GARDENS THAT POP

A K-2 STEM EXPERIENCE

Created by C.I.T STEM Curriculum Team

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About this Experience

Gardens that Pop! integrates environmental science, art, literacy, and social emotional learning in a comprehensive study of our indelible connection to one another through our connection to and dependence upon plants.

Students will learn about the anatomy of seeds, the life cycle of plants, and how plants communicate. They will have the opportunity to create their own Lego planter to grow mint, which they can take home and share with their families. They will also plant their homemade wildflower seed bombs to add to the biodiversity and to beautify their community. All observations and reflections will be recorded in personalized Science Journals, which students can use to document their learning and growth throughout the program.

The Experience will culminate with a field trip to learn about composting, extending student learning and providing inspiration for future garden projects. By participating in Gardens that Pop!, students will develop essential skills, knowledge, and attitudes related to environmental awareness, plant care, and community engagement.

Note to Activity Specialist

NY Edge is thrilled to have you leading this experience! You will lead students on a journey of discovery, exploring the far-reaching impact of plants around the world.

During this program, students will dive into a variety of plant-related topics, including the anatomy of seeds, plant life cycles, and plant communication. Students will discover that although plants may appear passive and quiet, they actively communicate with one another and with other species. Scientific studies have revealed that they are also quite sensitive to negativity, just like us!

To ensure a smooth experience, please be sure to read all lessons in advance, so you have adequate time to prepare and organize all necessary materials. You will need a laptop or iPad with internet access to display videos and Google slides that are linked in the lessons.

The Essential Question will serve as the guiding theme for the program, and the Enduring Understanding will summarize the core concepts that students will explore throughout each lesson. These tools will help you tailor your instruction to meet the learning objectives and outcomes of the program.

We hope you and the students will enjoy exploring the power of plants through this exciting program. Thank you for your commitment to helping students grow their knowledge and appreciation of the natural world.

Family Letter

Greetings NY Edge Families!

We are thrilled to embark on an exploration of our deep connection to and reliance on plants. Through hands-on explorations, students will delve into the fascinating world of plants, from planting mint seeds to creating wildflower seed bombs that beautify their community and support vital pollinators such as bees and butterflies.

We will study seed and plant anatomy and examine the different stages of a plant's life cycle, all of which will be recorded in students' personalized science journals.

Plants connect us to one another. They are crucial for our survival. All of our food comes from plants directly, or from animals that eat plants. Plants provide nutrition, medicine, clothing, shelter, fuel, and purify the air we breathe. They also beautify our communities. Plants are also communicators. If we slow down and start listening with greater intention, perhaps we will understand them, ourselves, and the world a little better.

Here are questions to help start conversations at home around plants:

- Why do plants need the sunlight?
- How do plants drink water?
- What do plants need to grow?
- How do plants and animals help each other?
- What are some ways we use plants in our daily lives?

Here are some recommended resources about plants that you might find informative and engaging:

- Cucumber Mint Salad with Lemon Mint Dressing
https://www.youtube.com/watch?v=kl1UdLNNVPo
- Composting Service on Wheels Appears in New York City
https://www.youtube.com/watch?v=EIKGmKZ9Qao
- Make Compost with a Sandwich Bag
https://www.youtube.com/watch?v=QA7GzLYjk64
- What is a Carbon Footprint? What Can You Do About Yours?
https://www.youtube.com/watch?v=YseZXKfT_yY
- NASA Climate Kids
https://climatekids.nasa.gov/menu/big-questions/
- Plants Use an Internet Made of Fungus
https://ed.ted.com/best_of_web/4uORORJx
- Find a Community Park Near You (NYC Parks Dept.)
https://www.nycgovparks.org/greenthumb

We can't wait to get started on what is sure to be an enriching experience. Please do not hesitate to reach out with any questions or concerns. Email: STEM@NewYorkEdge.org

Warmly,
The NY Edge STEAM Team

Materials

Experience Slide Deck

Laptop or iPad to share videos and Google slides
Science journal (one per student)
NYC stickers (1 package per class)
Plant stickers (1 package per class)
Large chart paper
3 different colored packs of post-Its
Lego
Mint Seeds (3 seeds per student)
4" square plastic nursery pot (one per student)
Soil
Compostable plastic spoons (one per student)
Water
Spray bottles
White paper (one piece per student)
Pencils (one per student)
Colored pencils/markers

Seed Bomb Materials: (source)
Wildflower seed mix
Air-dry clay (water-based)
Rolling pins (one per student)
Large heart metal cookie cutter (one per student)
Wax paper (one roll per class
3 large cookie sheets (per class)
3 water sprayers filled wit water

Pop Up Card Materials:
Jewel stickers (one order per class)
Floral stickers (one order per class)
Glitter glue (2 orders per class)
Blue card stock paper (on pack per class)
Green card stock paper (one pack per class)
Colored construction paper (on pack per class)
Markers (one package for every two students)
Scissors (one per student)
Glue sticks (one for every two students)

Ziplock Greenhouse:
Greenhouse template (printed on green card stock;
one Sandwich-sized Ziploc bags (one per student)

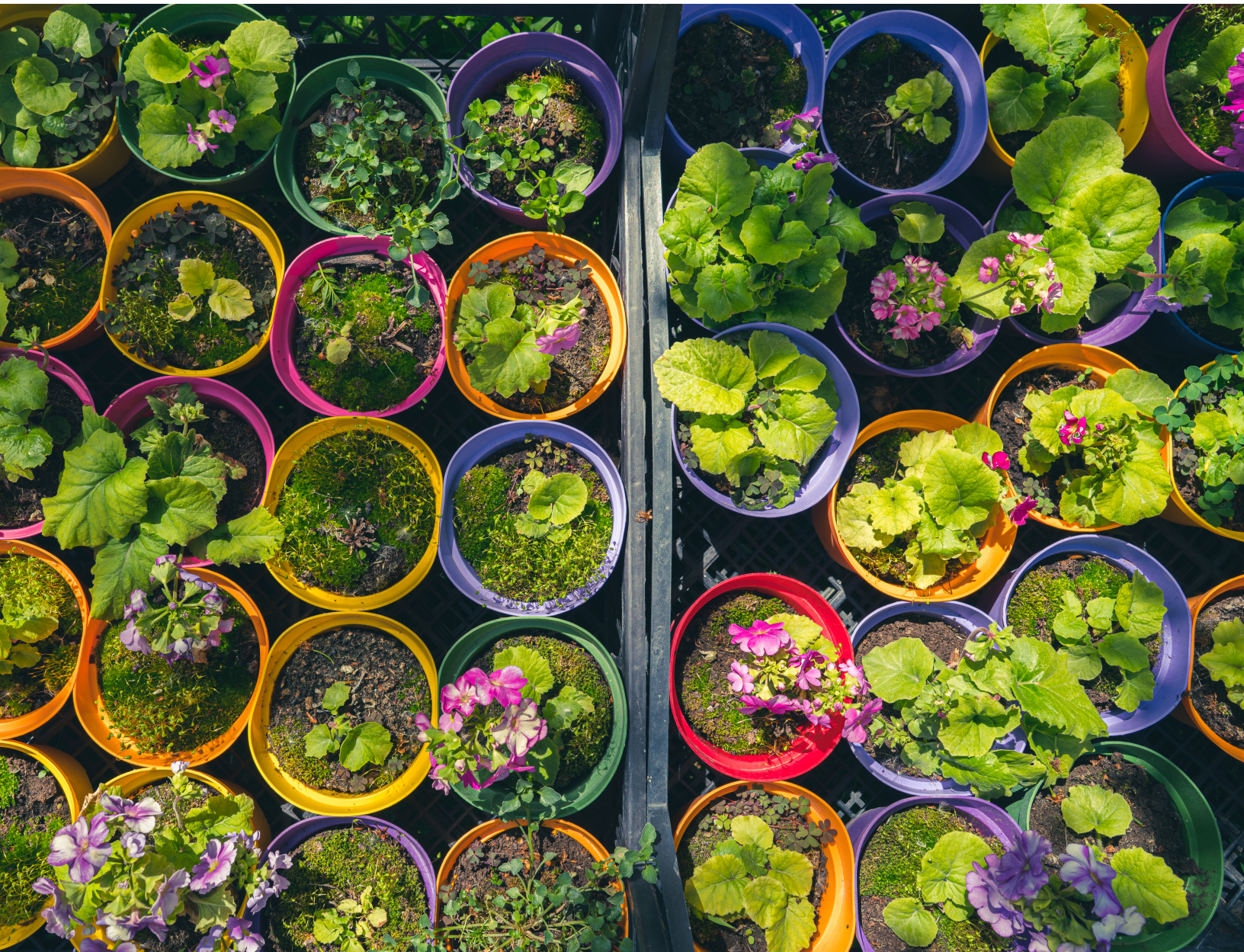
Permanent black markers (one per student)
Lima, pinto, mung, black-eye pea, and lentil
(one legume per student for a total of 5 legumes)
Scotch tape (one roll for every 6 students)
Paper towels (one sheet for every student)
Spray bottle
Water

Essential Question: How do plants connect all life on earth?

Enduring Understanding: Plants are a very important part of the ecosystem, connecting all life on Earth. They also help balance the Earth's climate by absorbing carbon dioxide and releasing oxygen. Plants provide shelter, medicine, building materials, and fuel.

Overview of Lessons:

Week 1 Topic: Exploring the Power of Plants
Week 2 Topic: Decoding the Language of Plants
Week 3 Topic: Crafting Nature's Beauty with Botanical-Themed Pop-Up Cards
Week 4 Topic: Seed Bombing for a Greener Future
Week 5 Topic: Exploring Sustainable Practices through Composting & DIY Greenhouses
Week 6: Field Trip - Exploring the Benefits and Techniques of Composting



Vocabulary

- Airborne: transported by air; flying
- Bullying: hurtful or teasing threat, abuse, aggressive intimidation
- Chemical: a substance that has a particular makeup; can be made by humans or found in nature
- Climate change: refers to long-term shifts in temperatures and weather patterns; Since the 1800s (Industrial Revolution), these shifts have primarily been driven by human behavior and activities, but also do naturally occur
- Composting: the natural process that occurs when organic matter breaks down into a granular material; compost is rich in nutrients and is great for organic fertilizer
- Crops: plants that are grown and harvested on a large scale for food
- Decomposition: to break up into its smaller parts; decay, rot
- Dormant: inactive, but capable of becoming active (e.g., a seed, a volcano)
- Embryo: tiny, undeveloped plant inside the seed
- Floral: made of or decorated with flowers
- Germination: the sprouting of a seed (or spore), usually after a dormant period
- Landfill: a system of trash disposal in which the garbage is buried
- Leaves: part of a plant attached to a stem; helps plants collect sunlight to make their food through ha process called photosynthesis
- Life cycle: the series of changes in the life of an organism (includes reproduction)
- Native: born or raised in a particular place; a local resident (indigenous)
- Negativity: an attitude in which someone considers only the bad qualities of someone or something; tendency to be disagreeable
- Nutrients: molecules in food (i.e. proteins, fats, carbohydrates, vitamins, minerals) that all organisms need to make energy, grow, develop, and reproduce

- Organic material: matter that comes from the remains of recently living organisms such as plants and animals, and their waste products in the environment
- Petals: modified leaf that protects and surrounds the reproductive parts of a flower; they are brightly colored to attract pollinators, which enables the plant to reproduce
- Storyboard: series of sequenced illustration that map out the important events of a story in order
- Receptor: a cell, or group of cells that receive stimuli (i.e., anything that triggers a physical or behavioral change); sense organ
- Reproduce: the process by which plants and animals produce offspring
- Roots: the usually underground part of a plant that absorbs water and minerals, stores food, and holds the plant in place
- Seed coat: hard outside shell of the seed; the seed coat protects the embryo
- Seedling: a very young baby plant
- Sprout: a small growth on a plant; a new growth from a germinating seed; once the shoot reaches the surface, it becomes a sprout
- Stem: the main, often long, part of a plant that usually grows upward above the ground and supports other plant parts, such as branches and leaves
- Vibration: tiny, very fast back-and-forth (or up-and-down) movements

Week 1: Exploring the Power of Plants

Essential Question: How do plants connect all life on earth?

Learning Objectives:

· Students will recognize and describe the various stages in the growth and development of a plant.
· Students will construct a unique Lego planter for cultivating their mint plant in a visually appealing way.
· Students will customize their science journal to record their observations and inquiries.

Materials:

·Experience Slide Deck
Lego compatible 5” X 5” base plates (one base plate per student)
· Lego (assorted bricks)
· Buckets (one bucket of filled with Lego for each group of 4 students)
· Mint seeds (3 seeds per student)
· Potting soil
· Compostable plastic spoons (one per student)
· 4” square plastic nursery pot (one per student)
· Water
· Spray bottles (3 per class)
· Science Journals
· NYC stickers (1 package per class)
· Plant stickers (1 package per class)
· Markers (one package for every two students)
· Chart paper
· Markers for chart paper (for teacher)

Vocabulary:

· Germination
· Life cycle
· Nutrients
· Seedling
· Sprout

Instruction Description

Hook

Show students the 5-minute Plant Life Cycle Stages video.

Ask: What are the similarities and differences between the life cycle of plants and humans?

A: Possible answers could include:

1. Plants and humans reproduce differently. Plants produce seeds or spores that can grow into new plants.
2. Plants and humans have different stages of development. A human goes through infancy, childhood, adolescence, and adulthood.
3. Plants and humans have different lifespans. Some plants can only live for a few months, while others can live for hundreds, or even thousands of years. Humans, on the other hand, have a relatively short lifespan as compared to some plants. The average human lifespan is around 80 years. (The oldest human lived to almost 123 years.)
4. Plants and humans have different nutrient requirements. Plants require sunlight, water, and nutrients from the soil to grow, while humans require a balanced diet that includes carbohydrates, proteins, fats, vitamins, and minerals to grow and stay healthy. (Plants also produce their own food through a process called photosynthesis, whereas humans cannot produce their own food.)

Teach/Demonstrate

Today we are going to learn about the life cycle of plants by growing mint from seed. Mint not only has a refreshing aroma, but is included in many different types of recipes from around the world. It can be eaten plain to freshen your breath, or used to make tea.

Teacher Note: At the front of the room, have:

- 1 large container of potting soil
- 3 spray bottles filled with water
- 1 square plastic nursery pot to each student
- 1 compostable plastic spoon to each student
- 3 mint seeds per student

Call up students in groups of three to take one square plastic nursery pot. Have them use one of the spoons to fill their pot between ¾”-1” below the rim with potting soil.

Have students lightly moisten the soil with a sprayer. Then plant the 3 mint seeds about 2-inches apart from one another, ¼” beneath the soil.

Distribute one bucket filled with assorted Lego pieces to each group of 4 students. Give every student one 5” X 5” Lego compatible base plate on which they will place their potted mint seeds to build a decorative “pot” or encasement around.

Here are examples made with larger Legos (called Duplo) that may serve as inspiration for students: IMAGES

Teacher Note: Students will transplant their seedlings in a sunny outdoor location about 3 weeks after they sprout, or when they have 1-2 sets of leaves.

Independent Practice

As scientists, we will observe our planted mint with our sense of sight, smell, touch, and taste. We will record our observations in our Science Journals, to track changes over time. This will help us determine if our mint is thriving, or not doing well. Based on our noticings, we can make informed decisions on how to best care for our mint.

Today you will receive a Science Journal to personalize with drawings and very special stickers around the themes of plants and NYC.

Teacher Note: Distribute Science Journals, markers, and stickers to students. Students decorate their Science Journals.

Share

Students share their unique Lego pots and science journals.

Link

Today you planted mint from seed. Remember to water your mint when the soil is dry to the touch. You will most likely need to water it every 2-3 days. If the soil is dry the day after you watered it, add a bit more water. Throughout our time together, record your observations and inquiries in your science journals.

Exit Ticket: Have students record their response to the prompt in their Science Journal.

Teacher Note: Draw the plant cycle on the board or chart paper. Include the following in your diagram: *seed, germination, sprout, seedling, young plant, adult plant*.

A sprout is different from a seedling. A sprout is a very young plant that has just begun to grow from a seed. It is typically characterized by a single stem and a pair of tiny leaves that contain stored food for the growing plant.

A seedling, on the other hand, is a more developed young plant that has grown beyond the sprout stage. It has developed true leaves and a root system. The stem is thicker and stronger than that of the sprout, and is able to support the weight of its few leaves.

A young plant develops from a seedling. It has a stronger stem, a more complex root system, and a larger number of leaves.

Mint seeds take about 10-16 days to sprout.

Have students copy the diagram from the board and label it *Plant Life Cycle*. Ask them to circle the current stage of their mint (i.e., the seed) and write today's date.

NYS Science Standards

- P-LS1-1. Observe familiar plants and animals (including humans) and describe what they need to survive.
- 2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow.
- 2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats.

NYS Social Emotional Learning Standards

- 2C.1a. Identify ways to interact with others that protect personal and collective safety and wellbeing, including establishing, maintaining, and respecting boundaries.

Week 2: Decoding the Language of Plants

Essential Question: How do plants connect all life on earth?

Learning Objectives:

· Students will compare the communication systems of plants and humans.
· Students will storyboard an adventure story featuring a seed character of their own creation.

Materials:

· Experience Slide Deck
  - Internet access
· Laptop/iPad for showing video
· Science journals
· White paper (one piece per student)
· Pencils (one per student)
· Colored pencils/markers

Vocabulary:

· Airborne
· Bullying
· Chemicals
· Receptor
· Storyboard
· Vibration

Instruction Description

Hook

Show students this 2-minute video: Bully a Plant – Say No to Bullying

Ask:
- **What happened to the plants that received insults for one month?**
- **What happened to the plants that received compliments for one month?**

Although larger-scale, repeated experiments would need to be run to establish more solid conclusions, other scientific studies have shown that sound vibrations can trigger a response in plants through one of their receptors (called a mechanoreceptor).

Ask:

- **How do people respond to bullying?**
- **Do you think human responses to bullying have any similarities to the way the plants responded to bullying in this experiment? Explain.**

Teach/Demonstration

Plants are sensitive to their environment. They seem to be sensitive to the vibrations in our voice and the vibrations from other sounds in nature, including the buzzing of bees. They are also sensitive to the amount of sunlight, water, air, and space they are given.

Ask: What are we sensitive to in our environment?

Ask: Do you think different types of plants have different sensitivities? What about people?

Plants, like people, not only take in information from their environment, they also provide information to their surrounding environment. Plants communicate through odors, some of which we can perceive, and sound signals, which are not detectable by human ears, but are picked up by other plants and animals.

Have you ever smelled freshly cut grass?

The grass releases an odor to signal danger (i.e. the lawn mower) to nearby plants. In response to the grass's cry for help, neighboring plants prepare their own chemical defenses in an attempt to ward off danger. Plants' warning messages may be in the form of odors or sounds (vibrations).

Plants also release gases from its flowers, leaves, and roots, which act as airborne messages to communicate with insects. For example, plants release a scent that attracts insects to eat pests that are currently munching on them.

Plants can even recognize their siblings through chemical signals! Plants sense nearby plants with whom they compete for resources. Scientists studied a flowering plant called sea rocket. When grown in pots with relatives, they tended to restrict the growth of their roots, allowing their siblings room to grow. They did not extend the same courtesy when placed in pots with random plants. When planted next to strangers, the sea rockets grew more extensive roots to aggressively compete for resources.

Ask:
- **Can you identify any similarities between plant and human communication?**
- **Can you identify any differences between their systems of communication?**

Optional Extension for 2nd Graders:

A native Cuban plant called marcgravia evenia that depends on bats for pollination communicates with them through specially adapted echo-reflective leaves close to their flowers to help the bats easily find the pollen, giving the plant a better chance of reproducing.

Show students this 3-minute video: This Plant Attracts Bats With a Satellite Dish

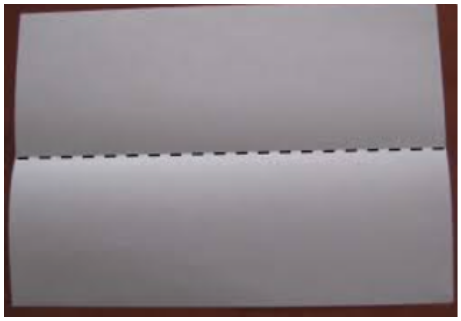
Independent Practice

Teacher Note: Show students the 6-minute video of Eric Carle's The Tiny Seed.

Give each student:
- one sheet of white paper
- one pencil
- colored pencils/markers

Today we are going to storyboard an adventure of our own seed character. A storyboard is a series of illustrations that map out the most important events of a story in order.

To do this fold your paper in half horizontally.



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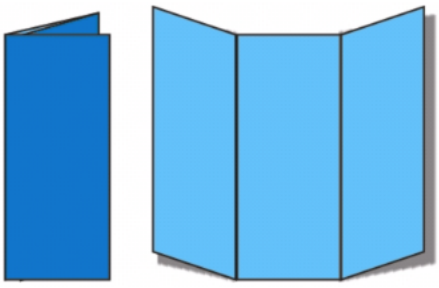
Then we will make a vertical trifold.



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The result of the two types of folds are 6 equal-sized boxes.
Teacher Note: You can watch the first minute of this video to clarify how to fold the paper into 6 equal-sized boxes: 6-box fold

Think about a name you would like for your seed. The name could be the word “seed” in a different language. For example, in Spanish, one word for seed is semilla. Then, come up with the 5 most important parts of your story. Each part will go in a separate box. The first box is where you will write your title and the author and illustrator’s name – that’s you! You can also include an illustration in that first box. Since there are five boxes for your story, you may choose to organize the sequence of events using certain transition words: first, next, then, after that, and finally.

Title: Written and illustrated by:	First…	Next…
Then…	After that…	Finally…

Teacher Note: Write synonyms for “next,” “then,” and “after that” on the board. These may include: afterwards, followed by, before long, later, soon after, etc. A synonym for “finally” could include “in the end.”

Share

Have students share their storyboards.

Link

Today we learned that plants are sensitive to their environment, just like us. They communicate with one another and different species through odors and vibrations. They can be competitive and territorial, but they can also be gracious and voluntarily share their space with relatives.

Next time we will be making 3-dimensional floral pop-up cards to give to a family member or friend.

Exit Ticket: Have students record their response to the prompt in their Science Journal.

- Draw and label how you plan to use your mint leaves.

- How do you plan to help your mint grow?

NYS Science Standards

- P-LS1-1. Observe familiar plants and animals (including humans) and describe what they need to survive.
- K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.

NYS Social Emotional Learning Standards

- 2B.1c. Recognize bullying behaviors and practice safety and courage in seeking help from a trusted adult to respond.

Week 3: Crafting Nature's Beauty with Botanical-Themed Pop-Up Cards

Essential Question: How do plants connect all life on earth?

Learning Objectives:

· Students will identify the name and function of the following plant anatomy: roots, stem, leaves, and petals.
· Students will create a 3-dimensional floral card to give to a loved one with a meaningful message.

Materials:

· Experience Slide Deck
  - Internet access
· Laptop/iPad to show video
· Science journals
· Blue card stock paper
· Green card stock paper
· Colored construction paper
· Markers
· Scissors (one per student)
· Glue sticks (one per student)
· Glitter glue
· Jewel stickers
· Floral stickers

Vocabulary:

· 3-dimensional
· Anatomy
· Floral
· Roots
· Stem
· Leaves
· Petals
· Reproduce

Instruction Description

Hook

Show students the 2 ½ -minute video: Parts of a Plant – Roots, Stems and Leaves

Ask: What is one function of a plant's roots?

A: Roots take in the water and nutrients the plant needs to survive and grow. Roots also help hold a plant firmly in place, preventing it from being washed away by water or blown away by strong winds.

Teach/Demonstration

Today we are going to learn about several plant parts and their purpose.

Then we will be creating 3-dimensional pop-up floral cards, in which we write a kind message to give to a family member or friend.

The four main plant parts that we will investigate today are the: roots, stem, leaves, and petals.

Teacher Note: Share Plant Parts slideshow with students.

Independent Practice

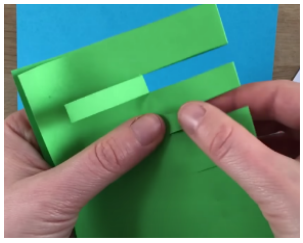
Teacher Note: Here is a 11-minute video tutorial to help you teach the kids how to construct a 3-D card: Tutorial

Distribute:
- Jewel stickers
- Floral stickers
- Glitter glue
- Scissors
- Construction paper (to cut out flowers, sun, plants, etc.)
- Glue sticks

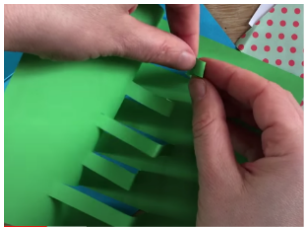
Demonstrate each step with students (It may be helpful to show the tutorial, pausing at each step):

1. Cut your green card stock into a rectangle that is slightly smaller than your full-sized piece of turquoise card stock.
2. Fold the turquoise cardstock in half with a firm crease. Set that paper aside. Fold the green sheet with a firm crease.
3. Keep the green sheet folded as you cut 2 long slits at the edge of the paper (about halfway across the paper). Then cut 2 shorter slits about 1/3 of the way across the paper next to the first two slits, then add 2 long, 2 short, and 2 long slits.

4. Keeping the green paper folded, gently lift the green cuts up and fold them up and back. These will be the 3D stems of the flowers.



5. Open the folded green sheet and turn these stems “inside out.”



6. Glue the green sheet inside the folded turquoise card stock. Keep the stems popping outward.
7. Now cut out flowers and glue them to your 3D stems. Instead of cutting out flowers, you may use floral stickers. I advise placing the sticker on a different piece of paper, cutting it out, and then gluing it to the pop-up stem, so the sticky part of the sticker does not attach to another part of the card stock.
8. Now it is time to decorate and write a beautiful message inside your card!

Share

Students share their pop-up card creations.

Link

Today we identified four important parts of the plant: roots, stem, leaves, and petals. We discussed how each part contributes to the survival of the plant.

Next time we meet, we will make wildflower seed bombs out of clay to beautify our community.

Exit Ticket: Have students record their response to the prompt in their Science Journal.

Draw a diagram of a flowering plant. Label the roots, stem, leaves, and petals. Circle the structure that attracts pollinators to help the plant reproduce.

NYS Science Standards

- P-LS1-2. Plan and conduct an investigation to determine how familiar plants and/or animals use their external parts to help them survive in the environment.

NYS Social Emotional Learning Standards

- 2C.1b. Demonstrate adaptability in social contexts that consider community and personal wellbeing.

Week 4: Seed Bombing for a Greener Future

Essential Question: How do plants connect all life on earth?

Learning Objectives:

· Students will create wildflower heart-shaped seed bombs out of air-dry clay.
· Students will identify the name and function of the following seed anatomy: seed coat, embryo, and cotyledon.

Materials:

· Experience Slide Deck
  - Internet access
· Laptop/iPad to watch videos/Google slides
· Science journals
· Wildflower seed mix
· Air-dry clay (water-based)
· Rolling pins (one per student)
· Large heart metal cookie cutter (one per student)
· Wax paper
· 3 large cookie sheets
· 1 black permanent marker

Vocabulary:

· Dormant
· Embryo
· Seed coat

Instruction Description

Hook

Share this 3 ½-minute video: How Does a Seed Become a Plant?

Ask: What is the first part of the plant to break through the seed coat?

A: The roots!

Ask: Which direction do the roots grow?

A: Roots always grow downwards, regardless of the way in which the seed is planted.

Teach/Demonstration

Have students listen to the 7 ½-minute book A Seed is Sleepy by Dianna Hutts Aston and Sylvia Long, which showcases seeds from around the world.

After students watch the read aloud, **Ask:**

- **What is your favorite descriptive word (or adjective) that the author uses to describe a seed? What did you like about that word? (e.g., its sound, it had many syllables, etc.)**

Teacher Note: Images of seeds are at the 0:17 time stamp. Images of plants are at the 7:23 time stamp.

- **Compare the seeds to the plant they will grow into. Do the plants look like you imagined they would? Do any plants resemble the seeds they came from?**
- **Why do you think many seeds grow inside a protective covering (called a seed coat)?**
- **Look at the seeds of an evergreen. Why might these seeds not need to rely on a protective seed coat for their seeds?**
- **What special qualities do some seeds have that make it easier for them to travel once they have separated from their plant. What seeds in the story can do this? How do you know?**
- **Can you name two examples of edible seeds?**
- **Do all seeds need the same conditions to grow?**
- **Are there any conditions that all seeds require to grow?**

(source of questions)

Independent Practice

Today we are going to make a heart-shaped seed bomb out of clay. Once our seed bombs are finished and have had time to fully dry, you can bring them home and choose a place in the community to launch it as a way to beautify your chosen area with wildflowers that will grow from the seeds embedded in your clay hearts. Flowers help bees and other pollinators thrive.

We selected wildflower seeds to put into our seed bombs because they should grow nicely in NYC during the summer. We chose a variety of wildflower seeds, so that we would have a better chance that some of the seeds would grow.

Teacher Note: Have the baking trays (or any type of tray) at the front of the class.

Distribute the following to students:

- A large piece of air-dry clay placed on a 6” X 6” piece of wax paper
(The size of the wax paper does not need to be measured; it is an approximation)
- One heart cookie cutter
- One rolling pin
- About 1 teaspoon of wildflower seeds.
-

Walk students through each step of the process:

1. Write each student’s name in permanent marker in the top right corner of their wax paper.
2. Roll out your clay until it is about ¼-inch thick.
3. Use your heart-shaped cookie cutter to make a heart.
4. Remove the surrounding clay from the outside of the cookie cutter with your fingers.
5. Remove the cookie cutter from the clay.
6. Use your fingers to gently press the wildflower seeds into the surface of the clay heart.

(The seeds do not need to be pressed too deeply into the clay – just enough to stick to the clay, without falling off. Students may be generous with the number of seeds they use, as not all of them will grow.)

Collect students’ hearts (keeping them on the wax paper) and place them on the baking trays at the front of the room. Allow them to dry.

Share

Have students share where they plan to launch their seed bomb and why they chose that community location to beautify.

Link

Today we learned several important parts of a seed. We examined seeds from around the world to discover similarities and differences. Then we made wildflower seed bombs to beautify our community and help pollinators thrive.

Exit Ticket: Have students record their response to the prompt in their Science Journal.

Have students copy the table below. Students will classify how at least 4 of the seeds from these Google slides travel by illustrating each seed in of the four quadrants. Many images may have more than one correct answer.

Teacher Note: Explain that seeds are dispersed by animals who eat and poop out the seeds!

Blown by wind	Eaten by Animals
Stick to Animals	Transported by Water

NYS Science Standards

- P-LS1-1. Observe familiar plants and animals (including humans) and describe what they need to survive.
- P-LS1-2. Plan and conduct an investigation to determine how familiar plants and/or animals use their external parts to help them survive in the environment.

NYS Social Emotional Learning Standards

- 2C.1b. Demonstrate adaptability in social contexts that consider community and personal wellbeing.

Week 5: Exploring Sustainable Practices through Composting & DIY Greenhouses

*Teacher Note: This lesson may take two sessions to complete.

Essential Question: How do plants connect all life on earth?

Learning Objectives:

· Students will identify at least two benefits of composting.
· Students will determine which items are compostable using photographs from a Google slideshow.
· Students will construct a Ziploc bag “greenhouse” to sprout various legume seeds.

Materials:

· Experience Slide Deck
  - Internet access
· Laptop/iPad to watch videos/Google slides
· Science journals
· Lima, pinto, mung, black-eye pea, and lentil
(Teacher Note: Students receive one of each legume, for a total of 5 legumes)
· Sandwich sized Ziploc bags (one per student)
· Greenhouse template (one per student)
· Scissors (one per student)
· Markers
· Scotch tape (one roll for every 6 students)
· Paper towels (one roll per class)
· 3 spray bottles
· Water

Vocabulary:

· Climate change
· Composting
· Crops
· Decomposition
· Landfill
· Micro-organisms
· Organic material

Instruction Description

Hook

Show students the 6-minute video: Beginner's Guide to Composting

Wow! This organization collects about 8 tons of compostable materials each week. That's about the weight of an Asian elephant, or a T-Rex, or a school bus!

Yet NY residents throw over 14,000 tons of food in the trash every week. That's about 8 cars or 14 walruses! So, there is still a lot more that can be done. Cities across the world are creating more composting programs. Currently, San Francisco, California is city that composts the most.

Teach/Demonstration

Composting is simply the natural process of recycling organic matter, such as leaves and food scraps, into nutrient-rich fertilizer for plants, including the fruits and vegetables we eat.

Composting has many benefits, which include:

- Reduces waste and saves money

By reducing the amount of waste sent to landfills, we save money on its pick up and disposal. It also reduces waste because the compost can be used to make our soil healthier for growing food.

Teacher Note for 2nd graders: In landfills, bacteria chemically break down organic matter without access to much oxygen, which results in the emission of a harmful greenhouse gas called methane. Since compost decomposes organic matter with access to more oxygen, it mostly produces carbon dioxide as a byproduct. Although CO2 is also a greenhouse gas, methane is a much more potent one. Methane traps about 30 times more heat than carbon dioxide. For example, banana peels will break down much slower in a landfill as compared to a compost pile. This means that the emissions from landfills spread over longer periods of time as compared to compost emissions. Food waste in a landfill gives off three times more carbon than the same waste tossed into compost.

- Creates healthier, nutrient-rich soil

Composting can help improve poor-quality soil by encouraging the production of beneficial microorganisms (mostly bacteria and fungi), which help to break down organic matter (like our food scraps) to make the soil filled with more nutrients and able to hold onto more moisture.

Optional Extension for Grade 2: Have students watch the 7-minute read aloud Tiny Creatures: The Invisible World of Microbes

- Reduces the need for chemical fertilizers

Since composting improves soil structure and the amount of nutrients in the soil, there is less need to add chemical fertilizers.

- Greater growth of crops

More crops grow when the soil is healthier, just like we grow and function better when we eat healthy foods.

- Less plant disease

Besides helping plants grow, compost can help fight off plant diseases by protecting plants with beneficial microorganisms.

Just like any recipe, your compost is only as good as the ingredients you put into it.

Have students determine which items can and cannot be composted: Can This Be Composted?

Independent Practice

Now we are going to sprout several different types of seeds without any soil! We will construct "greenhouses" out of Ziplock bags. Seeds need moisture and heat to germinate. Just like actual greenhouses, our Ziplock bags are sealed, so warm air cannot escape and the temperature inside the greenhouse bag can increase to warm the seed.

Show students some images of greenhouses from around the globe: Greenhouses from Around the World

Teacher Note: Play compost song when students are working on their Ziploc greenhouses: Compost – A Portrait of the NYC Composting Community

Have 3 spray bottles filled with water at the front of the room.

Distribute the following to each student:

- 1 greenhouse template
- 1 sandwich-sized Ziploc bag
- Black permanent marker
- Scissors
- One of each legume: Lima, pinto, mung, black-eye pea, and lentil
- 1 sheet of paper towel

Guide students through each step of constructing their Ziplock greenhouse, by making your own to keep in the class for future observations.

1. Cut out the shape of the greenhouse.
2. Cut out the grey square from your greenhouse template. This is where our clear Ziploc bag with your beans will be placed shortly.

Teacher Note: Students will most likely need help inserting the scissor into the template to cut out the grey square (which can be recycled).

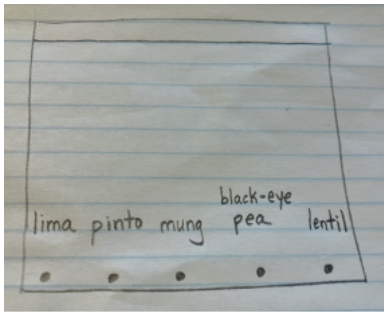
3. Write your name on the black line with a marker.
4. Fold your paper towel in half twice so it can fit into the bottom half of your Ziploc bag.
5. Teacher Note: Call students up to the front of the room in groups of 3-4 to dampen their paper towel with a sprayer. Demonstrate how they should moisten the paper towel without soaking it. The paper towel should not be dripping with water. While other students wait, they may use their black marker to make designs on their house (e.g., bricks, tiny windows, curly cues, etc.)

Use water to moisten the paper towel.

We are using paper towels to germinate (or begin to grow) seeds, but sponges, paper coffee filters, and newspapers also work.

6. Evenly space and place each of the 5 legumes onto the damp paper towel.
7. Carefully place the folded and moistened paper towel with the legumes placed near the bottom of the paper towel into the bottom of the Ziploc bag. Seal the bag.
8. In your science journal, make a sketch of your Ziploc bag and label the order of your seeds to help you keep track of growth.

   For example:



9. Use scotch tape to tape the bag to the back of the greenhouse template. Make sure the beans face front.
10. Depending on the set up, students can tape their greenhouse to a sunny window at school, or at home. Have students check on the legumes each day to track changes.

In their science journals, have students predict which seeds, if any, will grow without soil.

On the board write the names of the seeds used in the greenhouse Ziploc: lima, pinto, mung, black-eye pea, and lentil.

Then write the prompt on the board: I predict that the _____ seed(s) will germinate without soil.

Teacher Note: Have early finishers watch the 10-minute video, Blippi Visits a Greenhouse

Share

Students will share their Ziploc greenhouses and their seed predictions.

Link

Today we discussed the benefits of composting and how our city is working to increase its compost programs.

We also made a Ziploc greenhouse to observe the life cycle of several different legume species, including lima, pinto, mung, black-eye pea, and lentil. Once your seed start to develop roots, transplant them outside about 1-1 ½-inches beneath the soil, so they can access the nutrients they need from the soil. Also, if they are kept in a Ziploc bag too long, mold will start to develop.

Teacher Note: With your fingers, show students what 1-1 ½-inches looks like. A paperclip or quarter is about 1-inch long.

Exit Ticket: Have students record their response to the prompt in their Science Journal.

Predict which legume in your Ziplock greenhouse will start to sprout first. Draw what you think it will look like once it sprouts. Label your drawing.

NYS Science Standards

- P-LS1-1. Observe familiar plants and animals (including humans) and describe what they need to survive.
- K-ESS3-3. Communicate solutions that will reduce the impact of humans on living organisms and non-living things in the local environment.

NYS Social Emotional Learning Standards

- 2C.1b. Demonstrate adaptability in social contexts that consider community and personal wellbeing.

Week 6: Field Trip - Exploring the Benefits and Techniques of Composting

1. Tour of NYC Parks' Dept.'s Five Boro Green Roof, or one of their other programs: https://www.nycgovparks.org/learn/ecosystems
2. NYC Compost Project: The NYC Compost Project is a citywide program that works to reduce waste in the city by promoting composting. They offer workshops and classes on composting.
3. Tour a community garden
4. Queens County Farm Museum: The Queens County Farm Museum is an historic farm in Queens that offers educational programs and workshops on sustainable agriculture, including composting. They have a working compost operation on the farm.
5. Brooklyn Grange Rooftop Farm: The Brooklyn Grange Rooftop Farm is an urban farm located on the rooftops of buildings in Brooklyn. They use composting to fertilize their crops and offer tours and workshops on composting and sustainable agriculture.
6. The High Line: This elevated park features a variety of native plants and ecosystems. Kids can learn about the park's unique design and its plants.
7. The Central Park Conservatory Garden: This garden features a variety of plants for kids to explore.

Essential Question: How do plants connect all life on earth?

Learning Objectives:

Materials:

· Science journals

Vocabulary:

Instruction Description

Hook

Teach/Demonstration

Independent Practice

Share

Link

Exit Ticket: Have students record their response to the prompt in their Science Journal.

What is one surprising thing you learned today?

NYS Science Standards

NYS Social Emotional Learning Standards