Lesson Title: Parts of a Plant
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Topic: How do plants survive where they live?
Targeted Grade Level: Kindergarten
Time Needed: Approx. 2 weeks (5 main lessons, plus 3-5 mini lessons to measure and discuss data)
Subject Integration: Art, Science, Math

Justification

Students will be able to use various art mediums including performance and visual arts to explore how plants survive in their environments through the use of their structures. Students will also be able to use non-standard measurement to see how missing structures and resources affect plant growth.

Standards

NGSS Performance Expectations		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
Developing and Using Models *Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.*	***ESS3.A: Natural Resources*** *Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.*	***Systems and System Models*** *Systems in the natural and designed world have parts that work together.*

Common Core State Standards:

Math:

- **K.MD.A.2** -Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two students and describe one student as taller/shorter.*

ELA:

- **SL.K.5-** add drawings or other visual displays to descriptions as desired to provide additional detail.
- **RI.K.3** With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

National Art Standards

- **VA:Cr2.1.Ka**- Through experimentation, build skills in various media and approaches to artmaking.
- **VA:Cr2.3.Ka**- Create art that represents natural and constructed environments.
- **VA:Re8.1.Ka-** Interpret art by identifying subject matter and describing relevant details.
- **DA:Pr5.1.Ka**.- Demonstrate sameside and cross-body locomotor and nonlocomotor movements, body patterning movements, and body shapes.
- **DA:Pr5.1.Kb.** Move safely in general space and start and stop on cue during activities, group formations, and creative explorations while maintaining personal space.
- **DA:Pr5.1.Kc**. Move body parts in relation to other body parts and repeat and recall movements upon request.

Explanation

This lesson lends itself well towards art integration. Integrating visual art, music, and movement allows students to truly grasp and retain information about how plants survive in their environments. The students will learn the words to and dance with the song "Flower, Stem, Leaves, and Roots" by Dr. Jean. Once they begin to show mastery at simply recalling the song and movements, students will be able to use their knowledge to create artwork that shows what plants need to survive in their environments.

Measurable Student Learning Objectives:

- Students will be able to explain how plants survive in their environment.
- Students will be able to identify plant structures through the use of visual art and dance.
- Students will be able to measure plant growth using non-standard measurement.
- Students will be able to create a model to represent the needs of different plants and animals (including humans) and the places they live.

The Nature of STEM

Scientific Knowledge is Based on Empirical Evidence

Empirical evidence is information that researchers generate using observation and experimentation to help uncover answers to questions (McShane & Lueken, 2019). This investigation allows students the opportunity to use skills that have been previously taught to help them make sense of their observations.

It is important to be careful to not use dead words such as “proof” or “reason” but instead use alternative words like “evidence,” “support,” and “suggests” (Schwartz, 2007). These alternative words lend themselves to the nature of science by not making science a study where ideas are either right or wrong, but instead, that scientists investigate and experiment to find links or correlations, but never proof.

Scientific Knowledge is Open to Revision in Light of New Evidence

The nature of science is one in which scientific knowledge remains open to revision in light of new evidence. This goes back to the notion that science is about finding links or correlations, not proof.

In this investigation, several teams will be working on the same investigation simultaneously using a variety of plants. This will help them to see that the need for certain resources varies throughout the plant world and is not a hard and fast rule.

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

The tenant that scientific knowledge assumes an order and consistency in natural systems is important because otherwise science would have no basis for which to guide its theories and laws.

The students will begin with the basic understanding that plants have four main parts and require four resources to stay alive. Once the students are able to explain this through the use of visual and performing arts, students will then be asked to expand on that knowledge by applying it to a variety of different plants that have different needs.

Makes Sense of Problems and Persevere in Solving Them

Much like science, math makes sense of problems and perseveres in solving them. The students will persevere through their investigations that will lead them not only to new insights, but to new questions. Each time their math solves the question they were working on, new ones will arise. While math may solve problems, science asks more questions.

Model With Mathematics

Graphing is one way that scientists can model with mathematics. Modeling allows the data to become more visual. This is especially important in early childhood as students are able to better grasp concepts that are presented in a visual format. Telling a child that Plant A is five centimeters taller than Plant B means nothing to them. However, putting that information in the form of a graph and now they will have a visual that helps understand measurement.

Reason Abstractly and Quantitatively

Students will be reasoning both abstractly and quantitatively. Students will begin by abstractly reasoning what makes a plant and what they need when they first begin their investigation. They will then use this knowledge and use it in quantitative fashion using measurement and graphing.

Engaging Context/Phenomena:

Students will be gathered around the carpet area and shown a potted plant. The teacher should pass the plant around and ask students what they see and know about plants. A chart could be created to record their early understandings about plants.

Explain to the students that they will each be taking care of a plant for the next two weeks, but before they can take care of it, they will have to complete an investigation to learn more about plants and how to care for them.

Students will then learn a new song to help them remember all the information they just learned about plants. Let them know that the song is to a familiar tune ("Head, Shoulders, Knees, and Toes") but that we are going to change the words and actions to learn about something else that has parts. Play the song "Flower, Stem, Leaves, and Roots" by Dr. Jean and teach students the movements.

Data Integration

Students may not be aware that while they are studying plants in their classroom, there are scientists in space doing the same thing. A short, age-appropriate presentation can be made using information obtained from NASA's webpage about the Tropi Experiments. These resources can help students understand how and why scientists are studying plant growth in space.

Differentiation of Instruction

One modification I would make would be in the labeling of their artwork. Many kindergarteners are still learning how to form letters, let alone words. To help, I would create a

version where the parts of the plant are written with a tracing font so that students can trace the words if they are uncomfortable writing them on their own.

Real-life Connection

Plant needs are a real-life connection because students will be able to use this knowledge outside of the classroom throughout their lives to grow and care for a variety of plants including those used in farming.

Possible Misconceptions

Students may find the idea of a plant being a living thing to be a difficult concept because they cannot see it's living functions. These, as well as, what resources a plant needs to survive will help address this misconception.

Students may also find the idea that although we label "plants" under one category, there are a variety of species that require different things. They will be exploring this during the "Elaborate" section.

Teacher Background

Teachers will need a very basic understanding of what a plant needs to survive as well as how to use non-standard measurement. Teachers will also need to create the movements for the song "Flower, Stem, Leaves, and Roots" or consider doing this with student input.

Lesson Procedure

(see the following pages)

5E Model	*5E Objectives*
Engage	Show students a potted plant and discuss what they see. Allow students to do a "123 pass" so that they are able to experience the plant themselves. Explain to them that they will each be taking care of a plant for the next 2 weeks, but before they can take care of it, they will have to complete an investigation to learn more about plants and how to care for them. Tell them they will be learning a new song to help them learn and remember this new information. Let them know that the song is to a familiar tune ("Head, Shoulders, Knees, and Toes") but that we are going to change the words and actions to learn about something else that has parts. Play the song "Flower, Stem, Leaves, and Roots" by Dr. Jean and teach students the movements. If they are enjoying the song, offer to challenge them by singing it slowly and then speed it up as fast as they can, just for fun.

Explore	Break up students into teams of 5. Provide each team a potted plant. Ask: What do you see? Is there anything you can't see? Instruct teams to remove plants from the pot. Ask: Now what do you see?

Explain	Have students create a flower model using various materials. Students must be able to label the parts of a flower. Modification: version where the parts of the plant are written with a tracing font Materials provided by teacher: Sunflower seeds, pipe cleaners, cupcake tins, leaves (paper or real)

Elaborate	***Procedure:*** Tell students that now that they know the parts of a plant, we need to learn what a plant needs to survive. Show students the space gardening Powerpoint and explain that even now, scientists are exploring what plants need to survive in different environments. We are going to be like those scientists. Assign each team a different variety of plant to investigate. They will have 5 of them to care for. The team will then investigate what happens to a plant when one of its needs are not met. One plant will have no sunlight, one plant will have no water, one plant will have no soil, and one plant will have no air. The 5th plant will be a control. The plants will be measured daily using non-standard measurement to compare growth. The data will be collected in a student investigation journal.

	Standards Addressed (Which standards are being explicitly taught in this section?) ESS3.A: Natural Resources- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. K.MD.A.2- Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two students and describe one student as taller/shorter. **Resources (List all resources and materials used in this part of the lesson.)** ● PebbleGo ● Space gardening Powerpoint ● Student investigation journal ● Plants ● Soil ● Water ● Plastic ziploc bag ● Ruler
Evaluate *Assess students knowledge, skills and abilities.*	1. Students will create an AVID Frayer model to illustrate what plants need to survive. 2. Investigation journals 3. Label the parts of a plant orally

References

McShane, M. Q., & Lueken, M. (2019, April 09). What is Empirical Evidence? Retrieved June 7, 2019, from https://www.edchoice.org/blog/what-is-empirical-evidence/

NASA- Tropi Experiments. (n.d.). Retrieved from https://www.nasa.gov/centers/ames/research/Tropi/

Schwartz, R. (2007, October). What's in a Word: How Word Choice Can Develop (Mis)conceptions About the Nature of Science. *Science Scope*, *31*(2), 42-47.