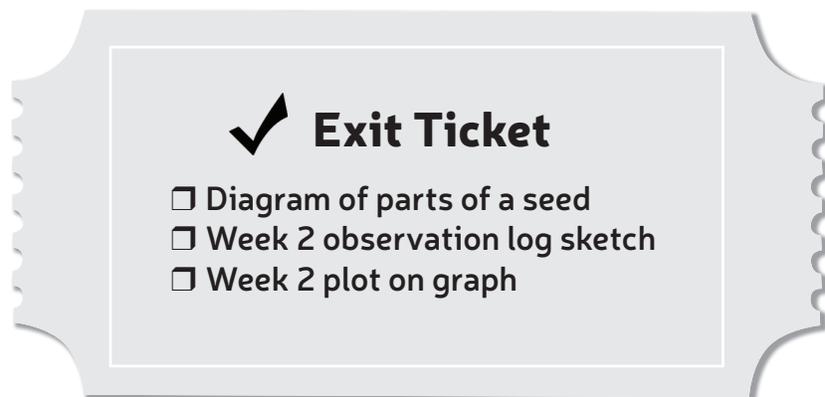
Focus on what is different from week to week.

NOTE: If there’s no visible growth, there will be soon!

Step 5: Update Growth Over Time Graph

Have students measure—from the bottom of the cup—and update their graphs.

NOTE: Review measurement technique in **Preliminary Tips** (page 4).



WEEK THREE

Cotyledons and True Leaves

Building an Identity

SWBAT - Students will be able to...

- Identify and describe essential elements of a seedling
- Understand the difference between cotyledons [kädə lēdn] and true leaves
- Understand the relationship between chlorophyll and photosynthesis

Guiding Questions

(Repeating questions from Week 2)

1. How do I know if I'm doing well? Are my leaves bright green?
2. Am I growing tall and strong? Do I have good posture? Am I wilting?

(Have your students, in the voice of their seedlings, ask):

3. What is helping me (the seedling) to grow? (*Hint: Soil, water, light, temperature, nutrients.*)
4. What are my cotyledons? (*Hint: The first leaves to appear from a germinating seed.*)
5. What are my true leaves? (*Hint: Leaves that have the appearance and function that all future leaves will have.*)
6. What do people need to grow?
7. How is this the same or different from a seedling?

Step 1: Discuss “What is a seedling?”

I have grown from a seed to a seedling. I have gone from absorbing moisture and warmth to absorbing moisture, warmth **and light**. Not only am I collecting nutrients from the soil with my roots, I am also producing nutrients in my leaves with green **chlorophyll** through **photosynthesis**!

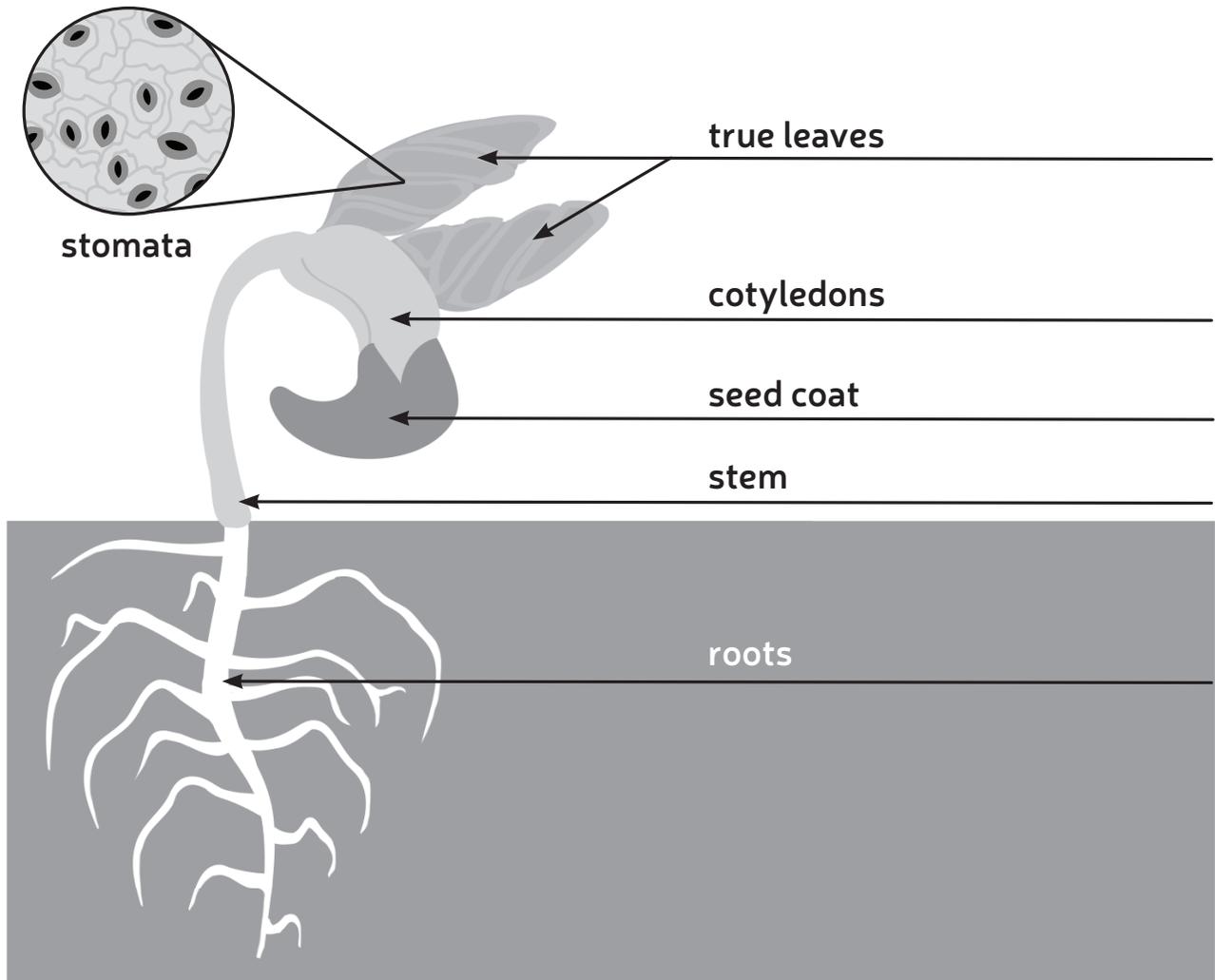
Step 2: Diagram the Parts of a Seedling

See seedling diagram. Have each student draw a diagram of their seedling and label the following parts:

Roots, Stem, Seed Coat, Cotyledons, True Leaves, Stomata
(See glossary on page 30 for definitions.)

WEEK THREE - Cotyledons and True Leaves
Building an Identity

Seedling Diagram



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WEEK THREE - Cotyledons and True Leaves

Building an Identity

Step 3: Describe the Process of Photosynthesis

Leaves are the “solar panels” of the plant, collecting energy from light.

Chlorophyll - The green pigment in leaves and other parts of a plant that allows them to produce energy through photosynthesis.

Photosynthesis - A process used by plants to convert light energy into chemical energy which serves as food and allows plants to grow.

Stomata - Small pores in leaves that allow the carbon dioxide used in photosynthesis to enter the leaf and oxygen to exit.

Step 4: Understand Why Plants Grow Towards Light (phototropism)

I use light to make food—and I always want to find the best and brightest source!

Light energy is needed for plants to survive. By growing toward the light, I absorb more energy.

Time lapse videos of seedlings growing toward sunlight may be helpful and can be found on YouTube.

Step 5: Update Weekly Observation Log

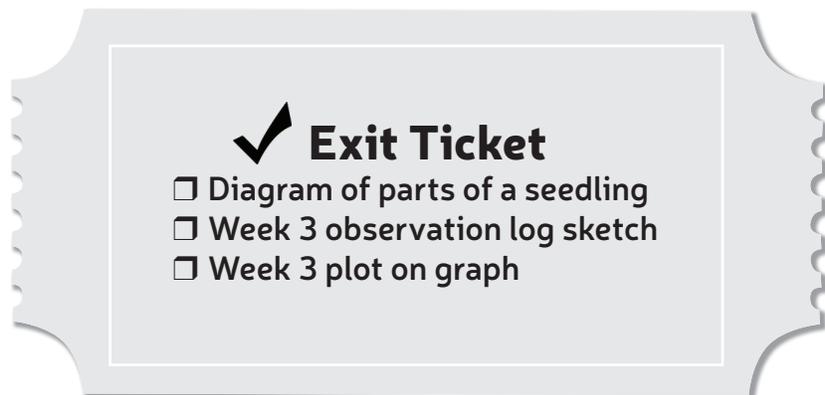
Have students sketch their plants and describe what they see. Focus on what is different from week to week.

Step 6: Update Growth Over Time Graph

Have students measure—from the bottom of the cup—and update their graphs.

HOMWORK ASSIGNMENT:

Ask students to bring in a larger cup for transplanting. The cups that are included with this Seeds for Schools kit are 5 oz. The transplant cup can be any size larger than 5 oz. and can be paper, plastic or styrofoam.



WEEK FOUR

Transplanting My Seedling

Graduation

SWBAT - Students will be able to...

- Transplant seedling into a larger container so that they are able to repeat the transplant process to an outdoor location

Guiding Questions

1. Is your seedling ready to graduate to a larger container?
2. How will you tidily and safely transplant your seedling?

Step 1: Determine if Seedling is Ready for Transplant

Have students inspect their seedlings with their companion planters. The plants ask:

1. Do I have strong roots? (not tilted over/can you see the roots?)
2. Do I have 4 leaves or more?
3. Am I at least 12 cm high?

Step 2: Prepare for Transplanting

Instruct students to prepare their new cups from Week 3 homework:

1. With a pen or pencil, carefully make two drainage holes in the bottom of the new cup. **Students may need help creating drainage holes in their new cup.**
2. Write your name on the outside of your new cup.
3. Prepare the work surface with newspaper to make clean-up easier.
4. Add soil to the bottom of cup and moisten. Make sure the soil is evenly moist but not soaking wet.
5. Make ample space in the soil for the seedling.

Step 3: Transplant Seedling

Instruct students to do the following:

1. Gently squeeze cup to loosen soil from side of cup (hug and squeeze!)
2. Grasp rootball while supporting stem and gently place into new container.
3. Add soil to fill new container and cover roots.
4. Water gently.
5. Transfer the plant marker to the new cup once the seedling has been fully transplanted.
6. Remember, your plant is saying: Love me tender! Love my roots, and love my shoots!

WEEK FOUR - Transplanting My Seedling Graduation

Step 4: Update Weekly Observation Log

Have students sketch their plants and describe what they see. Focus on what is different from week to week.

Step 5: Update Growth Over Time Graph

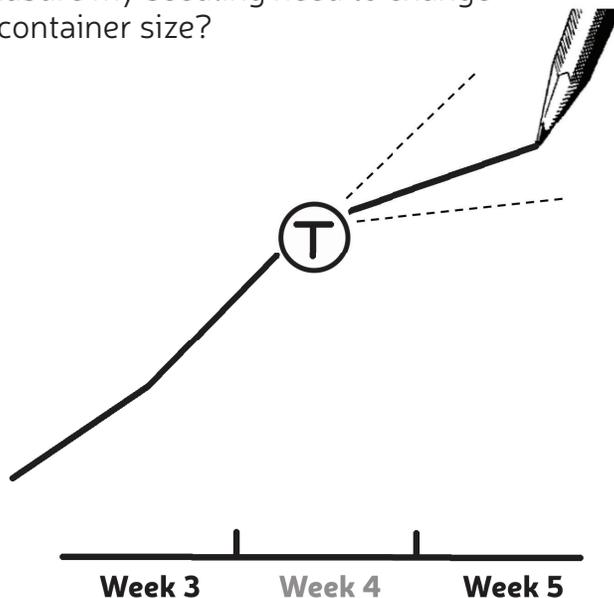
On graph, indicate that transplant has taken place on that date.

Have students measure—from the bottom of the cup—and update their graphs.

Students may mark their graphs with a (T) to indicate when they transplanted their seedlings.

Will the seedling grow at the same rate after the transplant?

Will the way that I measure my seedling need to change to adjust for the new container size?



✓ **Exit Ticket**

- Transplanted healthy seedling into a larger cup/container
- Week 4 observation log sketch
- Week 4 plot on graph

WEEK FIVE (PART 1)

Learning About Your Climate

Know your Zone / Know your “When”

SWBAT - Students will be able to...

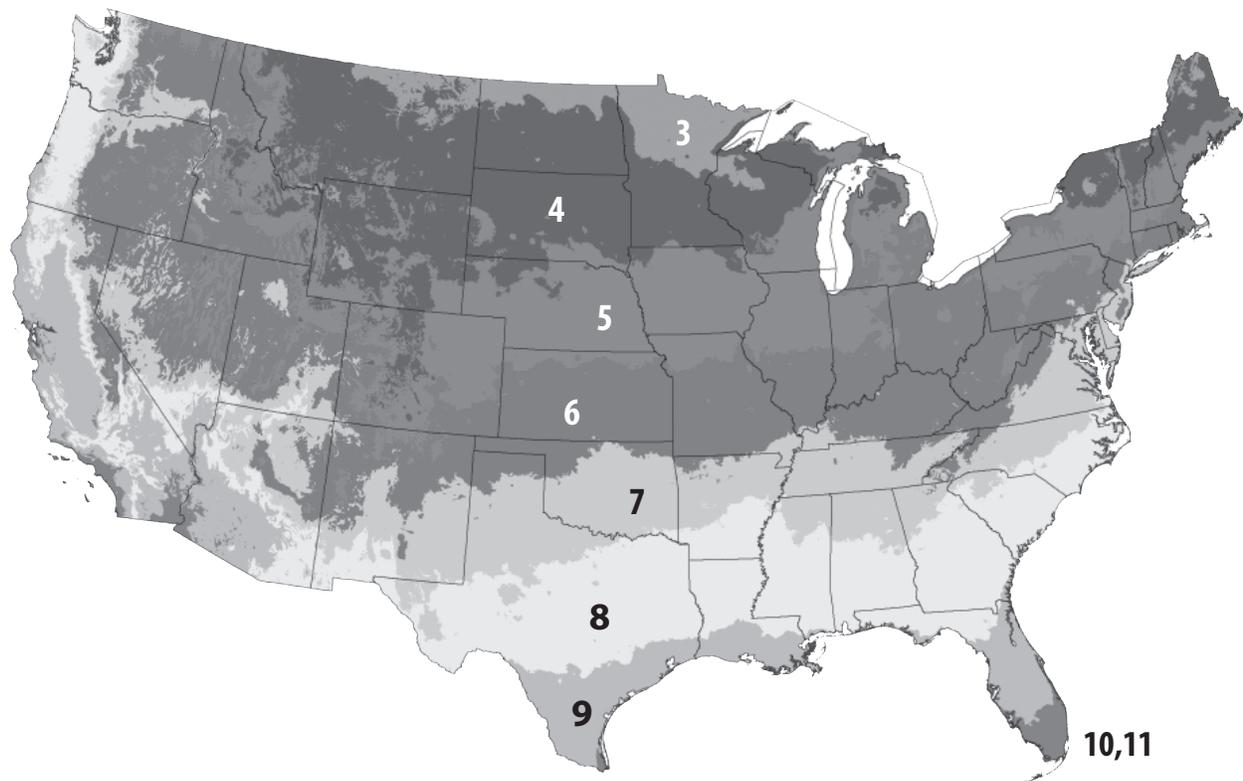
- Locate their state on a map
- Understand how geography and climate affect planting
- Understand that seedlings must acclimate to outdoor weather conditions to survive
- Understand the importance of “hardening off” your seedlings

Guiding Questions

1. Where am I? Can my seedling live outside at this time of year? Will it get too cold?
2. When is the last frost date for my area?
3. Should I check the weather forecast?

Step 1: Identify Home State on the USDA Hardiness Map

Have students look at **USDA Hardiness Map** and locate their home state. If you have the map printed out and on a bulletin board, mark your classroom location with a thumb tack or pushpin.



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WEEK FIVE (PART 1) - Learning About Your Climate
Know your Zone / Know your "When"

Step 2: Collect Data to Make an Informed Decision

Once students have identified where they live on the **USDA Hardiness Zone Map** ask them to identify the zone number that they live in.

With this zone number use the internet to check "Last frost date for zone ____". This will provide a general date range for planting outside.

Now that a date range for last frost has been identified, it should be compared with the local 10-day forecast. Turn to the internet to verify that the **lowest** daily temperature is 45-50°F or above through the full ten days ahead.

If the forecast stays safely above 45°F, you are ready to prepare for transplanting outdoors!

WEEK FIVE (PART 2)
"Hardening Off" My Seedling
Adjusting to a New Neighborhood

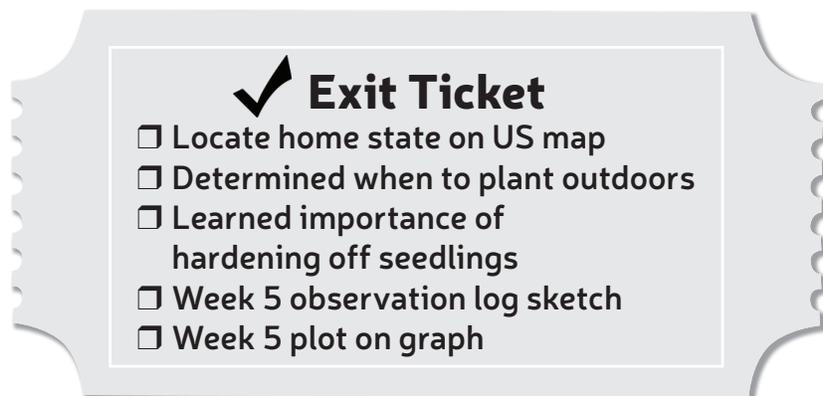
Step 1: Start Hardening Process on a Monday

Before a seedling can be transplanted outside it must first be acclimated to the sunlight, temperature and the wind of an outdoor environment.

Burpee recommends moving seedlings to a protected location outside. Place them in the sun for about an hour the first day. Do not put the seedlings in direct sun for more than an hour the first day. Do not put them in a windy location.

Add about one hour of direct sun for each day of the process. By the end of the week, you'll be at 5+ hours and the plants will be ready for transplanting outdoors.

The process of hardening off doesn't have to be executed perfectly or uniformly to be highly successful. It is most important not to overstress seedlings in the first few days of exposure to outdoor weather conditions.



WEEK SIX (PART 1)

Understanding the Plant Life Cycle

Beginning and Ending with Seeds

SWBAT - Students will be able to...

- Understand the stages of a plant life cycle
- Take transplanting lesson learned in Week 4 and apply it to transplanting their seedlings outdoors

Guiding Questions

1. What are the stages of a plant's life cycle? (1) Germination (sprout), (2) Photosynthesis (chlorophyll in stems & leaves), (3) Bloom and pollination, (4) Set seed (spread or disperse new seeds as plant dies back).
2. What stages have I observed with my seedling?
3. Have I decided where I will plant my seedling so that I can continue its life cycle?
4. What is the next stage of my plant's life cycle?
5. What is pollination? (*Hint: The process of transferring pollen from the male part of the flower, the anther, to the female part of the flower, the stigma.*)
6. What are pollinators?
7. What animals benefit from pollination? (*Hint: Butterflies, bees and people.*)
8. What animals benefit from seeds? (*Hint: Birds, chipmunks, mice, people and other animals.*)
9. Have I prepared the new transplant location like I prepared the larger cup?
10. Did I make sure the location has sun all day?

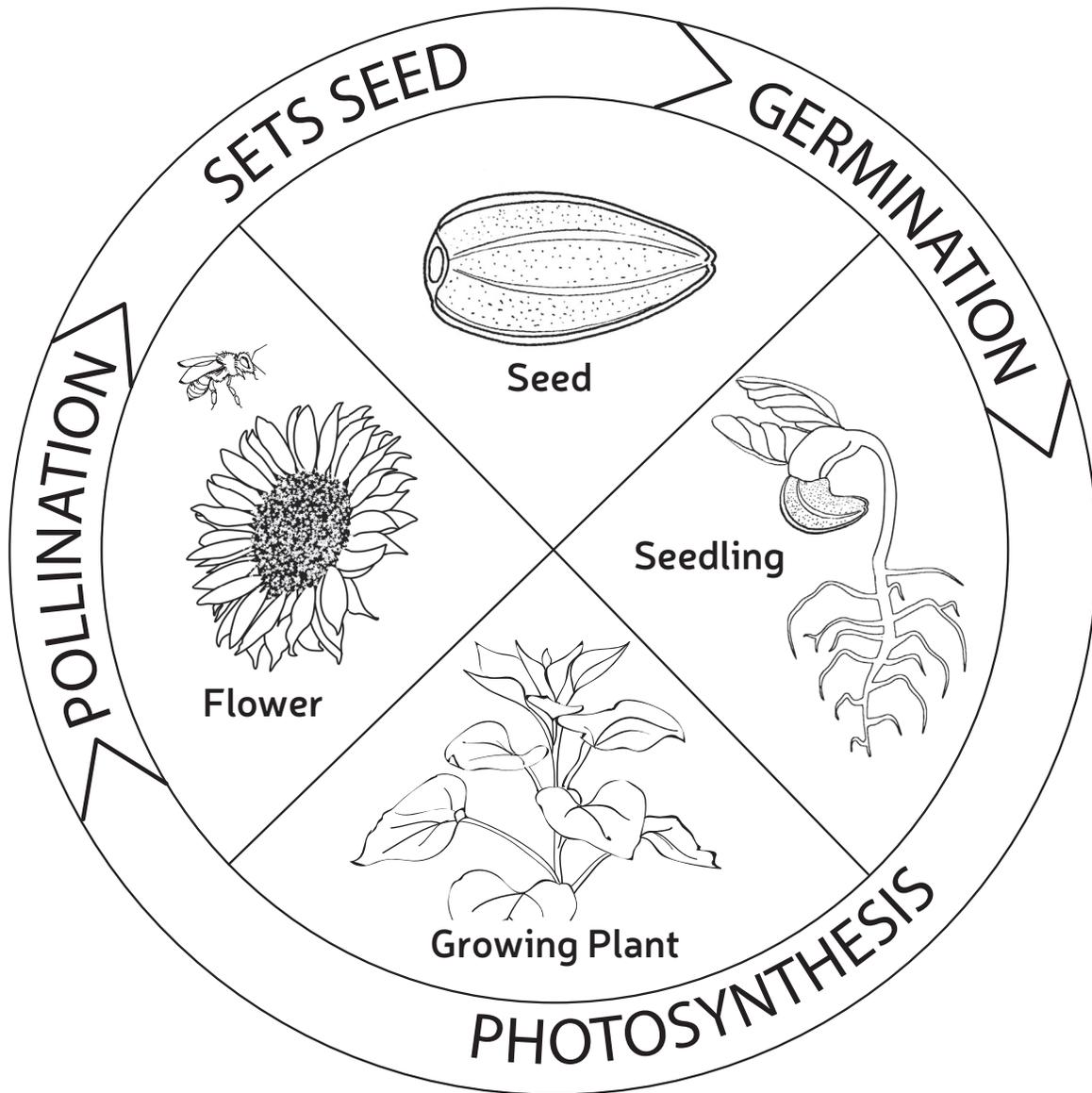
Step 1: Explore the Life Cycle of a Plant

Discuss the life cycle of a plant, including **germination**, **photosynthesis**, **pollination** and **setting seed**.

*Plant life cycle videos may be helpful and can be found on YouTube.

WEEK SIX (PART 1) - Understanding the Plant Life Cycle
Beginning and Ending with Seeds

Seed



*PRINTABLE VERSION AVAILABLE AT POWERFULPLANTS.NET/SEEDSFORSCHOOLS

WEEK SIX (PART 2)

Transplanting Outside

Finding a New Home

NOTE: Seed starting generally begins between 6 and 8 weeks before transplanting outdoors. This lesson plan has been arranged to transplant outdoors in Week 6. If the weather is not yet warm enough to transplant, seedlings can remain in cups for up to 8 weeks but will need a balanced fertilizer to remain healthy. The Week 7 and Week 8 activities can be shifted forward or combined with transplanting outdoors.

Step 1: Finding an Outdoor Location for Your Hardened Off Seedling

Have students determine where they will transplant their seedlings:

Backyard? Patio? School grounds? Community garden?

Area should get full sunlight (8+ hours/day) and be protected from animals and lawnmowers for first few weeks.

Step 2: Transplanting Seedling to its New Home

Both Mammoth sunflowers and Big Kahuna garden beans are robust plants but seedlings need finely tilled soil to get started outside. Gently remove seedling from cup, taking care to not disturb the roots, and plant in fine soil. Gently press soil around the seedling and water thoroughly.

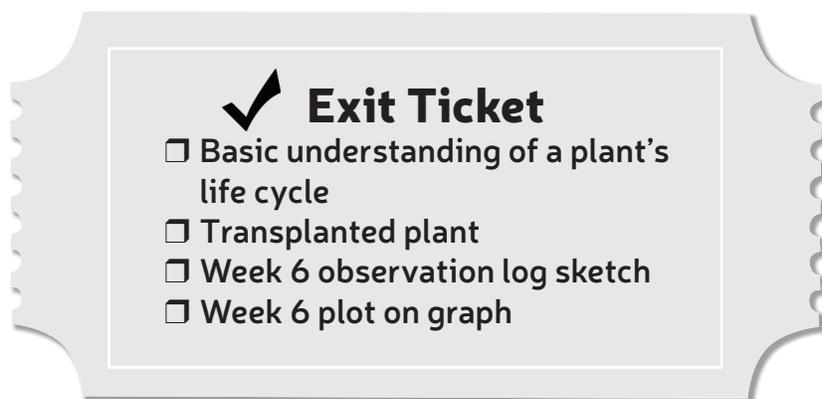
Step 3: Update Weekly Observation Log

Have students sketch their plant and describe what they see.

The sketch can be based on either the seedling in the cup or seedling in its new outdoor home.

Step 4: Update Growth Over Time Graph

Have students measure from the bottom of the container and update their graphs with final results. How much did your seedling grow?



WEEK SEVEN

My Gardening Experience

What Did We Learn?

SWBAT - Students will be able to...

- Articulate what they learned through sowing their seed and growing their seedling
- Read and understand growth over time graph results

Review Questions

Weeks 1 to 3:

1. What are the three main parts of a seed? (Testa, Cotyledon, Embryo)
2. Which seeds germinated better? The Big Kahuna garden bean or the Mammoth sunflower?
3. Compare and contrast: Based on the graph, which seeds grew faster?
4. What are cotyledons? What are true leaves?
5. What is photosynthesis? What is chlorophyll?
6. Why do seedlings and plants grow toward the sun?

Weeks 4 to 6:

1. Which seeds grew taller, the Big Kahuna garden bean or the Mammoth sunflower?
2. Which seed were easier to grow?
3. What USDA Hardiness Zone are we in?
4. What are the stages of a seed plant life cycle?

Step 1: Understand and Compare Graphs

What is the range of heights that the Mammoth sunflower seedlings grew?

What is the range of heights that the Big Kahuna garden bean seedlings grew?

Step 2: Reflect on Gardening Experience

Have students select one of the following quotes and explain how their experience with this project relates to their quote.

“Teachers plant seeds that grow forever.” Anonymous

“Seeds are like people. They need water and love and they will grow and grow and grow.”
Stephen Ritz, educator & gardener

“My garden is my most beautiful masterpiece.” Claude Monet, famous painter & gardener

“To plant a garden is to believe in tomorrow.” Audrey Hepburn, famous actress & gardener

“Bloom where you are planted.” Anonymous

WEEK EIGHT

My Favorite Powerful Plant™

What's your favorite flower, herb or vegetable?

SWBAT - Students will be able to...

- Research plants to find a variety that they would most like to grow
- Draw a picture of their favorite plant and explain why it is their favorite

Guiding Questions

1. What fruit, vegetable, herb or flower would I like to grow from seed? Why?
2. Does my plant flower?
3. How is your chosen fruit, vegetable, herb or flower different from your Mammoth sunflower or Big Kahuna garden bean?

Step 1: Select a Favorite Seed Plant

Students should search school books or the internet for seed plants they want to grow. This could be a fruit, vegetable, herb or flower. **Burpee.com** organizes plants by “Vegetables”, “Flowers (annuals)”, Perennials”, Herbs” or “Fruit”, which may assist students in finding a favorite plant.

Step 2: Design Front of Package

Draw an image of the plant, choose a Character Name and list the plant variety. The Character Name can be an existing name like *'Purple Dragon' carrot* or *'Busy Bee' sunflower* or students can make up their own characters. Teachers are welcome to post their characters on our Powerful Plants™ Facebook page.

Step 3: Design Back of Package

This will require some research: How do I describe my plant? How do I grow my plant? How much sunlight does my plant need? How long will it take to bloom or harvest? How deep and how far apart should seeds be planted? With this information, students will have a full understanding of how to grow their favorite plant varieties.



WEEK EIGHT - My Favorite Powerful Plant™
What's your favorite flower, herb or vegetable?

Create Your Powerful Plant™!

(FRONT)

POWERFUL
▶ PLANTS™
Watch. Learn. Grow.

NON
GMO

CHARACTER NAME

PLANT VARIETY

USE THE APP! WATCH. LEARN. GROW.

POWERFUL
▶ PLANTS™
Watch. Learn. Grow.

*PRINTABLE VERSION AVAILABLE AT POWERFULPLANTS.NET

WEEK EIGHT - My Favorite Powerful Plant™
What's your favorite flower, herb or vegetable?

Create Your Powerful Plant™!

(BACK)

<p>POWERFUL PLANTS™ <i>Watch. Learn. Grow.</i></p> <p><input type="checkbox"/> VEGETABLE <input type="checkbox"/> HERB <input type="checkbox"/> ANNUAL <input type="checkbox"/> FRUIT <input type="checkbox"/> PERENNIAL</p>	<p>HOW MUCH SUN DO I NEED?</p>  <p>HOW LONG WILL I TAKE TO BLOOM OR HARVEST?</p> <p>HOW DEEP SHOULD MY SEED BE PLANTED IN SOIL?</p> <p>HOW FAR APART SHOULD SEEDS BE PLANTED?</p>
<p>VARIETY _____ NAME _____</p>	
<p>DESCRIPTION</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
<p>PLANTING INSTRUCTIONS</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	

*PRINTABLE VERSION AVAILABLE AT POWERFULPLANTS.NET

GLOSSARY OF VOCABULARY WORDS

Soil – A mixture of organic matter, minerals, liquids and organisms that together support life. The upper layer of earth in which plants grow.

Seed – Contains the genetic information to produce a new plant.

Testa or Seed Coat – Outer coating of a seed.

Cotyledon – The embryo within a plant's seed. Once the seed germinates, the cotyledon becomes the seedling's first leaves.

Embryo – The part of a seed that contains the earliest forms of a plant's roots, stem and leaves.

Radicle – Part of the embryo in a seed that becomes the primary root.

Germination – The process of a seed becoming a seedling. Germination of a seed requires water and warmth to begin the growing process.

Seedling – A young plant developing out of a plant embryo from a seed.

Roots – The part of a plant which attaches it to the ground and anchors it, providing water and food to the rest of the plant.

Stem – The central stalk of a plant that supports leaves, flowers and fruit.

Photosynthesis – The process by which plants make their own food. To make food through photosynthesis, plants need sunlight, carbon dioxide and water.

Chlorophyll – The green pigment of leaves and plants, essential to the production of food (carbohydrates) by photosynthesis.

Stomata – Microscopic pores found in leaves and stems that take in carbon dioxide from the air (used by the plant for photosynthesis) and release oxygen and water (byproducts of photosynthesis).

Phototropism – Movement of a seedling or plant in response to light.

True Leaf – Leaves that appear above the cotyledons on the seedling; the plant's adult foliage.

Transplant – To remove from one place and reset (a plant) elsewhere, in another soil. Relocate.

Pollen – Fine powder produced by a flowering plant that enables a plant to reproduce.

Pollinator – An animal such as a bee or a butterfly that moves pollen from one flower to another allowing the plant to reproduce.

Annual – A plant that completes its life cycle, from germination to the production of seeds, within one year.

Perennial – A plant that lives more than two years.

GREEN BRONX MACHINE

Stephen Ritz is a South Bronx educator and innovator who believes that all students should be able to live and learn in a safe and healthy community that prepares them for a lifetime of achievement. He is an internationally acclaimed award winning educator, founder of Green Bronx Machine and author of the best-selling book, **The Power of a Plant** and newly released **Make It Happen**. Stephen is responsible for creating edible classrooms in which he and his extended student family have grown more than 65,000 pounds of vegetables, and generated extraordinary academic performance. Stephen's Green Bronx Machine has improved targeted daily attendance from 40% to 93% and has helped provide more than 2,200 youth jobs in the Bronx. www.stephenritz.com

Stephen inspires audiences around the world with his “Si Se Puede” message of passion, purpose and hope. His **TED** Talk has generated over 1 million views, ranks in the Top 10 Food/Education TED Talks of all time, and is used for teacher training and workforce development globally. Stephen was the focus of PBS' Emmy Award Winning episode of Joe Lamp'l's Growing a Greener World and has been featured on Disney, NPR, ABC, CNN, CBS, TNT, and the film adaptation of In Defense of Food. He has presented three times at The White House — including once for the “State of STEM” event and for the first South by South Lawn. Stephen has installed gardens both inside and outside of the White House.

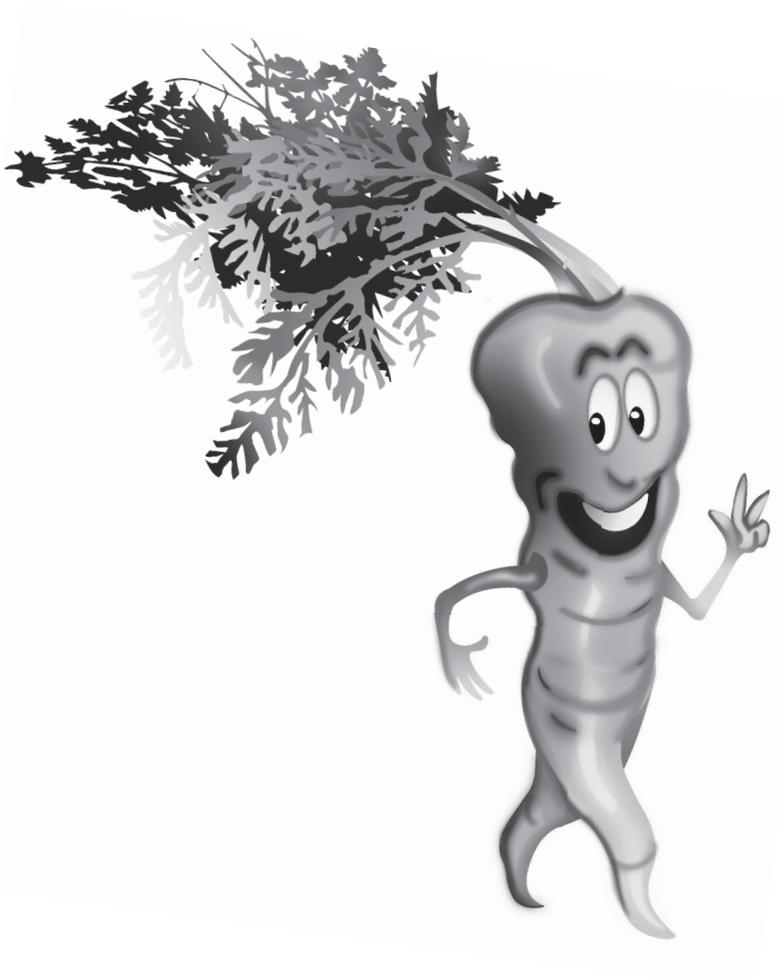
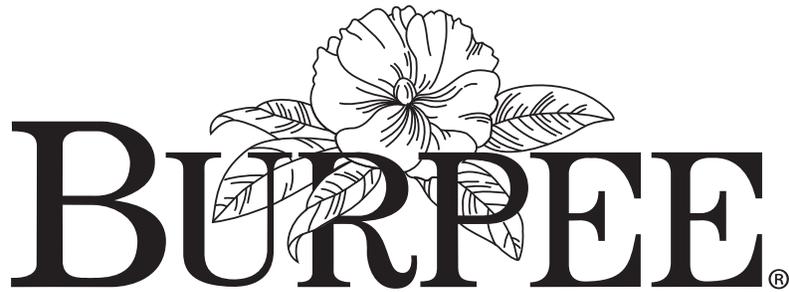
Green Bronx Machine builds healthy, engaged communities through inspired education, local food systems, and career exploration programs vital for 21st century college and career opportunities. Through the art and science of growing vegetables in classrooms all year long, GBM provides daily academic instruction in all subject areas and extra-curricular programs. Our internationally-acclaimed, data-driven approach has demonstrated an unprecedented increase in school-wide academic performance and in personal health outcomes in states and countries around the world.

Green Bronx Machine believes that healthy students help drive healthy schools, and healthy schools are at the heart of healthy communities. GBM offers a suite of student-tested, teacher-loved, and administrator-approved scalable goods and services. These include data-driven curriculum, professional development, in-school and after-school programming, summer-camp, teacher training, educational agricultural and food preparation technology, and so much more. Green Bronx Machine grows vegetables, and their vegetables grow students, schools, and communities one student at a time, one school at a time, one classroom at a time. www.greenbronxmachine.org



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