MARIE SELBY
BOTANICAL
GARDENS

Native Florida Plants Curriculum
Grades K-2

Kindergarten-2nd Grade: Plant Patterns, Parts, and Particulars

Curricular units designed & prepared by Tracy Calla, 2020

K-2 Standards addressed:

Big Idea 14: Organization and Development of Living Organisms

A. All plants and animals, including humans, are alike in some ways and different in others.
B. All plants and animals, including humans, have internal parts and external structures that function to keep them alive and help them grow and reproduce.
C. Humans can better understand the natural world through careful observation.

Big Idea 1: The Practice of Science

A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation.
B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method."
C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge.
D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.

Big Idea 16: Heredity and Reproduction

A. Offspring of plants and animals are similar to, but not exactly like, their parents or each other.
B. Life cycles vary among organisms, but reproduction is a major stage in the life cycle of all organisms.

Big Idea 17: Interdependence

A. Plants and animals, including humans, interact with and depend upon each other and their environment to satisfy their basic needs.
B. Both human activities and natural events can have major impacts on the environment.
C. Energy flows from the sun through producers to consumers.

KINDERGARTEN NGSSS BENCHMARKS

Big Idea 14: Organization and Development of Living Organisms

SC.K.L.14.1 Recognize the five senses and related body parts.
SC.K.L.14.2 Recognize that some books and other media portray animals and plants with characteristics and behaviors they do not have in real life.
SC.K.L.14.3 Observe plants and animals, describe how they are alike and how they are different in the way they look and in the things they do.

Big Idea 1: The Practice of Science

SC.K.N.1.1 Collaborate with a partner to collect information.
SC.K.N.1.2 Make observations of the natural world and know that they are descriptors collected using the five senses.

SC.K.N.1.3 Keep records as appropriate -- such as pictorial records -- of investigations conducted.
SC.K.N.1.4 Observe and create a visual representation of an object which includes its major features.

FIRST GRADE NGSSS BENCHMARKS

Big Idea 14: Organization and Development of Living Organisms

SC.1.L.14.1 Make observations of living things and their environment using the five senses.
SC.1.L.14.2 Identify the major parts of plants, including stem, roots, leaves, and flowers.
SC.1.L.14.3 Differentiate between living and nonliving things.

Big Idea 16: Heredity and Reproduction

SC.1.L.16.1.Make observations that plants and animals closely resemble their parents, but variations exist among individuals within a population.

Big Idea 17: Interdependence

SC.1.L.17.1 Through observation, recognize that all plants and animals, including humans, need the basic necessities of air, water, food, and space.

Big Idea 1: The Practice of Science

SC.1.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.
SC.1.N.1.2 Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color, and motion, and compare their observations with others.
SC.1.N.1.3 Keep records as appropriate - such as pictorial and written records - of investigations conducted.
SC.1.N.1.4 Ask "how do you know?" in appropriate situations.

SECOND GRADE NGSSS BENCHMARKS

Big Idea 16: Heredity and Reproduction

SC.2.L.16.1 Observe and describe major stages in the life cycles of plants and animals, including beans and butterflies.

Big Idea 17: Interdependence

SC.2.L.17.1 Compare and contrast the basic needs that all living things, including humans, have for survival.
SC.2.L.17.2 Recognize and explain that living things are found all over Earth, but each is only able to live in habitats that meet its basic needs.

Big Idea 1: The Practice of Science

SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.
SC.2.N.1.2 Compare the observations made by different groups using the same tools.
SC.2.N.1.3 Ask "how do you know?" in appropriate situations and attempt reasonable answers when asked the same question by others.
SC.2.N.1.4 Explain how particular scientific investigations should yield similar conclusions when repeated
SC.2.N.1.5 Distinguish between empirical observation (what you see, hear, feel, smell, or taste) and ideas

or inferences (what you think).
SC.2.N.1.6 Explain how scientists alone or in groups are always investigating new ways to solve problems.

Literature Connections:

A Fruit Is a Suitcase for Seeds by Jean Richards
Plants Can't Sit Still by Rebecca E. Hirsch
Seeds by Vijaya Khisty Bodach
The Busy Tree by Jennifer Ward
The Tiny Seed by Eric Carle
The Reason for a Flower by Ruth Heller
Because of an Acorn by Lola M. Schaefer
A Seed Is Sleepy by Dianna Aston
The Magic and Mystery of Trees by Jen Green
From Seed To Plant by Gail Gibbons
Oh, Say Can You Seed? by Bonnie Worth
A Tree Can Be... by Judy Nayer
The Carrot Seed by Ruth Krauss
Once There Was A Seed by Judith Anderson and Mike Gordon
Seeds Go, Seeds Grow by Mark Weaklan
I Can Name 50 Trees Today! By Bonnie Worth
Flowers, Roots, Leaves, Stems, Seeds (5-book series) By Melanie Mitchell

Teacher Background Information:

Welcome to the wonderful world of native plants! This curriculum is intended to provide a basis for the study of life science, and to serve as a foundation for an understanding of the nature and practice of scientific observation. Kindergarten students will be introduced to shapes and patterns found in nature and among plants, the use of the senses to make observations, and the practice of recording their observations. 1st and 2nd grade students will investigate lifecycles, discover patterns of change over time, and explore the ways plants take care of their needs with specialized parts. All students will continue to build their skills as scientists by making observations, recording their findings, and comparing results with others.

We recommend, as often as possible, to take your students outdoors! Outdoor class time allows students to experience scientific concepts coming to life in local ecosystems and to get to know the plants and animals that live in their neighborhoods. Most importantly, though, learning outdoors gives you and your students to enjoy the many research-backed benefits of connection with nature: better academic performance, reduced stress and anxiety, improved moods and behaviors, and enhanced focus, creativity, critical thinking and problem-solving!

Before heading outside it is useful to set some outdoor learning guidelines:
Remind students that they will be working in the Outdoor Classroom, and that behavior expectations are the same as they are indoors. Review your classroom rules, and add the following:

- Respect all life in the schoolyard or garden. Observe living things with your eyes, not your hands.
- Don’t eat or touch things unless you know they are safe. Ask an adult.
- Everyone must stay within sight of one another, and within the boundaries (either pre-existing ones such as a fence, or something teacher-designated).

Before starting an activity or lesson, take a moment to allow your bodies to adjust to an outdoor setting. Consider spending one or two minutes just listening to the sounds outside and observing any notable natural phenomena (blooming flowers, wildlife, etc.), and enjoying the sunshine and fresh air.

What is a native plant?
A native plant is a plant species that occurs and thrives naturally in a particular region, ecosystem, and

habitat. Native plants are a part of the "natural neighborhood," or local ecosystem, and they live and work in conjunction with the other organisms in that ecosystem. They are the anchors of the web of life, and they have evolved and adapted to meet climatic and environmental challenges in their native area without intervention or assistance from humans.

Native plants provide food and shelter for animals of all kinds, including humans! They also filter the air and groundwater, and reduce soil erosion. Because native plants fill a niche, or play a specific role, within their ecosystem, they are intimately connected with the other elements - both living and nonliving- of that system. They thrive within that system, and seldom grow beyond the needs and capacities of that ecosystem. The interaction and interdependence of plants and animals within that niche make up our biological community.

Why study native plants?

In today's modern world, humans are likely to live their lives far removed from nature. Whether we are urban dwellers or live in the suburbs and rural areas, wild nature has largely been tamed or diminished. Native plants make excellent study subjects for all of us as they are likely to be found on or near school grounds, in nearby yards or parks, and even in the landscapes surrounding places like office buildings and shopping centers. A focus on local native plants allows students from all communities and walks of life to have opportunities to encounter these plants "up close and personal," and to build connections between science class and real life.

This unit has been designed to help students learn about plants. Ideally, Florida native plants will be the subjects of study, as a means of connecting content with nearby nature and students' lived experiences. Some native plant species are suggested for certain activities, but other plants may be used for observation, experiments, and investigations of scientific concepts.

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Activity: Living or Nonliving? Join the Club!

Adapted from "Sorting Living & Non-Living into Clubs," www.captainplanetfoundation.org

Background Information:

Children, in their own way, understand the characteristics of living and nonliving things, but can find it hard to comprehend them fully and to describe their understanding in words. This is particularly the case for plants, which carry out life processes in very different ways than animals, and (usually) do so almost imperceptibly in super slow-motion.

The mnemonic MR. C. SNERG is a helpful (and fun-to-say!) way to remember the 8 processes that characterize all living things. To be able to "join the Living Things Club" *all* of these qualifications must be met. Non-living things may sometimes exhibit *some* of these characteristics, but never *all* of them.

***M**ovement* All living things move in some way. They may move parts of their bodies, or move their whole body from place to place (running, swimming, flying, etc.). In plants, movements are less obvious and usually involve parts of a plant rather than the whole plant. (See *sensitivity* below)

***R**espiration* Living things carry out respiration at all times. If they stop respiring they are no longer alive.

***C**ommunicate* Living things have some means of communicating with each other and/ or other organisms. Plants communicate via chemicals and electrical signals.

***S**ensitivity* Living things can sense what is happening around them. In plants, this sensitivity is often what stimulates growth and movement. Some examples are roots that grow down in response to gravity, leaves and flowers that open or close in response to light, and vines with tendrils that twine around anything that they make contact with.

***N**utrition* Living things need energy for the life processes they carry out. Nutrition provides that energy. Animals get their nutrition by eating plants or other animals. Plants make their own food (glucose) from carbon dioxide and water, using energy from sunlight to fuel this process, known as photosynthesis.

***E**limination* All living things eliminate the waste produced by carrying out biological processes. Plants and animals both release carbon dioxide as a waste product of the process of respiration. Plants also release oxygen as waste from the process of photosynthesis. Students will probably also be (loudly) familiar with the animal waste products, urine and feces.

***R**eproduction* All living things can reproduce, making more living things like themselves.

***G**rowth* Living things become larger and more complex. Damaged parts of both animals and plants can also be repaired by new growth.

Materials:

- A live plant, ideally a plant that is native to Florida (a plant growing outdoors or a potted plant)
- A non-living item, such as a rock or a toy.

- Chart paper, or whiteboard
- Club sorting cards (below), one shuffled set of 20 per group or pair of students

Procedure:

1. Make copies and cut out the sorting cards below. Be sure that each pair or group of students has a complete set of 20 (10 each living and nonliving things).
2. Present your plant and your rock and ask the students if they think these things are living things? Which one? Both? Neither? How do they know? (Accept all student responses at this point.)
3. Now ask students if *they* are living? What do they need to stay alive? (air, food, water, etc.) Does the plant or the rock need these, too?
4. Tell students that they will be studying living things, also known as organisms. Explain that the definition of a living thing is *anything that is alive now or was once alive,* and nonliving things are *anything that is not now and never has been alive*. If students are confused about the difference between nonliving and dead, it may help to re-emphasize *once living* vs. *never alive*, and to provide examples of something that is dead but still classified as living, such as a tree stump vs. a thing was never alive, such as a pen or a marker.
5. Make a T-chart with LIVING and NONLIVING on the board or write each word on 2 separate sheets of chart paper. Draw the outline of a large house under each heading. Tell students that these are the clubhouses for Living Things and Nonliving Things. Which club would the plant join? How about the rock?
6. Divide students into small groups or pairs and challenge them to come up with a list of rules for being eligible to join *either* the Living Things Club or the Nonliving Things Club.
7. Suggest that to help them decide on the club's membership rules, they should reflect on the answers they came up with a few moments ago about what they need to stay alive, and how they knew whether the plant or the rock was alive. They should think about what members of each "club" have in common and what is different about members of the other "club." You may also wish to give them the hint that the clubs are opposites and the rules are pretty strict. A thing can *only* be in one club, not both.
8. When students have had several minutes to confer and, have the students share the rules they decided on for each club. Write the student responses in the corresponding clubhouse. As you write the responses, ask the other groups if they agree or if their group had a different rule. Allow students to debate, and adjust or rewrite the rules for each club if / as needed, but avoid correcting students or providing answers at this point.
9. Provide the pairs or small groups of students each with a set of the "Living / Non-Living" cards and ask students to work with their groups to determine which club each of the things would belong to and explain their answers verbally within their groups.

10. When students have sorted their cards into the 2 clubs, review the groups' "club rosters" and have students discuss their reasoning to ensure correct sorting.
11. Now revisit the lists of membership rules written on the board. Based on what they discussed in the sorting exercise, ask students if they would change any rules? Add or eliminate rules?
12. Discuss with students the characteristics of living and nonliving things (MR. C. SNERG) and create final sets of rules. Your final club rules should look something like this:

LIVING	NONLIVING
Eats or makes its own food	Doesn't eat, doesn't need to eat
Breathes	Doesn't breathe
Moves, or has moving parts	Doesn't move on its own
Senses and reacts to surroundings	Doesn't react to surroundings
Grows and changes	Doesn't grow
Communicates	Can't communicate
Eliminates waste	Can't/ doesn't eliminate waste
Reproduces	Doesn't reproduce

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Join the Club! Club Sorting Cards

palm 	**acorns** 
flower 	**fruit** 
bird 	**leaf** 

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lizard 	**butterfly** 
cactus 	**bark** 
car 	**crayon** 
toy 	**fire** 

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television 	**bicycle** 
balloons 	**clouds** 
shovel 	**water** 

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Activity: Shapes And Patterns Safari

Like real scientists, students must learn keen observation to take in information and record details of what they see. After all, it's only after someone has really seen something that he or she can make sense of it. When students train their eyes on the shapes and patterns in the natural world, you enrich science knowledge while also inspiring both artistic and mathematical thinking. Plants come in a wide variety of shapes, sizes, arrangement, patterns and textures.
After crafting their own binoculars from cardboard tubes (you will be surprised how well these DIY binoculars help children focus), students will use their observation skills in a structured way to explore a space outside, look for shapes and patterns, and keep a record of their observations.Students will learn about data collection and using different criteria for collecting and sorting information

Materials:

- Cardboard tubes (paper towel tubes cut in half crosswise or toilet paper tubes), 2 per student
- Yarn, ribbon or string
- Glue
- Markers or paint
- Copies of science log sheets below, 1 per student or pair of students
- Pencils

Procedure:

1. Review with students what they know about shapes and patterns, and the difference between shapes and patterns. A shape is the outline of a form, like a square, circle or triangle. A pattern is a repeated arrangement of numbers, colors or shapes.
2. Ask students what kind of shapes and patterns they have seen or can think of in nature? Write or draw their responses on the board. You may wish to display the image at this link https://upload.wikimedia.org/wikipedia/commons/6/69/Leaf_morphology_no_title_or_text.png as an example of some of the patterns and shapes they may see outside. (green box on left shows some common leaf shapes and patterns, blue box top right shows some common leaf edges or margins, and the purple box bottom right shows leaf vein patterns)
3. Tell students that they will be going on a safari outdoors to see how many shapes and patterns they can discover in nature! But first, they will need binoculars to help them focus better.
4. Distribute cardboard tubes. Using markers or paint, students can decorate the tubes any way they like. Avoid glitter or decoration that could get into students' eyes.
5. When finished, students should glue them together by applying one line of glue down the long side of each tube and pressing them together.
6. Punch one hole in each tube, tie a length of yarn or ribbon through holes so the binoculars can hang around their neck. Now they are ready to go on safari!
7. Head outside into the schoolyard and show students some examples of the shapes and patterns found outdoors. Remind students that patterns can be made up of colors, shapes or numbers, so when looking at patterns they should be sure to pay attention to see how many types of patterns they can discover. It may be useful to explain to them that nature's shapes and patterns are not

as perfect or exact as human-made ones.

8. Distribute the science log sheets. Tell students that scientists always record what they discover. The things that scientists observe and facts they learn are called data. When they go on their safari they will be recording their data about shapes and patterns on this science log sheet.
9. Using one of your examples above, explain how students should fill out the sheet: draw the shape or pattern they found in column 1, describe where they found it in column 2, and explain their evidence in column 3. (for example, "I know it is a triangle because it has 3 sides", or I know it is a pattern because the stripes are the same on every leaf" For younger students, this can be done as a group, with the teacher recording their data, and modeling how to organize it. Students can then copy the information on their own sheets.
10. Send the students out into the schoolyard to observe and record what they find.
11. When time is up, gather students to share their observations
    - What did we look for outside today?
    - What did we find out about shapes or patterns outside?
    - Which shape or pattern did you/ the class see the most? How many times? Where?
    - Which shape or pattern did you/ the class see the least? How many times?
    - What was the most interesting shape or pattern you found?
    - Try to replicate some of the patterns and shapes that you found
    - Try to identify and name the shapes and patterns you found, such as zigzag, oval, etc.
    - How do they think collecting and recording data helps us to learn about things? *When we gather information and write it down, it helps us remember what we observed. We can also share our information with others.*

Extensions: Take your binoculars outside and…

Science:

- Look for specific attributes: plants that have particular kinds of leaves; plants that have seeds; bugs in the schoolyard; etc.
- Use field guides to Florida native plants (you may need more than one title/ author in order to have enough photos to see both close-up and "full body" images of plants), and see if you can determine the identities of the native plants in your schoolyard by comparing the kinds of shapes and patterns they exhibit.
- Collect data during different seasons. Compare the results of what you find in fall vs spring.

Language Arts/ Visual arts:

- Hunt for things that contain ABCs in some way. Make an alphabet book or class mural about ABC's in the schoolyard.

Math:

- Measure, collect data on, and chart or graph other things outdoors: temperature, rainfall, height of plants, number of weeds in sunny vs. shady spots, etc

Social Studies:

- Take the students out to hunt for "treasures" (fruits, flowers, plants with specific attributes, interesting features in the schoolyard, etc.) Then create a treasure map of the garden.

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This science log belongs to: _____

What I saw	Where I saw it	It is a _____ because _____.

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Activity: The Wooden Giant

Background Information:

Trees are some of the largest living things in the world, and Florida native trees can be found almost everywhere—in the country, in the suburbs, in cities and parks, and as part of the landscape in many places where we work, live, play and learn. Trees are very large plants with thick woody stems. It is the wood in their stems that allows trees to become giants. Trees have all the same basic parts that other plants have, and are perhaps the most essential living thing in any ecosystem. All of these reasons make trees great subjects of study in your plant unit. There is so much to learn about these friendly neighborhood giants and their roles in the local ecosystem!

Trees are very important because they are the dominant living things in many ecosystems. From their roots to their leafy canopies, trees provide habitat for many kinds of animals, and even other plants (such as Florida's many epiphytic plants, or air plants) who depend on them for their survival. Trees are one of nature's most important food producers. If students have ever eaten fruit, nuts, chocolate, maple syrup or used spices like cinnamon, they can thank a tree! Trees absorb vast amounts of carbon dioxide and water, and as part of the process of photosynthesis, make oxygen and sugar. They use the sugar as energy to grow, and animals- like humans!- breathe the oxygen. In fact, 2 large trees can meet the oxygen needs of a family of 4! Trees also act like a sponge and a filter, absorbing water from rain, cleaning it, and releasing it slowly and steadily into our watersheds. Even dead trees continue to play a role in their natural neighborhood. If students have ever rolled over a rotten log, or looked under its peeling bark, they would see a tiny ecosystem teeming with life!

There is so much to learn about these friendly local wooden giants! In the following activity, students can get started learning about trees as well as honing their observation skills by using their senses to pay close attention to trees in the schoolyard, in the neighborhood, or even in their own yard.

Materials:

- Paper
- Pencils, crayons, or markers
- (optional) binoculars from the safari activity above or magnifying lenses
- Copies of "The Wooden Giant" fillable book pages (below), 1 set (6 pages) per student

Procedure:

1. Begin with a read aloud of one of the tree books suggested in the Literature Connections above
2. Ask students, Did you see a tree today? Think about that tree or another tree you have seen. What do you know about trees? Begin a KWL chart with their responses.
3. Continue discussion of trees by asking some of the following questions:
    - Are you bigger or smaller than a tree? Will you or the tree always be that way?
    - Have you ever felt a tree? Which part did you feel? What does it feel like?
    - Have you ever smelled a tree or part of a tree? What does it smell like?
    - What kinds of animals have you seen in, on, or around trees?

- Display a photo of a tree--Have you ever seen a tree like this? (photos of Slash Pines and a Live Oak tree are available in the “Growin’ Plants Dance” activity below) Can you think of a kind of food that comes from trees?
- Do you think trees are helpful to people? How?
- Can you think of a kind of food that comes from trees?
- Do you think people can be helpful to trees? How?
- What kinds of questions do you have about trees?

4. Take students out into the schoolyard with paper and pencils. If you like, tell them to bring their cardboard binoculars or magnifying lenses to help them make good scientific observations.
5. Once outdoors, take students to a tree or group of trees that students can get “up close and personal” with, and use their senses to get to know it.
6. Introduce students to their friendly neighborhood giant. Point out some of its features and encourage students to describe what they notice about it by starting with any shapes and patterns they can identify.
7. Have students spread out around the schoolyard to find a friendly wooden giant that they are particularly drawn to and would like to get to know.
8. Encourage students to use all of their senses (except taste, unless it is producing edible fruit that can be sampled) to learn as much as they can about their giant. Have them record their data to help them remember what they observed and so they can share it with other people because they will be writing a book about it!
9. Students can write or draw their observations individually, or with a partner who helps to record their observations as they dictate. With young children this could also be done as a group with the teacher recording student observations.
10. Use the prompts from the book pages or some of the following prompts to guide observations.
    - What kinds of colors can you see?
    - How does the texture of the bark feel?
    - Does the tree have flowers, fruits, or nuts?
    - Smell the earth, the bark, any leaves within reach. Crush any leaves that are found on the ground.
    - Can you see any creatures using the trees for food or shelter? If you don’t see any insects or animals, are there any signs that they have been there? (nests, holes, webs, etc.)
    - Are there any epiphytes (plants that grow on other plants) growing on the tree?
    - Is there anything surprising about your giant?
11. You may wish to make multiple trips out to visit your school yard trees to give students opportunity to make further observations .
12. If you do not know the species' identity, use a field guide to local trees to identify the tree so students can name their giant. It is also acceptable for students to give it their own name, like Bernice or George!
13. Distribute the copies of the blank pages for the students' books. Have students write and illustrate their books by filling in the blanks. This can also be done as a class with each student writing about a special class tree.

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THE WOODEN GIANT

My name is

And I met a giant! I will tell you all about it.

My giant is as tall as a

My giant's colors are

The leaves of my giant feel

The bark of my giant feels

The soil around my giant smells like

When I crush up the leaves it smells like

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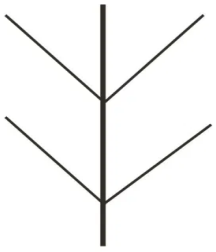
When I knock on my giant's trunk it sounds like

When I close my eyes near my giant I hear

My giant is a habitat (place where other creatures find what they need) for

I know this because

My giant has a branch pattern that looks like this: circle one



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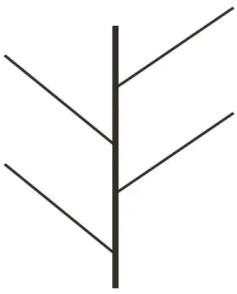

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My giant's leaves look like this:

Place a leaf or needles on a smooth hard surface. Place this sheet over it. Hold the sheet still. Using the side of an unwrapped crayon, rub the page and watch the leaf appear!

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My giant is helpful to people because:

My favorite thing about my giant is:

My giant lives:

Its name is:

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Meet my wooden giant!

Draw a picture of your tree friend.

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MARIE SELBY BOTANICAL GARDENS

Activity: Growin' Plants Dance

Materials:

- Yellow poster board labeled SUNLIGHT
- green poster board labeled NUTRIENTS
- red poster board labeled SPACE
- blue poster labeled WATER
- purple poster board labeled AIR
- Counters or tokens of the same colors: yellow, green, red, blue, purple.
- Images of Florida Mystery Plants (below)
- Music: some instrumental music, or perhaps a selection of music written for plants!
  * *Songs for Your Plants* playlist on Spotify:
  https://open.spotify.com/playlist/2ccULdJKhCUcTdv5Bl3qHo?si=zSszlPjxRdanP_Z7dqWAvA

Procedure:

1. Hang the labeled poster boards on the classroom walls, or affix to objects in the schoolyard.
2. Turn on music, gather students and tell them, "Today we are going to try to grow some plants!"
3. Discuss with students what plants need to grow. Water, light, air, nutrients. Plants also need enough space to grow in.
4. Point out the labeled sheets of paper. Ask the students to read the label. Tell them that we are going to imagine we are each of these things, and create movements that represent them.
5. Play music and model the movements for each color. Have students perform them with you:
   - YELLOW: move like rays of the sun that stretch and reach towards the earth. Demonstrate reaching and stretching stretching high, stretching behind you, stretch your head, stretching while twisting, stretching your feet, etc.
   - GREEN: move very low or down on the ground. Nutrients are down in the soil, so you need to move like an underground nutrient, slowly rolling, crawling, slithering, etc.
   - BLUE: is the rain falling from the sky, and splashing on the ground! Demonstrate jumping up high and splashing down low in different areas of the space.
   - PURPLE: is the wind and the air, swirling around. Demonstrate doing a swirl, then moving slowly, swirling around the space.
   - RED: is the space plants need to grow. When they have more space they get big, when they are super close together they stay small. Move from small to big: as you move forward you get small and tight, as you back up you get big and wide and fill up space!
6. Now tell them, "We're going to become different kinds of Florida plants!"
7. Show the pictures of the native plants, and have students decide how to make their bodies look like the plants. Remind students that plants don't move from place to place, so plant shapes have to be done with (at least one of) their feet rooted in the ground.
   - Slash Pines may be tall and thin
   - Live Oaks have twisted heavy trunks and branches
   - Sea Oats are loose and wispy
   - Prickly Pear Cactus looks crooked and disjointed and poke-y

- Giant Air Plants are curvy and droopy
- Saw Palmettos look stiff and pointy

8. When students feel confident that they know what all the plants look like, have them count off, 1 through 6.
9. Send students to go stand by the large colored sheets that correspond to their assignment: 1s are yellow, 2s are green, 3s are blue, 4s are purple, 5s are red. 6s are "mystery plants" who should come stand in the center of the room.
10. Distribute the colored tokens to the appropriate color-groups of students. Each student should have at least the same number of tokens as the number of "mystery plants" (for example, if there are 3 mystery plants, each student in the color groups should have 3 or more tokens)
11. Tell the class that the students in the middle are little seeds of "mystery plants." Have the mystery plants curl up into tiny seeds on the ground. "They are going to grow into one of the plants we just saw."
12. Secretly show a photo of one of the Florida native plants to the "mystery plant" students. They will be growing into this shape/plant. Don't let the other students know what it is!
13. The rest of the students get to help those little seeds grow! Instruct the other students that when you call out their color, they should move the way their element moves (stretching sun rays, underground nutrients, etc.) across the room and back to their place. When they move near the "mystery plants" they should sprinkle their life tokens on the ground around them.
14. The mystery plant students (who must remain rooted in place!) should try to catch and collect as many of the colored tokens as they can reach. For every token they collect, they can grow a little bit. If- and only if- they collect all 5 colors (at least one of each color), they can grow to full size!
15. Turn on the music, call out a color and let the fun begin! Remind students to move slowly and mindfully to avoid crashing or hurting one another.
16. "BLUE come on out! Let me see how you help the seeds grow! Ok, BLUE, head back and sit down. Now PURPLE come out 1Make sure you sprinkle all of your life tokens! Oh, look it's working! The seeds are beginning to grow…" and so on until all of the colors have had a turn.
17. Turn off the music, and tell the mystery plants to freeze in place.
18. Challenge the rest of the students to guess which of the native Florida plants the "mystery plants" have grown into, based on the shapes their bodies are making.
19. When you have finished, gather all students in the center and discuss what happened.
    - Was it easy or hard to guess the type of plant they grew into? Did they look like the [cactus, Giant Air Plant, etc.]? If not, why not? What makes that plant unique or identifiable?
    - Did any of the plants grow to full size? Did any of them stay seeds? Why is that?
    - What 5 things do plants need to grow? What happens if they don't get all 5?
    - What are some of the reasons you can think of that a plant might not be able to get all 5? (being rooted in place sure does make it hard, for starters!)
    - Do you think a plant could get too much of any of those 5 things? Can you think of an example?
    - Do you remember the word for the place where a living thing can get everything it needs? (Habitat)

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Activity: Seed Germination: It's In The Bag!

Background Information:

Seeds come in many different shapes and sizes, from tiny orchid seeds that look like dust, to the giant double coconut, but all have the same kinds of things inside them to turn into a plant. They also undergo the same process of germination, growing from a seed to a young plant. Inside every seed is an embryo (a tiny plant with leaves, a stem and roots.) and the embryo's own source of proteins, fats, and carbohydrates (the cotyledons or endosperm, which is the "meat" of a seed) to sustain it, so it does not require additional nutrients. This is also what makes seeds and beans a good source of nutrients for humans and other animals. The outside of the seed has a seed coat, which protects the embryo. Seeds remain dormant until conditions are right for germination. All seeds need moisture, air, and the proper temperature range to germinate. Different plant species have specific requirements. Once the seeds have the right conditions in the right proportion, water and air is taken in through the seed coat. This helps the seed get energy from its food supply. The embryo's cells begin to enlarge and the seed coat breaks open. A root known as a radicle emerges first, followed by the shoot, which comprises the stem and leaves. After germination, the plant needs sunlight, moisture, air (carbon dioxide) and nutrients to survive, which can now be taken in by the roots and leaves.

Materials:

- clear plastic ziploc bag, 1 per student
- paper towels
- dried beans
- spray bottle or watering can
- water
- towel or mop to wipe up any spilled water
- permanent marker
- tape
- copies of the seed observation sheet (below), 1 per student

Procedure:

1. Ask students what they know about seeds. Ask the students if they know how to plant a seed and what a seed needs to grow. Make a K-W-L chart or list on the board with their responses.
2. Hand out paper towels and ziploc bags.
3. Have students ball up a few pieces of paper towel, place them inside the bag, and gently press them down so that there are a few inches of space at the top of the bag.
4. Show students the beans and tell them that beans are a kind of seed.
5. Give or allow students to select several dried beans in order to ensure that at least one of them will germinate. Avoid using any beans that are split open.
6. Have students distribute the beans evenly in the bag, and gently spray water on the paper towels until saturated.
7. Seal up the bag. Make sure students put their name on it

8. Tape the bags to a sunny window.
9. Distribute the observation sheet, and have students fill in their name, the number of seeds they planted and their predictions about what will happen.
10. Continue observing the seeds daily for at least 1 week.
11. Students should visit their seeds at the same time every day and draw their observations on the film strip frames below (one drawing per day/ per frame). If there are multiple germinated seeds per bag, have students select one seedling to observe and record. Remind students to be sure to make careful observations of details so that they can produce accurate records.
12. On the last day, students can cut out the film strips and tape them end to end to make one long film strip, or cut out each frame and arrange them in chronological order (first day on top, final day on bottom) to make a flip book. Staple the flipbook along the edge and watch the movie of their seeds growing!

Teachers note: You can continue to grow and observe the plants for as long as you like, but be aware that they will not grow to maturity in the bag, and seeds that have been sprouted this way do not transplant well out into the garden. If students would like to sprout seeds to grow at home, it is recommended to plant native Florida plant seeds in small pots with potting soil...which is part of the next activity!

At the end of the growing period, revisit the KWL chart you started at the beginning of the activity and discuss findings.

- How did different parts of the seeds change during the week? What happened first? Next? Did everyone's seeds change In the same order?
- Did the seed do what you thought it would? Did anything surprise you about how it grew?
- Do you think seeds are living or nonliving? What did you observe to make you believe that?
- Did all the seeds grow? If not, why do you think this happened?
- (if beans/ seeds were not all the same type) Was there a type of seed that grew better or worse than the others? Compare their growth to the other types.
- If plant needs aren't met, what will happen?
- Did anything unexpected happen with your plant?
- What new questions do you have about plants? How can we find answers to these questions?

Extensions and Variations:

Science:

- Have students add one bean seed to the bag every day of the week. By the end of the week, they should be able to see all the stages of germination at the same time!
- As the plants grow, students can label the parts of the plant at different stages of development
- Compare seed germination with different kinds of Florida native plants.
- Experiment with different amounts of light, water, or temperature to make observations.

Language Arts:

- Tell students to imagine they are a seed. Write a narrative about what happens to you as you grow from a seed to a plant.

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Name: _____

I planted _____ seeds.

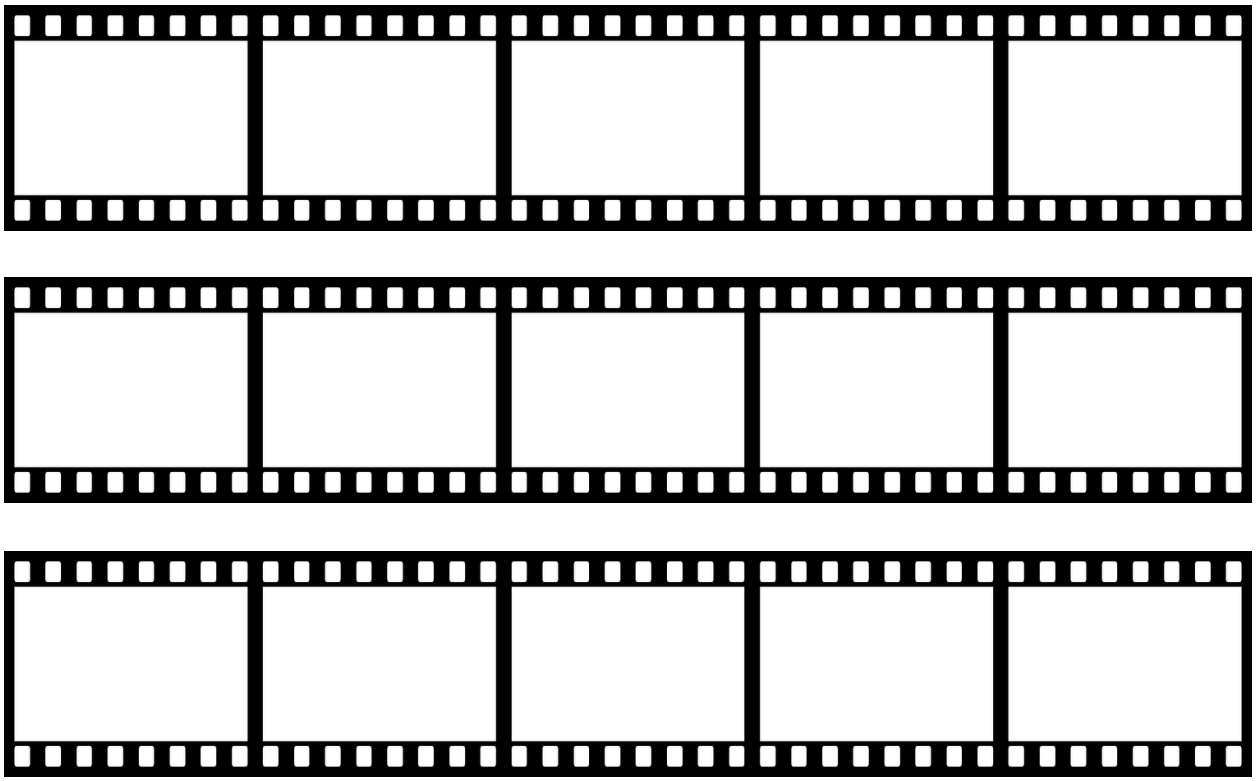
I think my seeds will:

_____

_____

_____

This is what happened:



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Activity: Science experiment--Talking to Plants, aka *I'm Rooting For You!*

In this experiment students will test whether talking to plants helps them grow faster and stronger.

Recommended native plants to use for this experiment are beach sunflower (*Helianthus debilis)*, blanket flower (*Gaillardia pulchella)*, tropical salvia (*Salvia coccinea*), or Florida's state flower, tickseed or Coreopsis (*Coreopsis leavenworthii*). These are "annual" plants, which means they germinate, grow into flowering plants, produce seeds, and then die in one growing season. Their short life spans make them good subjects for classroom study as students may be able to observe most or all of their life cycles in the course of a school year. They are also easy to care for when planted outdoors. Beach sunflowers and Gaillardia do well in hot, sunny and somewhat dry conditions. Coreopsis and tropical salvia prefer regular watering (but not soggy conditions). Coreopsis likes full sun while tropical salvia appreciates a little bit of shade in the hottest part of the day.

The best part about growing these plants is that if they are taken home (or planted in the schoolyard) and grown in appropriate conditions they go to seed and produce many seeds that sprout near the original plant (or wherever wind, rain, or birds take them!).

Materials:

- Native flower seeds. *It is best to use all the same kinds of seeds, soil and pots, in order to minimize variables in the experiment.*
- Two small seed-starting pots and saucers per student (Yogurt cups with lids work great for this. Make sure they have drainage holes.)
- Enough potting soil to fill each pot about ¾ full.
- Waterproof labels and pens or markers
- Water
- Butcher paper, newspaper or a tarp to cover tables and floors if planting indoors
- A mop or towel to wipe up spills if watering indoors
- Copies of student science logs (below)
- Measuring tools: rulers and a scale (optional)

Procedure:

1. Distribute pots, soil, and seeds to students. Students should have a few seeds for each pot to ensure that at least one of them germinates.
2. Discuss with students what they know about what a plant needs to grow. (sun, water, etc.) Tell students that many people believe that talking to plants helps them to grow, too. Have they ever heard that before? Have they ever tried it before?
3. Tell them that what they have in front of them are the materials for a science experiment where we will test whether talking to plants really does make them grow better.
4. Have students fill their pots about ¾ full with soil. To plant the seeds, make a small shallow hole in the soil about 1cm deep (about a finger. Place the seed in the hole, carefully cover with a

small amount of soil and gently press down to prevent the soil; and the seeds from washing away when watered.

5. Have students label both of their plants with their names and the plant's name. They should then label one plant "silence" and the other one "happy talk."
6. Discuss with students how to set up a scientific experiment: In order to test a hypothesis (an idea or an educated guess), an experiment should only test one thing at a time. It is important to make sure that all of the plants are the same and are treated the same way except for the one thing you are testing (in this case, whether talking to plants helps them grow.) This makes it clear whether the results are due to the test treatment and not some other factor. Also, scientists do not get upset if their results are not what they expect. Some of the greatest scientific discoveries have come from experiments that didn't turn out the "right" way!
7. Place ALL plants in a sunny place and water them.
8. Distribute the science logs below. Have students fill out the "Predict" section.
9. Each day students should take their "happy talk" plant to their desks (or another place away from the "silence" plants) and spend 5 minutes talking to it in a positive way. This should be done at the same time and for the same duration every day. They can tell the plants stories, talk about their day, things they like to do, encourage their plant to grow big and strong, or sing songs.
10. Continue this procedure for a few weeks.
11. At the end of the experiment period compare and contrast the two sets of plants: Which ones look healthier? Are any plants leafier, greener, or taller than the others?
12. Tell students that they will need to measure their plants to verify their observations. As a group, have students make a list of the different kinds of measurements they should take (Height, width, number of leaves, thickness of stems, etc.)
13. Have students take their measurements and record them.
14. Do they see any patterns in their measurements (their own and compared to other students)? Is there any evidence suggesting that the plants receiving the happy talk treatment have grown better than the plants who got the silent treatment?
15. You can also weigh the plants for additional data. Stronger healthier plants will be larger and have more root mass, so they are usually heavier. Place the plants from the *silence* group on a scale. Do not weigh plants that died or did not grow. Add up the total weight of all the silence plants. Divide by the total number of plants weighed. This will give you an average weight per plant and compensate for any plants that weren't weighed. Repeat the procedure with the happy talk group.
16. Have students fill out the Observe and Explain sections of the Student Science Log.
17. Plant seedlings in a garden and watch them grow!

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This science log belongs to: _____

Predict
Describe what you think will happen:
Observe
Describe what happened:
Explain
Explain why you think this happened:

"I'm Rooting for You" Plant Growth Experiment