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| **Estimated Time:** Five 45-minute class periods | |
| **GSE Standard(s) and Element(s):**  **S2L1. Obtain, evaluate, and communicate information about the life cycles of different living organisms.**  b. Plan and carry out an investigation of the life cycle of a plant by growing a plant from a seed and by recording changes over a period of time.  c. Construct an explanation of an animal’s role in dispersing seeds or in the pollination of plants. | |
| **Science and Engineering Practices:**  **Planning and Carrying Out Investigations**  Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.  **Developing and Using Models**  Develop a simple model based on evidence to represent a proposed object or tool. | **Disciplinary Core Ideas:**  **Interdependent Relationships in Ecosystems**  Plants depend on water and light to grow.  Plants depend on animals for pollination or to move their seeds around.  **Developing Possible Solutions**  Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solutions to other people. |
| **Crosscutting Concepts:**  **Cause and Effect**  Events have causes that generate observable patterns.  **Structure and Function**  The shape and stability of structures of natural and designed objects are related to their function(s). |
| **Authentic Scenario (Phenomena):**  The living things around me go through a unique life cycle. Show the students a video of a seed growing in slow-motion: <https://www.youtube.com/watch?v=w77zPAtVTuI> | **Vocabulary:**   * life cycle * plant * seed * changes * dispersing * pollination * model * organisms   Suggested vocabulary:   * stem * leaf * roots * flower |
| **Guiding Questions:**  How are life cycles different for different living things?  How does a plant grow from a seed?  How do animals help disperse seeds and pollinate plants? |
| **Materials Needed:**   * paper towels * seeds for planting (varying kinds or all the same for the class) * water for each table * Ziploc bags for each student * Sharpie markers (to write names on bags) * rulers * pencils * Growth Chart for each student * Animals Move Seeds Pictures (printed and cut out as cards for sorting) * Hand lenses for each student * Fuzzy socks (one per group) * Seeds for observing: acorns, maple seeds, burrs, nuts in shells, coconut, milkweed pod and seed, berries, grass seeds- the more the better | **Safety Considerations:**   * Students should never place seeds in their mouths unless instructed to do so by a teacher. * Be sure students trying to blow seeds around (during the Seed Shape Investigation) are wearing proper eye protection. |
| **Technology Integration:**   * Devices with Internet access. |

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| **5E Stage** | **Student Activities**  How will students engage actively in the three dimensions throughout the lesson?  **Teacher Activities**  How will the teacher facilitate and monitor student learning? |
| **Engage** | Show the students a video of a seed growing in slow-motion: <https://www.youtube.com/watch?v=w77zPAtVTuI>  Ask, “What do you notice? What do you wonder?”  Explain that all the living things around us go through a unique life cycle just like the bean plant from the video.  Tell the students that they are challenged with growing and keeping a plant alive by making sure it receives the right amount of water. If you water the plant correctly, it grows and multiplies. Encourage students to begin a list of what they think plants need to survive. The teacher will record student answers and keep the list posted. |
| **Explore** | Students will be working to assemble an observable plant experiment. Students will follow these steps to set up the experiment:   1. Write your name on the outside of a Ziploc bag 2. Fold your paper towel into quarters. 3. Wet the paper towel generously, but not so that it’s dripping. 4. Place a seed on the paper towel and fold the paper towel over the seed like a blanket. 5. Close the bag tightly. 6. Keep the bags near a window or grow light in between examinations.   You may choose to have the entire class plant the same type of seed or have groups of students plant different types of seeds (vegetables, fruits, flowers, etc.) so that they can compare their growth. The teacher will lead a discussion with the class where students decide when and how they are going to observe their seeds. They will need to discuss and decide how often they will observe the seeds, whether they will check the outside of the bag, or open them and examine the inside, how often will they measure, whether will they measure with flexible or static rulers, etc. It’s important for students to plan their methods for investigation with guidance from the teacher.  It’s recommended that each day, for at least a week, students measure their seed growth. Students will record their observations and measurements on their Growth Charts.  **Differentiation:**  Aid struggling students with repeated instructions/demonstrations during initial seed planting. Offer extra support to ensure proper seed preparation. Provide sentence frames like, “Today, I see that my seed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and measures \_\_\_\_\_\_\_\_\_\_\_ in length.” for journal entries. Model proper ruler use repeatedly. |
| **Explain** | The teacher should plan activities to go along with each day, or even every other day, of plant observation. Here are some examples of what can be done to deepen student understanding of plant life cycles and the role of animals in seed dispersion and pollination:   |  |  | | --- | --- | | **Activity** | **Instructions/Resource(s)** | | Life Cycle Diagram | **Resource**: <https://www.ecosystemforkids.com/life-cycle-diagrams-of-animals.html>  **Procedure:** Students will order and label the stages correctly. | | Animals Move Seeds Matching Game | **Resource**: Animals Move Seeds Pictures  **Procedure:** Print the pictures. Students should sort the pictures of the animals into three categories: Moving Seeds without Meaning to, Harvesting Seeds, Eating Seeds. | | Pollination Article | **Resource:**  <https://www.sciencelearn.org.nz/resources/102-methods-of-pollination>  **Procedure:** Use the best method for your students to share the article about pollination. Have students create a picture/diagram showing one of the facts they learned about pollination from the article. | | Seed Shape Investigation | **Resources/Materials:** hand lenses, different types of seeds (acorns, maple seeds, burrs, nuts in shells, coconut, milkweed pod and seed, berries, grass seeds- the more the better), Fuzzy sock, small container of water for each group  **Procedure:** Students will examine each type of seed and record their shape. Students will then work as detectives to try and determine how the seeds are transported from one place to another using the materials provided at their group. Have students describe the seed shape and structure and decide if it’s moved by wind, water, attached to animals, eaten by animals, or buried by animals and justify their thinking.  From: <https://www.exploringnature.org/graphics/seed_dispersal_activity.pdf> | |
| **Elaborate** | After completing the seed observations, students working with different seeds should compare and contrast the shape, size, and progress of their plants using a Venn diagram. If the entire class planted the same seeds, students should try to figure out what may have caused seeds of the same type to grow differently (different amounts of water/sunlight and initial seed health). Have students record or draw their observations on chart paper and share them with the class. |
| **Evaluate** | Close this activity with student presentations of their ideas from the Elaborate portion of the lesson. Allow students to plant seeds in soil to continue observing growth, or take them home for planting. Encourage students to make full conclusions about their plant based on evidence from their observations/measurements. Teachers may use student Seed Books and evidence from daily activities to assess learning. |