### Context for Learning

Unit Introduction: Purpose, Intended Learning Objectives, Standards, & Misconceptions

### Lesson Plans

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<th>Lesson</th>
<th>Purpose</th>
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<tr>
<td>1. <strong>What Are Plants?</strong>&lt;br&gt;An Introduction <strong>(Not included in Unit)</strong></td>
<td>The purpose of this lesson is to introduce students to the basic concepts of plants and familiarize them with the terminology that will be used throughout the unit.</td>
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<td>2. <strong>Each part of a plant has a special function</strong>&lt;br&gt;(Abbreviated Lesson Plan)</td>
<td>In this lesson, students will learn that plants have four distinct parts and that each part has a specific function to the plant.</td>
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<td>3. <strong>What do plants need to grow and change?</strong>&lt;br&gt;(Abbreviated Lesson Plan)</td>
<td>The purpose of this lesson is for students to discover that plants have basic needs and to identify the main resources that plants need to survive and thrive, such as sunlight, water, and nutrients.</td>
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<td>4. <strong>What in the environment affects how a plant grows?</strong>&lt;br&gt;(Abbreviated Lesson Plan)</td>
<td>In this lesson, students will examine certain environmental stressors that affect plant growth and survival, such as temperature, gravity, and carbon dioxide.</td>
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<td><strong>5. What is the purpose of fruits and flowers?</strong>&lt;br&gt;(Detailed Lesson Plan)</td>
<td>In this two-part lesson, students will investigate that all fruits and flowers contain seeds. They will determine how seeds become new plants by examining the parts of a seed and finding the beginning of a new plant inside.</td>
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<td><strong>6. How and why do seeds travel?</strong>&lt;br&gt;(Detailed Lesson Plan)</td>
<td>The purpose of this lesson is for students to investigate why seeds have different characteristics that help them travel. Through this two-part lesson, students will discover how animals, insects, weather, and water help seeds travel and thus reproduce. They will also discover why it is important for seeds to be able to travel from their parent plant.</td>
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*Bolded Lessons are formal lesson plans for CAT Review*

Summative Assessment

References

Planning Commentary
Unit Introduction

Target Grade Level: 2nd

Topic: Plants

Unit Purpose: The purpose of this unit on plants is for second graders to visualize and describe many of the factors that contribute to plant germination, growth, and reproduction. During this unit, students will define the parts of a plant and describe their unique functions. Through experiments and activities, students will describe what contributes to successful plant growth, and also what hinders it. Students will also define the purpose of fruits and flowers for plants, and describe how seeds are used in the reproduction of plants. The lessons will engage students by providing them opportunities to do the bulk of the scientific experiments themselves, and to observe and explain natural phenomena in their classroom and school environment. Students will be motivated by getting out in nature to make their observations, and by using fruits and vegetables that they don’t usually consider to be plants. Students will learn by actually doing, not just watching or reading. The unit progresses in the sequence it does to give students background knowledge before introducing them to more complicated topics, such as plant reproduction. The first two lessons ensure that all students have the basic foundation of what plants are including what makes plants living, what different kinds of plants look like, and the basic parts of plants. The next two lessons then focus on the standard of what plants need to grow and develop successfully, and what environmental factors can harm or prohibit the growth of plants. At the end of this unit, students use their knowledge of plants up to this point and discover how new plants are created and how other factors, such as animals and weather, contribute to plant reproduction. Each lesson serves to combat common misconceptions that students hold about plants. Throughout this unit, students will be given the opportunity to question and observe natural phenomena. They will get to carry out experiments to test one variable, and observe and record data from these experiments. Students will use the data they have collected to form conclusions about natural phenomena, and will communicate their ideas in written and oral form.

National Science Education Standards:
Life Sciences: Content Standard C

Characteristics of organisms

- Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.
- Each plant or animal has different structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.
- The behavior of individual organisms is influenced by internal cues (such as hunger) and by external cues (such as a change in the environment). Humans and other organisms have senses that help them detect internal and external cues.
Life Cycles of Organisms

- Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.

Organisms and environments

- An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

California Content Standards:

- 2. e Students know that light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants.
- 2. f Students know flowers and fruits are associated with reproduction in plants.

California Science Inquiry Standards:

- a. Make predictions based on observed patterns and not random guessing.
- c. Compare and sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).
- d. Write or draw descriptions of a sequence of steps, events, and observations.
- e. Construct bar graphs to record data, using appropriately labeled axes.
- f. Use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.
- g. Follow oral instructions for a scientific investigation.

Unpacking the Standards:

2. e. Students know light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants.

- Plants are alive based on the following definition: Living things can move, need food and water, breathe, and reproduce.
- Many plants look different from each other but share characteristics that make them plants. Plants have four distinct parts, and plants grow and change like people and animals do by going through a life cycle.
- Each of a plant’s parts has an important function for the plant.
- Plants need water, air, sunlight, and nutrients to grow. Without these basic resources, plants will not germinate or survive.
- The environment plays a large role in a plant’s growth and survival. Plants that do not get the right amount of sunlight or water may not grow. If it is too hot or cold, some plants may not stay healthy. Gravity affects plant growth. Plants need sufficient carbon dioxide or air to stay alive.

2. f. Students know flowers and fruits are associated with reproduction in plants.

- Seeds grow inside of flowers.
- Fruit grows around seeds.
- All seeds contain baby plants.
New plants grow from seeds.

All seeds serve the same purpose: to germinate and continue the plant species.

Seeds disperse in many different ways based on their characteristics. Animals help seeds travel with their fur and waste. Insects help pollen travel on their bodies. Seeds blow in the wind. Seeds float on water.

Seeds travel from their parent plant to not have to compete for resources and to continue the plant species in new areas.

**English Language Development Standards:**

**Listening and Speaking: Comprehension**

**Beginning ELD Level**
- Begin to speak a few words or sentences by using some English grammatical forms (e.g., single words or phrases)
- Answer simple questions with one-to-two word responses
- Respond to simple directions and questions by using physical actions and other means of nonverbal communication (e.g. matching objects, pointing to an answer, drawing pictures)

**Reading:**

**Word Analysis: Concepts about Print, Phonemic Awareness, and Vocabulary and Concept Development: Beginning ELD Level**
- Recognize English phonemes that correspond to phonemes students already hear and produce in their primary language

**Fluency and Systematic Vocabulary Development: Vocabulary and Concept Development Beginning ELD Level**
- Demonstrate comprehension of simple vocabulary with an appropriate action

**Intermediate ELD Level**
- Use expanded vocabulary and descriptive words in oral and written responses to written texts.
- Apply knowledge of content-related vocabulary to discussions and reading.

**Writing:**

**Strategies and Applications: Organization, Focus, and Penmanship**

**Intermediate Level**
- Write legible, simple sentences that respond to topics in language arts and other content areas (e.g., math, science, history–social science).

**Target Learning Objectives:**

*Through this unit,*

- Students will define a living thing, incorporating plants into their definition
- Students will compare and contrast the characteristics of a living and nonliving item
- Students will draw and label the basic structures of a plant
- Students will compare and contrast the parts of a plant in the ground to the parts of a plant that we eat
- Students will describe the function of the 4 basic plant parts
- Students will identify sunlight, water, and nutrients as basic needs of plants
- Students will compare and contrast healthy plants with plants that have been negatively affected by the environment
• Students will describe how certain environmental stressors affect plant growth
• Students will explain that gravity affects that roots will always grow downward, regardless of the direction in which the seed was planted
• Students will label and define the parts of a seed
• Students will design and execute an experiment to determine if all seeds contain baby plants
• Students will identify that seeds have different properties and characteristics and classify seeds that appear similar
• Students will explain that seeds are shaped differently so that they can travel in different ways, and that animals, weather, and water help these seeds travel
• Students will explain why seeds need to travel from their parent plant
• Students will question natural phenomena in the environment
• Students will decide how to conduct an experiment to test a variable and then carry it out
• Students will use simple equipment such as magnifying glasses to gather data
• Students will use data to come to conclusions about natural phenomena
• Students will draw and explain their results in written and oral form

Common Student Misconceptions:
• Plants, fungi, and seeds are not living.
• Plants feed by absorbing food through their roots.
• Plants feed by people providing them with plant food.
• Plants absorb water through their leaves.
• Sexual reproduction occurs in animals and people but not in plants.
• The word fruit describes only sweet fruits such as those found in a fruit salad.
• Fruits exist solely for people and animals to eat.
• Flowers exist to look pretty.
• Pits are not seeds.
• “Seed guts” are found inside seeds.
• Only people like gardeners and farmers plant seeds.
• Seeds do not travel for any particular reason.
• All seeds will become new plants.

Summative Assessment: The summative assessment for this unit is a written examination with matching, drawing, ordering, multiple choice, and short answer questions. Because of its length, the test should be administered over 2 days, pages 1-2 the first day and 3-4 on page 2. Directions and all questions should be read aloud as students take the exam. The test assesses knowledge of all lessons throughout the unit including plant parts, plant basic needs, plant part functions, and plant reproduction. Beginning English Language Learners may only be asked to do parts of the exam, such as draw a picture or match objects.
Lesson #2: Each plant part has a special function

Purpose: This lesson will span over a two-day period and will serve as part of the basic foundation for the remainder of this unit. In this lesson, students will learn that plants have four distinct parts and that each part has a specific function to the plant. They will learn the vocabulary and terminology necessary to understand future lessons. On Day I, students will physically examine plants and discover what the parts of a plant look like by looking not only at a potted green plant, but parts of the plant that we eat to make the content more relatable to them. On Day II, students will perform hands-on investigations that will illustrate how each part of the plant is used to benefit the plant. From this lesson, students will have a better understanding of basic plant parts. This knowledge will be built upon in future lessons and is integral to understanding the remainder of the unit. It is also relevant to students’ lives because they will be examining plants that they eat themselves.

Time Required: Two days; ~45 minutes each day

Materials: Fresh vegetables such as carrots, radishes, turnips, celery, asparagus, onions, spinach, lettuce, kale, broccoli, cauliflower; plant roots, stems, leaves, and flowers, 2 small plants (labeled 1 and 2), scissors, water, 2 glasses of water, food coloring, a fresh piece of celery with its top, a white carnation, knife (adult use only), Straight from the Bear’s Mouth: the Story of Photosynthesis by Bill Ross

California Science Content Standards:
- Life Sciences 2.e Students know that light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants.
- Inquiry f. Use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.
- Inquiry g. Follow oral instructions for a scientific investigation.

National Science Standards Content C:
- Each plant or animal has different structures that serve different functions in growth, survival, and reproduction.

Intended Learning Objectives:
- Students will draw and label the parts of a plant
- Students will compare and contrast the parts of a potted plant to the parts of a plant that we eat
- Students will explain the functions of roots, stem, and leaves
- Students will classify plants into 6 categories: stem, roots, leaves, flowers, fruits, and seeds

Instructional Sequence
Day 1: What do the parts of the plant look like?
Part I: Introduction
A. [Review Information] Review the four main parts of a plant learned in the previous lesson. Hang the plant parts chart on the wall from the previous lesson. Bring in a live potted green plant so students can visualize the parts and have something to compare/contrast with during the investigation.
B. [Activate Prior Knowledge] Ask students to name some plants that they have eaten before. If they are stuck, remind students that vegetables are plants that grow in the ground.
   a. Which part of the plant do students think they are eating? Why?
   b. List responses on the board. Say responses clearly for English Learners and have them repeat them out loud.
C. [Introduce Activity] Tell students they will be examining the parts of a plant using vegetables that they eat. Introduce and define the terms investigation, prediction, hypothesis, and conclusion on a chart to clearly display in the room.

Part II. Investigation
A. Divide students into four groups based on language, culture, gender, and ability level for them to rotate around four stations.
B. Have students write headings on four pages of their plant logs, “Leaves”, “Roots”, “Stem” and “Flowers”. Write the words on the board so students can copy them and draw a picture of each next to the word.
C. At one station, have students examine roots such as carrots, radishes, turnips, etc.
   a. Have students make predictions about what part of the plant these vegetables are. They can flip over a card to see if they were correct in guessing that they are looking at plant roots.
   b. Ask students to compare and contrast the roots of the vegetables to the roots of a green plant. Have students make drawings and observations in their plant logs and predictions about what roots might be used for on the “Roots” page.
D. At another station, have students examine stems such as celery, asparagus, leek, onion, etc.
   a. Students should make predictions about what part of the plant the vegetables are, and then flip over the card to see if they were correct.
   b. Have them compare/contrast to stems of a green plant. Students should make drawings and observations in their plant logs and predict what stems might be used for on the “Stem” page.
E. At the third station, have students examine leaves such as lettuce, spinach, collard greens, and kale.
   a. Have students make predictions about what part of the plant they are and flip over the card to see if they are correct and then compare/contrast to leaves of a green plant.
   b. Have students make drawings and observations in their plant logs and predict what leaves might be used for on the “Leaves” page.
F. At the last station, have students examine flowers such as broccoli and cauliflower.
   a. Ask students to make hypotheses about what part of the plant they are looking at, and then find out if they were correct. Then have students compare/contrast to a flower from a green plant.
b. Have students make drawings and observations in their plant logs and predict what flowers might be used for under the “Flowers” page.

G. [Formative Assessment] Monitor stations closely. Are students engaged? Are students recording drawings and observations? Are students on task? Are students discussing with their group using scientific vocabulary?

Part III: Closure
A. [Review Lesson] Come back together to review what students observed at the stations. Make a chart with four columns, and put each vegetable under its corresponding column. Discuss the similarities and differences between the vegetable parts and the parts of the green plants.
B. In their plant logs, have students write 2 new things they learned that day and 1 question they still have about plant parts.

Assessment Activity: Divide a bulletin board into six sections and label them roots, stems, flowers, leaves, seeds, and fruit. Have students draw or cut out examples of foods and plants appropriate to the different parts. Provide books, catalogs, and magazines for reference, and encourage students and parents to look for and create pictures for the board at home.

Day 2: What are the functions of the parts of a plant?

Part 1: Introduction
A. [Review Prior Lesson] Invite students to recollect the parts of the plant they examined in the prior lesson.
B. [Making Predictions] Ask students, “What do you think would happen if a plant did not have roots or a stem? What do you think the purpose of leaves might be?” Predict what each part might be used for. Write predictions on the board.
C. [Introduce Investigation] What does the word function mean? Define the word on the board. Give some examples of the use of the word function, including the functions of our body parts. Tell students they will be discovering the function of the different plant parts in their investigation.

Part II: Investigation: Predict, Observe, Explain
This is to be done as a whole class activity, with the teacher leading the investigation and discussion. Sit with students at the front of the room so that everyone can see the experiments. Students will make observations and recordings in their plant logs after each function is discussed.

Function of roots:
1. 10 days prior to this experiment, label two similar potted green plants ‘1’ and ‘2’. Remove plant 2 from its pot and shake all the soil of its roots. Have students observe you cutting the roots of plant 2, and then repot it without its roots. Place both plants in a sunny location and water as necessary. Have students make predictions about what will happen to Plants 1 and 2.
2. Over the course of 10 days leading up to this activity, have students make and record observations of both plants on their record sheet.
3. Discuss the results of the experiment. Ask the students what they are observing and why they think what happened did. Why do plants need roots? What can they not get without them?

4. Give groups of students a very tall plant to try to plant. Have them attempt to keep the plant upwards in the soil. Ask them why the plant may be falling over or leaning to the side. What happens if plants do not grow roots?

5. Come to a class consensus that roots are used to collect water for the plant and to hold the plant in the ground.

6. Ask students to draw a picture of roots and write 2-3 sentences about what roots are used for and what would happen in a plant did not have roots.

**Function of stems:**

1. *With students during the class prior, fill 2 glasses with water and add a few drops of food coloring to the water in each glass. Place a fresh stalk of celery with its top in one glass and a white carnation in the other glass. Set the glasses in the sunlight and leave them overnight.*

2. Have students observe what happened to the celery and flower overnight. Record changes on their record sheet. Why did the celery and carnation change color? How did the color get to the flower?

3. Cut across each stem (this should only be done by an adult). Find the tubes that carry water up the stem. Pass the stems around so that each student can observe the tubes.

4. Come to a consensus that the stems of plants are used to carry water up the plant, and that they also carry food from the leaves to the other parts. What would happen if plants did not have stems?

5. In their plant logs, ask students to draw a picture of a stem showing the tubes and write 2-3 sentences about what stems are used for and what would happen if plants did not have stems.

**Function of leaves:**

*It is impossible for students to directly observe the production of food by the plant.*

1. Ask students where they think plants get their food. Combat misconceptions by asking how plants would get their food if people were not around. Since they know that every part of the plant has a job, ask which part they think might make the plant food. Ask them how they think this happens.

2. Read appropriate parts of *Straight from the Bear’s Mouth: the Story of Photosynthesis* by Bill Ross to help students understand the importance of leaves to a plant.

3. Ask questions for students to explain what they learned, such as, Why does a plant need the green part (chlorophyll)? What else does a green leaf need in order to make food for the plant?

4. In their plant logs, ask students to be creative and draw a picture of leaves making food from the sun and write 2-3 sentences about why leaves are important and what would happen to a plant if it did not have green leaves.

**Part III: Closure**

A. [Review Lesson] Make a chart displaying the function of each plant part

B. [Technology Integration] Visit the website [http://www.mrsjonesroom.com/songs/plantparts.html](http://www.mrsjonesroom.com/songs/plantparts.html) with students. Have students read along with the lyrics and sing about the parts of a plant. If the website cannot be projected
for students, play the music on the site and display the lyrics visibly on a chart for students to follow along.

C. Have students write 2 things they learned and 1 question they still have in their plant log after the day’s lesson.

Assessment: Collect plant logs and review what students wrote about the functions of each part. Did students correctly identify the job of each plant part and what would happen to a plant if it were missing that specific part? Assess whether students understand the functions of leaves, stem, and roots and why they are so important to the plants overall function.

References:

**Lesson #3: What do plants need to grow and change?**

Purpose: The purpose of this lesson is for students to discover that plants have basic needs and to identify the main resources that plants need to survive and thrive. In this lesson, students will investigate how the absence of water, sunlight, and nutrients affects the growth of a plant. Students will compare and contrast healthy plants with dying plants and make connections about what attributed to the plants’ conditions. Students will observe how plants grow and change over time, and that plants need certain things to successfully grow. Knowing the importance of these resources will be crucial to understanding the remainder of the unit as this idea relates to all future plant concepts.

Time Required: ~45 minutes

Materials: *The Season’s of Arnold’s Apple Tree* by Gail Gibbons, plastic cup with seedlings, water, prepared shoe box with lid, 2 prepared index cards, tape, 2 small plants (same type, same size), paper bag, 2 small green plants (same type and size), water/watering can, three types of soil (sandy, clay, potting soil from nursery), package of seeds (quick growing like nasturtiums), trowel, 3 pots for each type of soil, labels for each pot

California Science Content Standards:
- **Life Science 2. e** Students know that light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants.
- **Inquiry a.** Make predictions based on observed patterns and not random guessing.
- **Inquiry d.** Write or draw descriptions of a sequence of steps, events, and observations.

National Science Content Standards C:
- Organisms have basic needs. For example, animals need air, water, and food; **plants require air, water, nutrients, and light**. Organisms can survive only in environments in
which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.

**Intended Learning Objectives:**
- Students will analyze factors affecting plant growth
- Students will compare and contrast healthy plants to dying plants and explain what has caused the plants’ conditions
- Students will identify sunlight, water, and nutrients as basic needs of plants

**Instructional Sequence:**

**Part I: Introduction**
   1. Have students divide their paper into fourths and then draw and write about the changes that occur to the plant in the story, such as the apple tree got bigger, leaves grew on the tree, flowers grew on the tree, apples grew on the tree
B. [Activate Prior Knowledge] Ask students what they think plants need to grow and change. Have they ever cared for plants before? What did they give the plants? List responses on chart paper.
C. [Introduce Investigation] Review with students the plants that they planted together and have been observing. Give directions for the station rotation and distribute plant logs.

**Part II: Investigation**
*Note: Experiments must be prepared a few weeks prior to lesson day. Invite students to plant the seeds and observe them as a class during the days leading up to this lesson. This lesson is set up to have students rotate to different stations to make their observations. Students should be given 5-10 minutes per station to adequately make drawings and observations. Set a timer for indication when to rotate stations. Monitor stations to assess whether students are successfully analyzing what contributes to healthy plants in their drawings and observations.*

**Station 1: Light**

**Part I:**
1. [Preparation] Prepare shoe boxes by cutting a large hole at the top of each box to allow light to enter. Precut index card inserts to fit the length and width of shoe box. Cut a hole in both index cards. Tape the first card above the plant so that the plant will bend toward the hole to seek light. Help children plant seeds 5 days prior to the lesson. Keep box closed unless observing plant growth.
2. [Investigation] Observe how the plant grew around the card in the box toward the light at the top. Ask students to record what happened and predict why they think this happened. Have them draw 4 pictures showing where the light is and how the plant grew.
3. Add second card once the plant has grown past the first card. Ask students to predict what will happen with the second card.

**Part II:**
1. [Preparation] Plant two green plants with students 3 weeks prior to the lesson labeled #1 and #2. Place plant #1 in the window so it gets plenty of sunlight. Cover plant #2 with a paper bag.

2. [Investigation] Have students observe how the plants reacted to the sunlight and lack of it. Students should draw how plant #1 grew towards the window to reach the sun, and how plant #2 under the sheet did not grow.

3. Ask students what else the plant did not get under the paper bag. Do plants need air to grow?

4. Have students come to a consensus about why plants need light to grow.

Station 2: Water:

1. [Preparation] Plant an additional 3 green plants 3 weeks prior to lesson and number them 1, 2 and 3. Place both plants in a sunny window. Water plant 1 when soil is dry on the top, do NOT water plant 2, and water plant 3 frequently throughout the day even when it’s already wet.

2. [Investigation] Have students observe what happened to the 3 plants over a couple weeks. Which grew the best? What happens if plants don’t get enough water? Too much water? Record observations in plant log with illustrations.

Station 3: Soil

1. [Preparation] Plant 3 plants in various types of soil 3 weeks prior to lesson. Soak seeds overnight then plant one seed in sandy soil, one in clay soil, and one in potting soil from a nursery; label each plant with the soil type. Place the pots in a sunny location and water as needed.

2. Ask students, “What is different about these soils? Do you think the plants will grow the same in each one? Which do you think will be best? Why?”


Part III: Closure

A. [Summarize New Information] Discuss as a class what was observed in stations. Which plants grew the best? Why? Conclude what plants need to grow. What kinds of environments are best for plants to grow in?

B. Ask students to record 2 new things they learned and 1 question they still have about plant needs.

Assessment Activity: Have the class write A Guide to Growing Healthy Plants. Determine a Table of Contents for pages such as air, soil, water, sunlight, tools, some easy to grow plants, etc. Assign part(s) of the guide to groups of students who will be responsible for writing and illustrating their page. Have students write their final text and draw illustrations on paper, then bind the pages inside a cover drawn by the class. Make copies for each student to take home as well as a class copy.

References:
Lesson #4: What in the environment affects plant growth?

**Purpose:** In the previous lesson, students learned the basic resources that plants need to germinate and grow. In this lesson, students will examine certain environmental stressors that affect plant growth and survival. Students will examine plants that have been exposed to extreme temperature. They will attribute root growth to gravity by examining that roots always grow downwards regardless of the way the seed is planted. Students will examine plants that have been deprived of carbon dioxide. They will conclude that the surrounding environment effects how a plant grows. This lesson builds on concepts from the previous lesson but delves deeper into the environmental factors that contribute to successful or unsuccessful germination and growth. These concepts are vital to understanding plant reproduction, the focus of the next two lessons.

**Time Required:** ~45 minutes

**Materials:** 3 green plants (same size and type); heat lamp; access to fridge or freezer; paper towels; plastic cup; 4 pint bean seeds; masking tape; magnifying glasses; petroleum jelly; plant logs

**California State Science Standards:**
- **Life sciences 2.e** Students know that light, gravity, touch, or environmental stress can affect the germination, growth, and development of plants.
- **Inquiry c.** Compare and sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).
- **Inquiry f.** Use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.

**National Science Standards Content C:**
- An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

**Intended Learning Objectives:**
- Students will compare and contrast healthy plants with plants that have been negatively affected by the environment
- Students will make conclusions about how certain environmental stressors affect plant growth
- Students will determine causes and effects of environmental stressors on plant health

**Part I: Introduction**
A. [Review Last Lesson] In our last lesson, we saw that light, water, and soil affected how our plants grew. If plants did not get enough sunlight or water, or if they were in soil without nutrients, those plants died.

B. [Making Predictions] What else might also effect how a plant grows? What might not make a plant grow very well? Discuss as a class what students think might affect plant growth. Draw pictures as well as words on the board.

C. [Introduce Investigation and New Vocabulary] What does the word environment mean? Call on different students and record a definition on the board. Tell students that they are going to be observing plants that have been exposed to different environments and determining the effects on plant growth and survival. Distribute plant logs.

Part II: Investigation
Seeds will have already been planted and experiments will be in progress prior to lesson day. As a class, observe what has happened to their plants in extreme temperatures, planted in different directions, and without sufficient carbon dioxide and instigate class discussions.

Temperature: What happens to plants in an environment that’s too hot or too cold?
1. With students, place a healthy green plant in a freezer for a few days. Remove and have students observe what happened to it. Record observations in plant logs.
2. With students, place a green plant directly under a heat lamp for a few days. Remove and have students observe what happens to it. Record observations in plant logs.
3. Ask students, “what do you think happens to plants in the winter when it gets too cold? What do you think happens when it gets too hot in the summer? How does this effect plant growth?”
4. Invite students to draw a picture of the two plants and write a couple sentences in their plant logs about how temperature affects plant growth.

Gravity: How can gravity affect the growth of roots?
1. Plant seeds with students a week prior to lesson. Fold a paper towel two times, and put it in a clear plastic cup around the sides. Wad up 2 paper towels and stuff them in the center of the cup. Pour 50 mL of water on the towels to moisten them.
2. Poke in 4 pinto bean seeds equidistant away from each other. Place one seed with the curved side facing up, one with it facing down, one to the left and one to the right. The seeds must be in these four positions in the cup. Label on the seeds A, B, C, and D.
3. Place the cup in a warm place. Observe the seeds for a week using a magnifier. Keep towels moist; water if needed.
4. Have students draw pictures of how the roots grew from each of the 4 seeds. Ask, in what direction did the four roots grow? Why? Discuss and review concept of gravity.
   a. Have students conclude that all roots grow downward because of gravity, no matter which direction the seed was planted.
5. [Target Advanced Learners] Invite advanced learners to ‘plant’ seeds in plastic bags with damp paper towels and hang them different ways on the window to determine if the roots will still always grow downwards. The students could present their findings to the rest of the class.

Carbon Dioxide: What happens if plants don’t get enough carbon dioxide?
1. Plant seeds two weeks prior to lesson. Have students observe what the plant looks like after one week. Record observations in plant logs.
2. With students, coat the leaves of the plant with petroleum jelly. Make predictions about what will happen.
3. After another week, observe what has happened to the plant. Record observations and a drawing of the plant in plant logs.
4. Why does the plant look like it does? What did the petroleum jelly do to the plant? What was the plant not getting enough of? Discuss the role of carbon dioxide, or air if CO2 is too much for students.
5. Have students write a sentence or two about what plants need in the environment (carbon dioxide or just air)

Part III: Closure

A. Review results of lesson: What did we find out affected plant growth today? What kind of environment is best for plants? Worst for plants? How could we help create the best environment for our own plants?

Assessment: Have students create a cause and effect graphic organizer to illustrate how environmental changes can affect plant growth. Example—plant does not get enough sunlight, leaves turn yellow; temperature gets too cold, plant dies. Assess if students are demonstrating cause and effect relationships between environmental conditions and plant health.

References:

Lesson #5: What is the purpose of fruits and flowers?

Purpose: Many students understand that new plants come from seeds, but they do not realize how those seeds actually become plants. In this lesson, second grade students will determine how seeds become new plants by examining the parts of a seed and finding the beginning of a new plant inside. They will rework their definition of fruit through an investigation and conclude that anything with seeds is considered a fruit, even foods like olives and peppers. Students will conclude that fruits and flowers are vital to plant reproduction because they carry the seeds needed to make new plants. This lesson is towards the end of my unit, and students have already learned about the parts of a plant, what plants need to grow, and what environmental factors affect plant germination and growth. The next and last lesson of the unit will be on how animals, insects, and weather help seeds travel, extending on the knowledge of plant reproduction gained in this lesson.

Time Required: Two days, ~ 45 minutes per day
**Materials:** Fresh cut up fruit such as peaches, cherries, watermelon, kiwis, & apples, cultural fruits such as guavas, papayas, and mangoes (do not remove seeds); non-traditional fruits such as green beans, peppers, cucumbers, tomatoes, & olives; knife (for teacher use only); flowers with obvious pollen and seeds; paper plates; paper towels; table cloths; hand wipes; magnifying glasses; presoaked lima beans; Handouts: Appendices A-J

**Materials Management:** For Day I, precut and prepare the fruit prior to the lesson and use tablecloths, paper towels, and hand wipes to avoid mess as much as possible during the investigation. After the students have examined the fruit and seeds, save the seeds for future planting use, and dispose of the remaining fruit and other materials. Teacher should be the only one with access to the knife. For Day II, presoak lima beans overnight to prepare for seed dissection. Make copies of handouts and overheads prior to both days’ lessons and distribute them when appropriate throughout the lessons.

**Common Student Misconceptions:**
- The word fruit describes only sweet fruits such as those found in a fruit salad.
- Fruits exist solely for people and animals to eat.
- Pits are not seeds.
- Flowers exist to look pretty.
- ‘Seed guts’ are found inside seeds.
- Only people and animals reproduce, not plants.

**California Content Science Standards:**
- **Life Sciences 2.f** Flowers and fruits are associated with reproduction in plants.
- **Inquiry a.** Make predictions based on observed patterns and not random guessing.
- **Inquiry c.** Compare and sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).
- **Inquiry e.** Construct bar graphs to record data, using appropriately labeled axes.
- **Inquiry f.** Use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.

**National Science Education Standards: Content Standards C**
- **Life Cycles of Organisms:** Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.

**English Language Development Standards:**
**Listening and Speaking: Comprehension:** Beginning ELD Level
- Answer simple questions with one-to-two word responses
- Respond to simple directions and questions by using physical actions and other means of nonverbal communication (e.g. matching objects, pointing to an answer, drawing pictures)

**Reading: Word Analysis:** Concepts about Print, Phonemic Awareness, and Vocabulary
and Concept Development: Beginning ELD Level
- Recognize English phonemes that correspond to phonemes students already hear and produce in their primary language

**Intermediate ELD Level**
• Use expanded vocabulary and descriptive words in oral and written responses to written texts.
• Apply knowledge of content-related vocabulary to discussions and reading.

Writing:
**Strategies and Applications: Organization, Focus, and Penmanship**
**Intermediate Level**
• Write legible, simple sentences that respond to topics in language arts and other content areas (e.g., math, science, history–social science).

**Target Learning Objectives:**
• Students will compare and contrast different kinds of seeds.
• Students will label and define the parts of a seed.
• Students will design an experiment to determine if all seeds contain baby plants.
• Students will define seed vocabulary terms—seed coat, root, leaf, stored food.

**Instructional Sequence**
*Day I: Fruits and Flowers Contain Seeds*

**Anticipatory Set:**
A. [Prior Lesson Review] Review previous lessons with students, including how they have observed how plants can produce flowers and fruit as well, like on apple trees.
B. [Personal Connection] Ask students if they like to eat fruit and to raise their hands and share different kinds of fruit they have eaten or seen. Record responses on a chart under ‘Kinds of Fruits.’
   a. [Target English Language Learners] Bring pictures of fruit with clear labels to display when discussing fruit. Put pictures and words (in Spanish and English) under ‘Kinds of Fruits. (Clases de Frutas)’ Say the words aloud and have the students practice repeating them back.
C. [Pair Up] Ask students to pair up with a partner and create a definition for what they think fruit is. Pair English Language Learners with bilingual students. Ask bilingual students to report what they said in English so that everyone is given the chance to share.
D. [Whole group Share-back] Share definitions with class. Have the class together create a working definition of what they think fruit is and add it to chart.
E. [Activate Prior Knowledge] Ask students, “Has anyone ever noticed what is inside a fruit when you cut it open or bite into it? What do you find inside fruit?”
   a. Lead students toward answering that seeds are found inside of fruits. [Target ELLs] Write “Seeds= los gérmenes” on the board with a picture of a seed.
   b. “What do we know about seeds?” Prompt with, “Do all seeds look the same? How are seeds similar or different?”
   c. If students have trouble producing an answer, tell them, “Some seeds are small, like apple seeds, while some seeds are big, like peach pits. Can anyone think of something else on a plant that has seeds? Flowers have seeds as well, although they don’t look the same as fruit seeds.”
   d. Add responses and further information from students to chart under ‘What We Know About Seeds.’
F. [Introduce New Activity & Purpose] Tell students that they are going to be looking at the seeds inside fruits and flowers and putting them into categories, based on color, size, and shape. They will count the seeds in each fruit and graph them like they have been doing in math and then make predictions about what these seeds might be used for. Ask who would like to make a prediction before beginning and add predictions to the chart under ‘What we think seeds are used for.’

**Instructional Activities:**

* **Fruits:**
  
  A. [Student Investigation—collaborative groups of 4 taking ability, gender, and culture/language into account]
    
    a. Lay out table cloths and pass out paper towels, Handouts A-D, & magnifying glasses
    b. Distribute on paper plates cut up fruits with the seeds clearly exposed.
    c. Invite students to work together to examine the seeds closely with a magnifying glass.
  
  B. [Classification of Data]
    
    a. Ask students to classify the seeds and record their findings on the “Classifying Seeds” worksheet (Appendix A).
    b. [Target Advanced Learners] Students who need a challenge may be given a blank chart and asked to come up with their own categories for classification.
    c. Walk around and monitor groups and recordings.
  
  C. [Whole Class Activity and Discussion—Graphing Number of Seeds]
    
    a. Have a representative from each group report how many seeds their group counted in each fruit.
    b. [Make a Graph] Make a class graph together for the number of seeds in each fruit, averaging the number of seeds from each fruit.
    c. [Independent Practice] Students can replicate the graph on “Graphing Seeds” (Appendix B) worksheet during math class or independent work time.
    d. Ask students, “Why do you think some fruits have only one seed and others have so many?” Allow for discussion.
  
  D. [Student Investigation-Combat Misconceptions]
    
    a. Pass out items such as green beans, peppers, cucumbers, tomatoes, and olives on paper plates to the same groups of 4. Ask students if they think that these items are fruits.
    b. Invite students to look inside these items to find the seeds within them. (Teacher should do the cutting of the fruit, students may split open olives and green beans themselves)
    c. [Teaching Point] Explain that although we don’t usually call these foods fruits, they are because we know that all fruits have seeds based on our investigation of the different fruits.
    d. Ask students if they can think of any other non-traditional fruits they may have seen or eaten.
  
  E. [Whole class discussion]
    
    a. Add new items to the class list of fruits.
i. [Target English Language Learners] Place pictures of fruits like these under ‘Kinds of Fruits’ to help make the correlation with the labels in both Spanish and English. Speak the words aloud and have all students repeat them in unison so ELLs can practice hearing and pronouncing the sounds.

b. Ask students to help you reword definition for what fruit is, and lead students to the idea that all fruits have seeds.

i. [Target English Language Learners] Display a definition that reads “All Fruits Have Seeds” with pictures of seeds and fruits underneath the words.

**Flowers:**

A. [Student Investigation]
   a. Distribute flowers with obvious pollen and seeds inside them.
   b. Invite students to observe and draw pictures of what they see.
   c. Ask, “Do fruit seeds and flower seeds look the same? How are they similar? How are they different?”

**Whole-Class Discussion:**

A. [Review Investigation] Gather students around. Discuss observations. Did all the fruits and flowers have seeds? Did they all look the same? What did the students see?

B. [Making Connections] Ask students, “What do you think the purpose of these seeds is? We have been talking about how plants grow, and we have planted lots of seeds to do our experiments. How do you think plants begin to germinate when nobody plants them, like in the forest or jungle? How might the fruits, flowers, and seeds help new plants grow?”

C. [Partner Share]
   a. Have students discuss this question with a partner and make a prediction for the seeds from fruits and flowers help new plants grow.
   d. Add predictions to class chart.

**Closure:**

A. [Summarize New Material] Review with students the content of the investigation. Distribute T-charts for homework and review how to fill out the chart.

B. [Connect to Next Lesson] Tell students that during the next lesson they will investigate what is inside a seed by dissecting a lima bean seed. Ask them to start thinking about what they think they might find when they do our experiment, and be prepared to explain your prediction.
   a. [Target ELLs] Ask bilingual students to ask ELLs what they think might be inside a seed if we cut it open.

**Assessment:**

A. [Target English Language Learners] Have ELL students fill out worksheet “Which Are Fruits?” using pictures to distinguish fruits from non-fruits and demonstrate comprehension. (Appendix C)

B. [Formal Assessment] For homework, ask students to fill out a blank T-chart by drawing pictures of fruits on one side and non-fruits on the other (items must still be food). At the bottom, students should write about how they made their decisions based on what they learned during the investigation. (Appendix I) Assess if students demonstrated that they know that fruits have seeds through illustrations and explanation. Did Intermediate ELLs write legible, simple sentences about fruit?
C. [Formative Assessment] Collect Plant Logs and worksheets for formative assessment. Did students classify seeds according to characteristics and graph seeds according to number?

**Day II: Seeds contain new plants**

**Anticipatory Set:**
A. [Making Predictions] Review that students found out that seeds are inside of fruit and flowers. Ask students, “What do you think is inside a seed? What do you think a seed might look like inside?”
   a. Have students draw their predictions in their plant log under ‘What I think is inside a seed’ (Appendix D, page 1)
   b. Reflect on predictions. Put up drawings on document projector. Ask the artists why they drew their drawings the way they did.

**Instructional Activities:**
A. [Student Investigation]
   a. Distribute lima beans that have been soaked overnight, paper plates, and magnifying glasses.
   b. Have students open their seeds carefully to see what is inside. Invite students to use a magnifying glass to get a closer look at what is inside the lima bean seeds.

B. [Collaborative Talk- Pair ELLs with bilingual students]
   a. Encourage students to talk with each other and discuss what might be seeing, what the parts look like, and what each part might be for.
   b. Have students record observations and draw a picture of the inside of the seed in their plant log under “What is in a seed?” (Appendix D, page 2)

C. [Making Predictions]
   a. Ask students, “So what do you think these parts might be for?” Invite students to predict what they are looking at. Encourage class discussion.

D. [Mini Lesson]
   a. Put up overhead transparency of a cross-section of a seed- ‘A Seed—Inside and Out’ (Appendix E)
   b. [Introduce New Vocabulary] Explain the terms “stored food, seed coat, leaf, and root,” and invite students to label their own drawing using the same vocabulary words. Point to the parts of the seed while clearly saying the words; have ELLs repeat them out loud.
      i. Tell students that a seed is the start of a new plant. The seed is covered in a seed coat the keeps the tiny leaves and root inside safe from harm; ask children to think of something else that acts like a seed coat (a coat we wear keeps us warm, a house keeps us safe, etc). The seed contains food for the new plant to use until it rows big enough to reach sunlight. Then the plant can make its own food.
   c. Pass out Flash Cards for students to cut out at a later time and use to study these terms (Appendix F)

**Formal Assessment:**
A. Ask students, “Do you think all seeds have baby plants inside? How can we find out?”

B. [Student-Led Experiment Design]
   a. Lead students to suggest looking inside other seeds and setting up their own experiment. Ask them, “How we might go about discovering if all seeds have baby plants inside them?”
   b. In their groups, ask students to design an experiment they might do to find out if other seeds have baby plants inside them. Ask them to come up with their question, materials, and what they would do in their experiment. Ask students to predict what they think will happen with their experiment.

C. [Follow Up Investigation]
   a. Repeat experiment with seeds such as peas and corn or other seeds that students suggest which have been soaked overnight.

D. [Conclude and Discuss]
   a. Have students form a conclusion about what is inside all seeds during class discussion. Write on the board: Seeds = New Plants / Gérmenes = Nueva Plantas. Reiterate the parts of the seed and the reason that there is a baby plant inside all seeds.
   b. Post a picture of “How a plant grows from a seed” in the classroom or on the document camera and explain how the seed parts help form the new plant. (Appendix J)

E. [Check Understanding] Ask students to draw a picture of a fruit or flower that has seeds in it, a picture of the inside of a seed, and then write a few sentences on what seeds are used for. (Appendix G) Encourage students to use the vocabulary learned in the lesson. Beginner English Language Learners can draw a picture and use one or two new vocabulary words in English to explain what they drew. Intermediate ELLs should write legible, simple sentences. Hang drawings on the wall in the classroom.

Closure:
A. [Summarize New Material] Ask students, “What did we learn today about fruits, flowers and seeds? What is found inside the seed? What are the seeds used for? Why do we plant seeds in the ground?” Call on a variety of students in the class to assess comprehension
B. [Connect to next lesson] “Tomorrow we will examine how seeds get planted in the ground if not by a person. Tonight I want you to think about how that might happen. Take a look at different kinds of plants after school and try to come up with some ways that new seeds travel and get planted on their own.”

Extension Activities (Optional):
1. [Individual Homework Assignment] Ask children to look for different kinds of seeds in their home, collect them, and bring them into class. Students can look for pumpkin seeds, popcorn seeds, peanuts, acorns, etc. (Check about allergies) Send a note home to parents about the assignment, and invite them to join their child in the hunt for seeds we see and use every day. Glue 4 different seeds to the homework handout. (Appendix H)
2. [Further Investigation] Ask students what will happen if they plant the seeds they looked at. Record their class predictions. Plan a day of planting a garden at school site. If an outdoor garden is not available, make a smaller class garden inside in pots. Fill out handout “What happened after I planted my seed” in “Inside a Seed” booklet (Appendix D, page 4) and compare with predictions.

References:

Lesson #6: How and why do seeds travel?

Purpose: This serves as the final lesson in the unit on plants. In the previous lesson, students concluded after an investigation that all fruits and flowers contain seeds. Students also dissected a lima bean seed and discovered that there are baby plants inside of seeds, which is how a new plant grows when the seed is planted in the ground. The purpose of this lesson is for students to investigate why seeds have different characteristics that help them travel. Through this two-part lesson, students will discover how animals, insects, weather, and water help plants travel and thus reproduce through investigation and experimentation. Students will also conclude why it is important for seeds to be able to travel from their parent plant. This final lesson is important for students to understand what is involved in plant reproduction.

Time Required: Two days, ~ 45-60 minutes per day

Materials: socks (one pair per student); Pop, Stick, Glide by Patricia Lauber (optional); collection of seed pods or seeds that might be moved in one or more ways (a coconut that floats, seeds with stickers or hooks, acorns or berries animals might spread, a maple seed with wings, etc.); water; fan; fake fur or terrycloth towels; cornmeal; plastic bees or insects; plant logs; Power Point Presentation, “How do seeds travel?” (Appendix O); Handouts (Appendices L-N); The Tiny Seed by Eric Carle

Materials Management: A week before this lesson, send home a note to parents asking them to send a pair of socks in with their student, preferably adult size so they will fit over students’ shoes. Make it clear that this pair of socks would not be returned. Students can feel free to bring in more than one pair of socks to compensate for some students not being able to bring a pair to school. Socks will be collected in a basket in the room to serve as a reminder to students until Part I of the lesson. Stations will be set up for Part II prior to the beginning of the lesson.
Common student misconceptions:
- Seeds only get planted by people, like farmers and gardeners.
- Seeds do not travel.
- All seeds will become new plants.

California Content Science Standards:
- Life Sciences 2.f Flowers and fruits are associated with reproduction in plants.
- Inquiry c. Compare and sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).
- Inquiry g. Follow oral instructions for a scientific investigation.

National Science Education Standards: Life Sciences: Content Standard C
- Life Cycles of Organisms: Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.

English Language Development Standards:
Listening and Speaking: Comprehension: Beginning ELD Level
- Begin to speak a few words or sentences by using some English grammatical forms (e.g., single words or phrases)
- Answer simple questions with one-to-two word responses
- Respond to simple directions and questions by using physical actions and other means of nonverbal communication (e.g., matching objects, pointing to an answer, drawing pictures)

Reading: Fluency and Systematic Vocabulary Development: Vocabulary and Concept Development: Beginning ELD Level
- Demonstrate comprehension of simple vocabulary with an appropriate action

Writing:
Strategies and Applications: Organization, Focus, and Penmanship Intermediate Level
- Write legible, simple sentences that respond to topics in language arts and other content areas (e.g., math, science, history–social science).

Intended Learning Objectives:
- Students will identify that seeds have different properties and characteristics
- Students will classify seeds that appear similar
- Students will describe that seeds are shaped differently so that they can travel in different ways, and that animals, weather, and water help these seeds travel
- Students will explain why seeds need to travel from their parent plant

Instructional Sequence
Day I: Nature Walk & Discussion
*Note: This activity is best suited to take place in a field of dry weeds where there are seeds that will stick, such as burrs. If no such environment is available, Pop, Stick, Glide by Patricia Lauber may be read aloud as a substitution introductory activity to introduce how different seeds travel.
Anticipatory Set:
A. Gather students at the end of lunch or recess while still on the playground. Bring the basket of socks, enough for each student to have one pair. Bring plant logs and pencils as well for students to record observations.
B. [Prior Lesson Review] Review with students what the class has been learning about plants and seeds. Ask them, “Did all the seeds that we looked at look and feel the same? Who can think of some seeds that look different from the ones we looked at in our seed dissection?” Encourage students to name other seeds that they have seen in nature.
C. [Making Predictions] Ask students, “What do you think would happen if we put these pairs of socks over our shoes and then walked around?” Allow for student responses and encourage elaboration and explanation.
D. Distribute one pair of socks to each student and have them put on the socks OVER their shoes.
E. [Introduce Activity & Purpose] Tell students they will be going on a nature walk. As they walk, they should be observing their surroundings and looking for different kinds of seeds.
   a. Students will record drawings and descriptions in their plant log.
   b. Students should be looking for different characteristics of seeds and observe what is happening to their socks.

Instructional Investigation:
A. [Nature Walk] Lead students on a walk through a dry field near campus.
B. [Encourage Observation] Point out different kinds of seeds to students, such as acorns, maple seeds, burrs, flower seeds, pinecones, etc. Students might not know that what they are observing are seeds and may need to be prompted.
   a. [Target English Language Learners] Say the names of different kinds of seeds and plants clearly to English Language Learners while pointing to the items and have them repeat the new words.
C. [Informal Assessment] Monitor students closely. Make sure students are recording their observations and including detailed drawings of the seeds to refer to later on in the lesson.
   a. Encourage students to use describing words about how the seeds look or feel.
   b. Ask English Language Learners to draw pictures of the plants they see.
   c. Ask students to take a look at their socks and observe what is happening!

Whole-Class Discussion:
A. Bring students back to the classroom and sit with them on the rug. Have students take off their socks and place them in front of them.
B. [Review Data] Say to students, “Take a look at your sock. What happened to your sock?” Responses may range from that the sock got dirty to that it has things sticking to it.
   a. Pick off a burr and tell students, “This is a kind of seed called a burr. I want you to feel the burrs from your sock and tell me what they feel like.”
C. [Target Visual Learners] Make a chart that has a column for kinds of seed and a column for the seeds’ characteristics.
a. Record responses for the burr, such as spiky, sticky, has hooks, etc. on chart paper.

D. [Making Predictions] Ask students, “Why do you think that plants would make seeds that stick to things?”

E. [Making Connections] Discuss other seeds that students observed.
   a. Why didn’t other kinds of seeds stick to their socks? What kinds of characteristics did other seeds have? What did they look and feel like? Add responses to the chart.

F. [Mini Lesson] The main concept of this mini lesson is that seeds need to travel away from their parent plant to germinate and survive.
   a. [Target Visual Learners] To demonstrate this concept, show students a pile of acorns that had hypothetically ‘dropped’ from an acorn tree, and ask them what might happen if all the seeds just stayed right where they had dropped from the tree.
   b. Discuss how the seeds would be competing with each other and the parent acorn tree for resources, such as soil and sunlight, and how none of them would get enough of the resources that they needed. However, if they traveled away from the tree, they would find new places with enough resources to allow them to germinate and make a new acorn tree.
   c. Ask them how new acorn trees would be able to grow if all the seeds were only in one place. How would we get the same kinds of plants in so many places around the world?
   d. Conclude with students that seeds need to travel for two main reasons: to be able to plant themselves in areas with little competition so that they can grow, and to continue their plant species in new places.

G. [Making Connections] Ask students, “How might the way seeds look make a difference in how that seed travels?”

Closure:
   A. [Summarize New Material] “Today we observed different seeds and saw that they have different characteristics. Some of them were spiky, like the ones that stuck to our socks. We made predictions about why seeds look different from each other. We learned that it is necessary for seeds to travel in order to germinate and grow.”
   B. [Connect to Upcoming Lesson] “Tomorrow, we are going to do some experiments that will show us WHY seeds have different characteristics from each other as we learn how seeds travel.”

Formative Assessment: Collect plant logs from the nature walk to assess what students took in from the experience. Did students draw plants they saw? Did they list characteristics of the different seeds? Did they discuss how the seeds were different?

Day II: Seed Dispersal

Preparation and Set-Up:
Each station should have different kinds of seeds that travel in different ways (see materials). At one station, set up seeds and a small fan. At another station, set up seeds and a bowl of water.
At the third station, set out seeds and fake fur or terry cloth towels. At the fourth station, set out bowls of seeds including a bowl of cornmeal which serves as pollen, as well as plastic bees and water. At the last station, set up edible fruit for the students, having checked prior to the lesson for any allergies.

**Anticipatory Set: Whole Class Discussion and Predictions**

**A.** [Target Visual Learners] Invite students to look at pictures of different seeds on the PowerPoint presentation that they would have not seen on the nature walk, like a coconut.
   a. Have students list some describing words about how the different seeds look. Add to the chart from the lesson prior.

**B.** [Think/Pair/Share] Remind students why seeds need to travel from their parent plant. Introduce the term 'dispersal.' Define it on the board. Have students turn to a partner and discuss the ways that different seeds might disperse. Remind them how the burrs stuck to their sock.
   a. [Target Visual Learners and English Language Learners] Students may draw pictures that show how their seeds are traveling.
   b. Have students share their drawings with the class using the document camera. Ask the artists to describe how their seed is moving and what about their seed allows it to move in that way.

**C.** [Literature Connection] Read Aloud *The Tiny Seed* by Eric Carle, which follows a plant through its life cycle from a tiny seed to a beautiful flower.

**D.** [Introduce Activity and Purpose] Tell students that they will be discovering why seeds look different and if this affects the way seeds travel.

**Instructional Activities:**

**A.** Group students into small groups, a total of 5 groups, taking into consideration language, culture, gender, and ability level.

**B.** Tell students that they will be rotating around to 5 stations around the room to observe how different seeds travel. Show them where the stations are set up and what to do at each station. Give clear instructions for students to follow. At each station, include a notecard with simple directions if students need a reminder.
   a. Hand out worksheet (Appendix L) and review how to fill it out with students.

**C.** Distribute seeds to each group at their respective stations. Invite students to observe the different seeds, and make notes on their worksheet about what each seed looks like and feels like.

**D.** When students are told to begin, they will do their specific assignment at their station. Students will have 3 minutes at each station to perform their investigation and record predictions. Use a timer so students know when to rotate stations.
   a. At one station, they will place all their seeds in a bowl of water and observe what happens and then record on their worksheet.
   b. At another station, students will place their seeds in front of a fan, turn it on, and observe which seed travels the furthest. They will record their results on their worksheet and draw a picture of the seed.
   c. At another station, students will be given either fake fur or a terry cloth towel. They will drop their seeds on the fabric and observe which seeds stick and which
fall off. They will record on their worksheet which seed was successful in sticking and draw a picture of the seed.

d. At another station, students will be given small cups with different kinds of seeds and cornmeal, which serves as pollen. They will dip wet plastic bumblebees into each seeds and observe what sticks to the bee. They will record their observations on their worksheets.

e. At the last station, students will eat berries with seeds in them (check for any allergies!) and discuss how the seeds might exit their bodies.

E. [Informal Assessment] Monitor stations closely to ensure that all students are on task. Make sure students are filling out their worksheets on the distinctions of the seeds.

Mini Lesson:
[Technology Integration] Use the included PowerPoint Presentation as a visual supplement to this part of the lesson (Appendix O). It includes pictures and descriptions of the different kinds of seed dispersal.

A. [Review Results of Investigation] What happened at each station? Ask groups to report what they observed at their stations. Did all the seeds act the same?

B. How would people help seeds travel? Discuss the roles of farmers and gardeners. Have students planted seeds themselves?

C. Which seeds stuck to the fake fur or towel? Relate the activity to the nature walk the day prior and how the burrs stuck to the students’ socks. Why do plants make seeds that would stick to fur? Discuss seed dispersal by way of animal fur/feathers or human clothing.

D. What happens when you eat berries with seeds in them? Do animals eat berries? Discuss how seeds are left in animal waste because they are not digested when eaten.

E. Which seeds floated? Why would seeds be able to float? What kind of environment would seeds that float live in? Discuss how one method of seed dispersal is by water and how seeds that live by water often float to be carried by water to new places, such as coconuts.

F. Which seeds were blown the farthest by the fan? What did those seeds look like? How did the characteristics of those seeds help them travel? Discuss wind dispersal and how light feathery seeds can be shaped like helicopters or parachutes to help them be carried along by the wind, such as dandelion seeds.

a. Watch video of dandelion seed dispersal included on PowerPoint.

G. What stuck to the plastic bees? Relate the cornmeal to pollen. Discuss pollination in terms of how bees or other insects are drawn to a flower, land on it, collect the pollen, and then fly to a new flower and transfer the pollen. When the pollen mixes, it forms new seeds. These seeds make new flowers.

H. [Check Understanding] In small groups, have students discuss the way that the seeds travel on the slide at the end of the PowerPoint presentation. Monitor for academic language and concept comprehension.

Closure:
A. [Expanding & Connecting Knowledge] Will all seeds always become new plants? Pose this question to students. Using knowledge from previous lessons, discuss what might
happen to seeds so that they would not germinate and grow. What would happen if all plants successfully grew?

B. [Compare/Contrast] Compare and contrast students’ new knowledge of seeds to their initial beliefs about seeds. What is the same? What is different? What statements need to be corrected?

C. In their plant logs, have students write 3-4 things they have learned about seeds or seed dispersal and 1 question they still have.

**Formal Assessment:**
[Homework Assignment] (Appendix M) Pick a different seed that you have seen over the last few days, either in real life or in a picture. Draw a picture of that seed. Describe 3 characteristics of that seed. Describe how that seed travels and explain what about the seed helps it travel that way; use some of the new vocabulary learned in class. Beginner English Language Learners can draw pictures of seeds traveling and use 1 new vocabulary word per picture. Intermediate ELLs should write simple, legible sentences that relate to the topic.

**Extension Activities:**
A. [Target Advanced Learners] Invite students to read *The Magic School Bus Plants Seeds* by Joanna Cole. Have students write their own story about planting seeds similar to the style of the book.

B. [Target Students in Need of Additional Support] Distribute “Seeds Travel” Handout and have students make a book about how seeds travel to refer to. (Appendix N)

**References:**


Planning Commentary

1. **What is the central focus of the learning segment? Apart from being present in the school curriculum, student academic content standards, or ELD standards, why is the content of the learning segment important for your particular students to learn? (TPE 1)**

   The central goal of my unit is for second graders to visualize and describe many of the factors that contribute to plant germination, growth, and reproduction. The material presented throughout the unit goes beyond the content standards to give students an in-depth visualization and understanding of the concepts of plants. During this unit, students will define the parts of a plant and describe their unique functions by experimenting with each part. Through investigations and instructional activities, students will describe what contributes to successful plant growth, and also what hinders it. Students will also define the purpose of fruits and flowers for plants, and describe how seeds are used in the reproduction of plants. The lessons will engage students by providing them opportunities to do the bulk of the scientific experiments themselves, and to observe and explain natural phenomena in their classroom, home and school environments. Students will be motivated by getting out in nature to make their observations, and by using objects from their lives. Students will learn by actually doing, not just watching or reading, which will help them construct their knowledge themselves.

   The content of this unit is important for my students to learn, particularly because they are lacking sufficient and/or accurate knowledge in this subject matter. Life sciences are important because they describe interactions between nature and us as human beings. I want my students to be aware of the phenomenon that occurs in nature all around them, and to understand how it fits together in a reciprocal and circular process. I want my students to understand the purposes behind these phenomena, such as why fruits and flowers exist, and why seeds are shaped the way they are to aid in seed dispersal. An understanding of these concepts will lead to an understanding of the world around them and how it operates. Additionally, the unit, particularly the last two lessons, will illustrate to student what occurs in the world outside of themselves; that plants, flowers, and fruits do not exist just for us, and that germination and reproduction occurs without human intervention. This unit will illustrate to students both where they fit into the larger scheme of things, but also what occurs outside of human influence. I want my students to understand the purposes behind science, and to recognize that everything looks and behaves the way it does for a reason. At the end of this unit, I want my students to be able to describe and explain those reasons in a way that makes sense to them and relates to their own lives.

2. **Briefly describe the theoretical framework and/or research that inform your instructional design for developing your students’ knowledge and abilities in both science and academic language during the learning segment.**

   I approached designing my unit with a constructivist learning perspective. I believe that students are not empty vessels in need of being filled; instead, they come to us with prior knowledge and invented understandings of the world around them, and it is our job to figure out this knowledge, assess it, and then build on it. Throughout this unit, I want my students to be given the opportunity build and construct their knowledge themselves. One of the basic principles of teaching and learning states that people tend to learn what they do, not necessarily what they are taught. Instead of being told or shown what is inside a seed, students will dissect a seed themselves and discover the beginnings of a new plant inside. Instead of being told that a
stem carries water and nutrients to a plant, students will observe how a white carnation changes color by being placed in colored water. I believe that doing this will ensure that the knowledge gained by the students actually means something to them and will be remembered past the test date because they came up with the knowledge themselves. Another basic principle of teaching and learning is that the extent to which people tend to learn what they are being taught is directly related to the extent to which they are actively engaged, cognitively. Listening to a lecture or watching a video does not require active engagement, which is why these types of instructional activities do not appear too often in my unit. Instead, students will participate in activities that require cognitive engagement, participation, and awareness, which is how they will be able to construct meaning. Most importantly, the meaning that they construct will not be anybody else’s but their own. I don’t want to teach concepts as much as I want to lead students to discover and construct their own concepts from their own experiences.

To be able to design my unit to address and combat common student misconceptions, I conducted an interview with 7 of my students, ranging from low performing to high performing and including English Language Learners. During my preassessment of my students, I noticed that they are not very proficient in using either scientific or academic language yet. I knew that this would have to be a major focus of my unit, and my goal was to introduce and use vocabulary in a way that students could relate to and in turn use themselves when discussing scientific concepts.

My students tend to learn best when the concepts are relatable and meaningful, rather than abstract. To connect the concepts of the unit to students’ lives, I wanted them to do real hands-on experiments using objects that they encounter in their day-to-day lives, such as fruits and vegetables, flowers, and seeds. I wanted to limit the amount of lecturing, as many of my students have short attention spans and would have difficulty sitting and listening for extended periods of time. Instead, I set up the majority of my lessons to activate students’ prior knowledge, then have the students investigate and experiment to discover new information on their own, and then come back to discuss this new information and connect it to the larger context of the unit. In this way, students are given opportunities to do many things within one lesson and are actively participating, while targeting all different types of learners in just one lesson. It is important to me as a teacher that students are given multimodal instruction, and are given the opportunity to speak, listen, read, and write about their ideas. Another basic principle of learning states that attention is the cognitive gating mechanism for learning. My goal was to get my students attention through interesting and engaging activities and thus hold their attention throughout the unit so that they have the most success with the material. I also created activities and assessments that required their attention and engagement, narrowing the chances for students to just slide by without ever truly absorbing and comprehending the information.

3. How do key learning tasks in your plans build on each other to support student learning of science concepts, inquiry skills, and the development of related academic language? How will students use the science concepts and inquiry skills to make sense of one or more real world phenomena? Describe specific strategies that you will use to build student learning across the learning segment. Reference the instructional materials you have included, as needed. (TPEs 1, 4, 9)

Throughout the course of my unit, students will be developing not only scientific concepts but inquiry and investigation skills as well. The sequence of the unit ensures that each lesson builds on one another in both subject matter and scientific skills, so that students are being
increasingly challenged along the course of the unit and consistently using the information and skills they are accumulating. The unit progresses in an increasingly complex sequence so that the students are using the knowledge gained in the prior lesson during the current lesson, which they will then use in the following lesson. This scaffolding technique ensures that the knowledge from the first lessons is not lost along the course of the unit, and it also demonstrates to students how concepts are interrelated. As my students are not accustomed to using much scientific language, vocabulary terms will be introduced and developed throughout the course of the unit, using pictures as reinforcements. Students will connect science with other subject areas, such as making a graph or reading or writing a story. Starting at a basic level at the beginning of the unit ensures that students develop a deep understanding of the central focus of the unit, and are not left with gaps in their information because they do not have the same background knowledge as other students. Additionally, the assessment tasks increase in complexity and focus on multiple dimensions of learning to develop competency in both subject matter and science inquiry skills. Students are asked to collect and acquire data, make sense of collected data, develop research questions, design an investigation, and explain their thinking in written and oral form.

The first two lessons in my unit ensure that all students have the basic foundation of what plants are including what makes plants living, what different kinds of plants look like, and the basic parts of plants. For my English Language Learners and students who do not have much prior knowledge on plants, these lessons are included to ensure that everyone has the background knowledge needed for the remainder of the unit and puts everyone on an even playing field. During these lessons, basic scientific vocabulary will be introduced that centers around the main concepts. I will be using pictures as well as vocabulary in both Spanish and English to target my ELLs as well as students who rely on visual representations. From the first lesson, students will be exposed to scientific vocabulary and skills such as making predictions, performing investigations, recording observations, forming conclusions, etc. This introduction to scientific language will benefit them along the course of the unit where they are asked to do increasingly complicated tasks, such as designing an experiment. It also introduces them to thinking and behaving like scientists. Students are taken on a nature walk and asked to record and explain their observations in the first lesson, and in the second they are performing investigations and forming conclusions based on their observations. These two lessons give students a good introduction to the format of the unit and sets the pace and standards for upcoming lessons.

The next two lessons in the unit focus and tie in to California Content Standard 2.e, what plants need to grow and develop successfully, and what environmental factors can harm or prohibit the growth of plants. These two lessons build off the first two, and they are using information such as plant parts when they discover basic needs and environmental stressors. These lessons let students take control of the majority of the scientific experiments and allows them to make sense of phenomena themselves, using their knowledge in a practical application.

At the end of this unit during the last two lessons, students use their knowledge of plants up to this point and discover how new plants are created and how other factors, such as animals and weather, contribute to plant reproduction. These lessons are the most difficult in content; however, students will use the knowledge and skills gained from the beginning of the lesson to be successful in these last two lessons. Throughout each lesson, students are provided with relevant vocabulary and given opportunities to make use of their newly acquired academic language. The assessment tasks let students demonstrate their knowledge in different multimodal ways so that everyone can feel successful with the material.
4. How do your choices of instructional strategies, materials, and the sequence of learning tasks reflect your students’ backgrounds, interests, and needs? Be specific about how your knowledge of your students informed the lesson plans, such as the choice of text or materials used in lessons, how groups were formed or structured, using student learning or experiences (in or out of school) as a resource, or structuring new or deeper learning to take advantage of specific student strengths. (TPEs 4,6,7,8,9)

It was important to me when designing this unit to keep in mind the specific interests and skill levels of my students. I have a very diverse class and I wanted to make sure that each lesson catered to each student’s style of learning, skill level, and interest in one or more ways. One of my first major decisions when designing this unit was to not rely on textbooks. Many of my students have difficulty reading and comprehending expository text, especially my English Language Learners and below grade level readers. I believed that the unit would be most successful through hands-on investigations and mini-lessons rather than textbook instruction. Therefore, instead of textbooks, I decided to rely on different types of accumulated materials to teach my unit. I chose science trade books on plants to supplement many of my lessons. My students are at a stage where they enjoy picture books and are able to receive information from the combination of looking at the pictures and hearing someone read aloud to them. Using relevant trade books is a way for me to teach from a book in a way that is more interesting and engaging than a textbook while still conveying relevant information to the students. Additionally, using trade books is a way to connect science and literacy, to keep my students engaged, to target their specific literacy needs, and to give everyone an equal and fair access to the material. I was able to accumulate handouts and worksheets from many sources to use in my unit, compiling a collection of resources that I felt were the best for my particular students. I also adapted and created my own handouts based on what my students have been doing so far in their class, such as practicing graphing in math, and using text structures where students need the most practice, such as filling in a table.

Since my class is very social and works extremely well together both as a whole class and in small groups, I decided to use this information by centering a lot of my unit around class discussions and accountable talk. My goal is to use the students’ loquaciousness to bounce ideas off of each other like real scientists would, and get them to practice using scientific language in the classroom and with each other. I hoped that by doing a lot of speaking and explaining, my English Language Learners would be exposed to more English and would get more experience hearing the sounds and structure of the language and, of course, the scientific vocabulary. For many of my students, it is easier for them to express their thoughts and ideas verbally than through writing, so hopefully so many class discussions would help them formulate their ideas verbally to be better prepared to write them down. My class is very capable of working independently without being led by their teacher, so I designed many small group activities and rotations for students to get the opportunity to feel competent in independent practice and to be exposed to their classmates’ ideas and opinions. I designed my groups taking many factors into consideration, such as gender, culture, language development, and interactions between the students. I am fortunate that my class has so many bilingual students who are always willing to help out our English Language Learners. One important decision I made for these small groups is that each group that has an ELL also has a bilingual student willing to help explain the concept in their native language. I did not want my ELLs native language to be a barrier in
understanding scientific content, so pairing them with a bilingual student will ensure that they are getting the information, both in Spanish and English.

As in any classroom, the students in my room do not all learn and process information in the same way. To target all learners, I tried to design multimodal instruction that would address each student’s learning needs. For my auditory learners, my hope is that mini-lessons, class discussions, accountable talk, and reading aloud from trade books serves as the reinforcement needed in learning the concepts. For my visual learners, I made use of many charts and diagrams to organize information and also included pictures and visuals, such as handouts, Power Point presentations, and drawings. When songs are taught, I have made sure that the lyrics are posted visibly so that students can follow along. I also included videos of seed dispersal within the Power Point presentation that clearly illustrate interesting ways that seeds travel which cannot be reproduced in the classroom. I have many kinesthetic learners who need to be able to touch and feel to understand, which is why I decided on and designed many tangible experiments, such as nature walks and investigations where they are able to touch real fruits, vegetables, flowers, and seeds. For my English Language Learners who are still learning names for objects, I tried to include as much realia as possible as well as opportunities to make use of both Spanish and English vocabulary. The assessments throughout the unit focus on multimodal learning so that all students are able to be successful in their area of strength. Assessments include writing, drawing, speaking, and doing so that students’ needs are targeted numerous times throughout the unit.

5. For this learning segment, identify students’ possible common sense understandings or misconceptions that contrast with accepted scientific understandings. How will you detect and attempt to change these common sense understandings or misconceptions?

There are many common student misconceptions about plants that I wanted to combat in my unit, such as that plants are not alive, that plants get food from soil, and that plants do not reproduce. In addition to these common misconceptions, I wanted to assess the knowledge of my specific students before designing my unit. Conducting an interview with my students prior to designing my unit was helpful in assessing the prior knowledge of my students and determining their common misconceptions about plant concepts that I could then work to correct within the unit. I interviewed seven students who ranged from performing below to above grade level and asked them some questions that I wanted to focus my unit around. I found that most students I interviewed knew some basics ideas and concepts about plants. I asked the students to draw me a plant and label its parts, and all of them drew at least a stem and leaves, while others drew roots and flowers. All students knew that plants need water, sunlight, and soil, and that they would die without them because “you’re not getting them the things they need.” However, their knowledge of plants did not stretch beyond plant parts and basic needs. Students were unsure of the functions of the plant parts; one student told me that flowers have stems so we can put them in vases. Students were also unsure how plants got their food, though one suggested that you buy it and give it to them, and another added on to this by suggesting that you dig a hole, put the food in, and then water it. I knew that in order for students to understand the more complicated concepts of my units, they would need a basic understanding of the function of each basic plant part. I also realized that these students do not have a concept of how plants grow and survive without human intervention, so I knew this would be a concept that I would have to work to develop throughout my unit.
A main focus of my unit is on the purpose of fruits and flowers, and I was very interested to assess my students’ prior knowledge on this subject because I was not sure how much students would actually know about plant reproduction. To my question, “What is fruit?”, most students answered that it was healthy and good for you. One of my more advanced students told me that all fruits contain seeds. When I asked her if olives were fruits then, because they have a pit, she told me that pits were not the same as seeds. The remainder of the students did not believe that foods like tomatoes, cucumbers, and peppers were considered fruits and told me that they were vegetables because you put them in a salad. When I asked my students why they believed plants make fruits and flowers, they were confused, and one student answered, “Because it is a great way for us to stay healthy.” When I asked her if she believed fruits and flowers helped the plants they grew on in any way, she told me no, they are just for us, and the rest of the students agreed. I recognized that knowledge of plant reproduction was very limited for this group of students, so I really wanted to end my unit with lessons on this big concept. I also realized that these students are very focused on how plants benefit humans, and how we in return benefit plants, such as by planting and watering them, but that students are lacking the idea of how plants germinate, survive, and reproduce without human assistance. Within my unit, I want students to understand how nature works so that plants do not have to rely on humans to grow and survive.

To draw on the background of my students, I asked them if they had ever had any experience planting anything before. Half of my students, mostly the girls, told me that they had planted flowers or vegetable gardens in their backyard, and helped water them and care for them while watching them grow. However, the other half of my students told me that they had never planted anything before. I wanted to make sure that these students would be given the opportunity to plant seeds and observe plant growth during my unit, because it could not be assumed that they knew what the progress of plant growth looked like. I included many activities where seeds would be planted prior to observations, and it is included in the lesson plans that the students will help plant the seeds themselves. All of the students that I interviewed told me that they liked eating fruits and vegetables. I decided to use these foods within my unit because they were relatable to students’ lives, and because they give another perspective on what plants are, different from the traditional green potted plant.

6. What language demands of the learning and assessment tasks are likely to be challenging for your students at different levels of language development? Explain how specific features of the learning and assessment tasks in your plan support students in meeting these language demands, building on what your students are currently able to do with language. Be sure to set these support plans in the context of your long term goals for your students’ development of academic language. (TPE 7)

My students are being introduced to and slowly learning to use academic language in the classroom. Although they are practicing defining and using new vocabulary words, these words are infrequently used in their vocabularies other than when responding to a question that requires usage of that word. During this unit, I wanted students to begin using scientific talk when speaking of concepts and explaining their thought processes. I realize that this will be a difficult concept but I feel that my students are capable of learning and correctly using scientific terminology, and this unit will be a good opportunity for them to practice with it. My long-term goal is for academic language to become ingrained in them that even my lowest performing students feel comfortable using it inside the classroom. I want to be able to have discussions with the students in which they are able to formulate their ideas and ways of thinker on a higher
level than they are used to at the moment. I want my students to be able to describe characteristics and phenomena using more sophisticated language, which is why I included so much oral and written observation within my unit for students to practice. We will also be using terms like ‘prediction’ instead of ‘guess’, terms for steps in scientific inquiry, and plant terminology.

Although my students are already social and get along well together, I want to get them thinking like a group of scientists within their small groups, bringing forth ideas and sharing their experiences and viewpoints in an educational environment. Small group time will thus be closely monitored for evidence of accountable and academic talk and not off-topic or unrelated subject matter. Additionally, many of the included assessments give students the opportunity to practice writing using scientific terminology and to explain their thought processes in written form, which students are just beginning to do. By asking students to design their own experiment, I am introducing students to the concept that science is not a predetermined set of tasks required by the teacher, but instead that they are responsible for their own education as well and are capable of asking questions and making scientific decisions. In addition, this type of preparation and writing will begin to prepare them for writing simple lab reports in future years. We will practice with different text structures by filling out charts and graphs centered around our collected scientific data. Students will be shown how to fill out tables while rotating in stations, which occurs in many lessons to give them sufficient practice with this newer concept. Although I assume that this will originally be a difficult concept for my students, I think it is important for them to learn how to organize information in a chart to make sense of their observations.

The biggest challenge will undoubtedly be teaching this unit to my English Language Learners. Using the English Language Development standards as a guide, I planned my unit with the hope that my students will be able to begin developing their use of English within the lessons. I want my two beginning ELLs to be exposed to as much English as possible as they begin to pick up the new language, and I believe that the best way for them to do this is to practice using the language and to use visuals for name to picture correspondence to learn new words. All vocabulary words will be clearly posted in both Spanish and English so that students can note phonemic similarities and will include a corresponding picture. Many of the assessments include visuals for students to match pictures, point to the correct answer, or draw their own picture to demonstrate their comprehension. I want my ELL students to practice using the correct words in English, even if they are responding to a question asked in Spanish so that they understand the concept.

7. Explain how the collection of assessments from your plan allows you to evaluate your students’ learning of specific student standards/objectives. (TPEs 2, 3)

In each lesson, my assessments, whether formal or informal, serve to measure the intended learning objectives. I included a multitude of assessments, both productive and receptive, so that students are being assessed in a variety of different ways and are being asked to display their knowledge through different modalities. My goal was to have students be able to demonstrate what they learned in their own words or in their own way, instead of just repeating information, so that I could best assess who truly comprehended the material and who needs additional help. Some of the informal assessments include just listening in on student discussion and collecting plant logs to assess students’ observations. Many of the more formal assessments I designed require higher-level thinking, such as creating a cause and effect graphic organizer or writing
about functions of plant parts. Assignments such as these require students to process the information acquired in class and make sense of it by phrasing it in their own words.

Some of the assessments appear simpler but still serve to measure the learning objectives through more creative means. For example, I included assessments where English Language Learners could demonstrate their understanding, such as drawing pictures or diagrams or working on a group project. After learning about the basic needs of plants in lesson #3, students are asked to write and then compile “A Guide to Growing Healthy Plants” using their knowledge of what plants need to stay healthy. This assessment gives the students the chance to be creative and also to put their knowledge into practice in a relatable way, which will make it more meaningful for them. From this assessment, I will be able to tell if students have met the intended learning objective of identifying and describing the basic needs of a plant to stay healthy. In Lesson #5 Part I, students will fill out a T-chart by drawing fruits and non-fruits and then describing how they know what makes a fruit a fruit. This gives students the opportunity to both draw and write to demonstrate their knowledge, and it forces them to put the knowledge gained in the lesson toward a practical application. For Lesson #5 Part II, students complete a similar type of assessment by drawing a picture of a fruit or flower that has seeds, drawing the inside of a seed, and then writing about what seeds are used for. This assessment meets the intended learning objectives of the lesson and again gives students two ways to demonstrate their knowledge. It is knowledge that they constructed themselves and put into their own words, rather than just circling an answer on a worksheet. Each formal assessment serves to cause students to make sense of the day’s lesson in a way that’s meaningful to them.

My summative assessment serves to measure the essential and most important intended learning objectives from the unit. The final assessment is a test with multiple choice, short answer, matching, sequencing, and drawing questions. The test assesses students’ knowledge of plant parts and functions, plant needs and environmental conditions, and how fruits, flowers, and seeds are involved in plant reproduction. It also serves to assess how students can do simple scientific skills, such as drawing a simple diagram and writing to explain a certain phenomena. From this test, I believe I would have a good sense of how effective my unit was in meeting my intended learning objectives.

8. **Describe any teaching strategies you have planned for your students who have identified educational needs (e.g., English learners, GATE students, students with IEPs). Explain how these features of your learning and assessment tasks will provide students access to the curriculum and allow them to demonstrate their learning.** (TPEs 9, 12)

While designing my unit, I kept in mind my 2 Beginning English Language Learners who speak no English at all. While I have other students who are classified ELL, they are able to essentially keep up with the rest of the class although they still require extra support. However, my 2 beginning ELL students require carefully thought out and designed curriculum that matches their specific English Language Standards. To address their needs, I decided to use lots of support in the form of visuals, such as pictures and realia, to explain the concepts so that these students would not have to solely rely on oral language, which they have little of in English. During group work, I would pair ELLs with bilingual students to make sure they have access to the material and are aware of the instructions and the purpose of the lessons.

I chose assessments that would allow them to demonstrate their learning through pictures, drawings, or visual projects. For the writing assignments, these students could write their responses in Spanish to make clear their comprehension of the material. Because they are barely
beginning to speak English and write no English at all, these students could respond in their native language, which I would then review with a bilingual speaker to assess content. I included songs within the unit because it can be early English Language instruction is often taught through rhyming songs and poetry, and it accustoms them to hearing more sounds of the English language. To learn the vocabulary words of the unit, we would practice saying the words aloud as a class so that all students could say them out loud numerous times. The words would all be written out and displayed around the room with Spanish translation and pictures. My goal would be for students to begin identifying pictures with the words in English, even though they are not writing sentences yet, and for them to understand the concepts of the unit, which could be demonstrated in Spanish.

I have a couple students who are performing above grade level. To ensure that the material is sufficiently challenging for these students, I included many extension activities that could be given to these students when they are done earlier than their classmates. These activities include designing extension investigations, giving presentations, reading more advanced trade books and writing about them in the form of reports and creative writing. When designing my unit, I wanted to target all learners in my class using different teaching strategies and assessments so that all learners are sufficiently challenged but not overwhelmed or bored.

References


**Trade Books**


