4th Grade SPRING

Center 1 - Outdoor Education Garden Space

Lesson Summary and Goals

Using the schoolyard garden to spark curiosity, students will learn about plant structures using celery and lettuce as examples. They will study celery structures in the classroom, and investigate a lettuce leaf with hand lenses and dissection tools outdoors. They will look for functions of both internal and external structures, as well as sample the fresh lettuce. Through this phenomenon-based lesson, students will be able to explain plant structures that allow the plants to grow and survive.

Supporting Resources

Videos:

- SciShow Kids The Color-Changing Celery - *Spoiler alert after minute 1:30*
- Lettuce Dissection (Spanish subtitles) – *For teachers and volunteers to view prior to the lesson*

Guides:

- Volunteer Support Instructions - lettuce dissection

Supplies from Classroom:

- Science notebooks
- Pencils and colored pencils

Volunteer:

- Celery – purchased in advance
- Food coloring – (red and blue recommended)
- 2 large clear jars or glasses

Day Before: Celery Investigation (One-page Procedure)

Conducted a day or two prior to the lettuce dissection lesson.

Preparation ahead of time

1. **Purchase a celery** still attached to the base with leafy greens on top.

Procedure with the students

1. Set the goal for the lesson by using the guiding question: **What internal and external structures help a plant to grow and survive?**

2. Towards the beginning of the day, prepare the glasses of food coloring. Fill two glasses halfway with water, and then add 5 drops of one color to each (blue and red recommended).

3. Using a knife (teacher only), remove a celery stalk from the bunch (ideally a leafier stalk from closer to the center), and place one celery stalk in each glass of colored water. The glasses can be located in a sunny spot in the classroom where kids can observe throughout the day.

4. Have a class discussion about why the celery may be changing color. Prompt discussion with "I notice, I wonder, and it reminds me of" sentence starters. You will revisit the celery after the second part of the lesson.

Day 2: Revisit the Celery, and Lettuce Dissection and Tasting

Preparation before leaving the classroom for the Garden/Outdoor Education Space

1. Students will need to bring their **science notebooks and a pencil** to the garden (or paper).

2. **Bring** the celery investigation. If you plan to have the follow up discussion outside, bring the celery jars, a knife, and the science vocabulary cards.

3. **Remind students how to use a hand lens** (between the object and eye, not touching either).

4. **Assign partners** for this lesson.

5. **Remind students to prepare themselves** for the current weather conditions.

Procedure with the students

1. Once in the garden, take a few minutes for students to acquaint themselves with what is currently happening in the garden. This is a good time to share about what they ***notice or wonder***.

2. Refocus the students on the guiding question: **What internal and external structures help a plant to grow and survive?**

3. Invite the students to explore the garden using their eyes to collect evidence that helps them answer the guiding question. Have students talk to their partner to discuss what they ***notice or wonder*** about plant structures.

4. Explain to students that these lettuce plants were planted by their first grade friends. The lettuce will be harvested by second graders at the end of April. **"We need to be careful to only take what we need to learn today."**

5. Model how to harvest a single lettuce leaf. Select a leaf on the outside of the plant. Follow the leaf down close to the soil. Break by twisting, or cut the leaf at the bottom.

6. When cued, each student will harvest one leaf with their partner, and return to the shady area with their pencil and notebook. Pass out two toothpicks, one pair of scissors, and one hand lens to each pair.

7. For a few minutes, students should examine the **external** structures of the lettuce plant. Invite students to draw their observations in their science notebooks and share their observations with their partner or the class.

8. To investigate the **internal** structures, demonstrate how students can dissect their lettuce leaf with scissors and a toothpick (see this video for a tutorial). Scissors provide a clean cut on the stem area in order to see a cross section of the plant. Toothpicks can be used to cut along veins and to peel back the very thin epidermal layer of the leaf. Invite students to join, reminding them to add observations about the plant structures to their notebooks. Dissected leaves can be composted.

9. Encourage students to share their observations with their partner or the class.

10. Invite students to harvest another leaf and rinse it in water before eating (fill a bin with water to rinse the leaves). Some students may not have sampled lettuce before and may be hesitant. Encourage them to try something new and celebrate it if they do, but sampling is not required.

11. Take a moment to help students appreciate all the resources, both natural and human, that have helped provide this delicious snack.

12. Please ask students to help clean up and gather supplies, then wrap up with a sense-making discussion, either in the garden or back in the classroom.

Demonstrate Learning

Now, you will bring both parts of the lesson together, the celery investigation and the lettuce dissection.

1. If needed, review what they observed about lettuce external and internal structures.

2. Revisit the celery investigation. Ask the class to share what they have ***noticed*** about the celery stem and leaves. Take the stalk out of the water to look at the base.

3. Using a knife, carefully cut the bottom inch off of the stalk and ask students what they ***wonder*** about the structures that may be involved in turning the leaves different colors.

4. Encourage students to add notes or drawings to their notebooks about what they see.

5. Remind students that all plants need water to survive. Refocus them to the guiding question by asking them to chat with a classmate about what structures they noticed that might help a plant grow and survive. Encourage students to share what they think.

6. Now, add on to their explanations with science terminology using the science vocabulary images provided (see the science background knowledge section below). The epidermis, midrib, and veins will certainly be visible, but the xylem and phloem inside the veins and the stomata are structures too small to see without a microscope. When inside the classroom, you can show this video for a visual representation of what happened.

7. Students can now add a section to their notebooks describing how a plant has structures to help it survive. You can also ask them to draw comparisons to a different plant or animal.

8. Students can revisit their predictions to see if they correctly guessed what would happen to the celery. Remind them that in science investigations, there is no wrong or right. The results of investigations are what help us learn. It is okay if predictions were incorrect! It is just an educated guess.

Center 2 - In the Classroom

Lesson Summary and Goals

Students will learn the history of the growing of lettuce and Colorado's key role in providing the important food source. Students will investigate the pros and cons of many systems of growing lettuce, including their own school's garden. Then, using the schoolyard garden to spark curiosity, students will write letters with questions to the Garden to Table team.

Lesson Materials

From the GTT Lesson Bin:

- Colorado Agriculture Fact Sheet
- Book: Side by Side-Lado a Lado by Monica Brown

Printable or Projectable:

- Note Catcher (bilingual)
- Lettuce in Colorado: Past, Present, and Future Slideshow (Spanish version)

Teacher will supply:

- Pencils
- Lined note paper

Slide Presentation

Preparation ahead of time (One-page Procedure)

1. Print a Note Catcher (bilingual) for each student.

Procedure with the students

1. Begin the lesson by explaining that the garden is currently growing lettuce planted by the 1st graders. The lettuce will be harvested by 2nd graders.
2. Focus the students on the following guiding questions: **How has lettuce shaped Colorado history?** and **What changes have happened in the way we grow food?**

3. Pass out a Note Catcher (bilingual) to each student. Explain that during the presentation, they can take notes on what they notice or wonder about the methods of growing lettuce in the past, present, and future.

4. Present the Lettuce in Colorado: Past, Present, and Future Slideshow, allowing time for students to take notes. Take time to view some of the video links embedded in the slideshow. Allow time for students to share what they are learning with a partner or the whole class. Example prompts include:

    a. What surprises you about how lettuce was consumed in the past?
    b. What makes Colorado a good place to grow lettuce?
    c. What difficulties did early Americans face in growing and selling lettuce?
    d. What technologies brought about big changes in the way lettuce was produced?
    e. Is your garden similar or different to the ways that lettuce is grown in Colorado?
    f. What would you want your role to be if you were to be involved in the production of lettuce?

5. Take a minute to bring home how important the farming industry is in Colorado with the Colorado Agriculture Fact Sheet "Did you know?" in bin.

6. Prepare the students to go for a short visit to the garden.

7. To wrap up the activity, read Book: Side by Side -Lado a Lado by Monica Brown to the students and have a discussion about Dolores Huerta and Cesar Chavez.

Science Background Knowledge

- All plants need water to survive. Water is important for all parts of the plant.
- Plants have structures to bring water from the roots, through the stems, up to the leaves where photosynthesis occurs. Plants use sun, carbon dioxide, and water to make their own food.
- As the water travels upwards, some of it is transpired, or exhaled as water vapor, through stomata – tiny pores in the leaves.
- As water molecules leave the leaf, they pull on nearby water molecules, creating a suction effect bringing water upwards through the structure of the plant.
- When the water molecules transpire in the celery investigation, the food coloring is left behind in the leaf, turning the leaves a different color.

Chlorophyll – a green pigment in the leaves of plants that aids in sugar production

Epidermis - a single layer of cells that covers the leaves, flowers, roots and stems of plants, creating a barrier between the plant and the environment

Midrib - the vertical structure of some plant stems, usually can expand or contract with the amount of water they contain.

Phloem - tissue where substances can flow up and down to carry the sugar that is made during photosynthesis from the leaves to the rest of the plant

Photosynthesis - the process by which plants make their own food using chlorophyll, carbon dioxide, and water in the sunlight - chlorophyll captures the sun's energy, which is used to make sugar (its food) from carbon dioxide and water

Stomata - tiny holes in the epidermis of a plant leaf that open and close to control the exchange of carbon dioxide, oxygen, and water with the environment

Transpiration - the process by which water is pulled from the ground through the roots, stems, and leaves of a plant and released through the stomata

Vein - a dense network of xylem and phloem to carry water and food to and from the leaves of a plant - veins provide the leaf support and help it hold its shape

Xylem - tissue that carries water from the roots to all parts of the plant in an upward direction - xylem is closer to the middle part of the stem or trunk and the uppermost part of the leaves