education OUTSIDE

RESOURCES

SECOND GRADE CURRICULUM TABLE OF CONTENTS:

Second Grade Unit 1: Life Cycles

OVERVIEW:

This unit introduces students to organism life cycles. Lesson 1 (Plant Life Cycle) introduces students to each stage of the plant life cycle. Lesson 2 (Flowers and Seeds) familiarizes students with flowers and seeds and furthers their knowledge of plant reproduction. In Lesson 3 (Plant Life Cycle Salad), students use different plants that represent the stages of the plant life cycle to create a salad. Lessons 4 and 5 (Worm Life Cycle and Insect Life Cycle) use familiar garden organisms as life cycle case studies. Students delve into each stage of the life cycle and explore how these creatures grow and eventually reproduce.

FOCUS QUESTIONS:

1. Why do plants change over time?
2. What is the job of a flower?
3. Do worms always look the same?
4. Do insects have babies?

NGSS:

[LS2.A] Interdependent Relationships in Ecosystems: Plants depend on water and light to grow. (2-LS2-1) Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)
[LS1.B] Growth and Development of Organisms: Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)
[ESS1.C] The History of Planet Earth: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)
[LS2.A] Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

[LS2.B] Cycles of Matter and Energy Transfer in Ecosystems: Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

Unit 1: Life Cycles

Lesson #	Title	In this lesson, students will...
1.	**Plant Life Cycle**	Explore the reason for a seed and the key elements of the plant life cycle. The class will then work together to create a large model of the plant life cycle using examples from the garden and have the opportunity to germinate seeds.
2.	**Flowers and Seeds**	Dissect flowers and perform a play to understand how plants attract pollinators to reproduce.
3.	**Life Cycle Salad**	Use different ingredients representing phases of the plant life cycle to make a salad. The recipe includes sprouts, lettuce/ mixed greens, sunflower seed, strawberries, edible flowers (chive), and honey/ balsamic/oil dressing. Students will eat and enjoy at the end of class.
4.	**Worm Life Cycle**	Observe an example of an animal life cycle by looking at different stages of a worm's life cycle.
5.	**Insect Life Cycle**	Learn the different stages of an insect life cycle through a story, bug hunt, and evolution game.

TITLE | PLANT LIFE CYCLE

GRADE | Second Grade

UNIT | 1

LESSON | 1

OVERVIEW | In this lesson, students will explore the reason for a seed and the key elements of the plant life cycle. The class will then work together to create a large model of the plant life cycle using examples from the garden and have the opportunity to germinate seeds.

Time: 45 minutes

Focus Question: Why do plants change over time?

Key Terms: SEED, SEEDLING, PLANT, FLOWER, POLLINATOR, FRUIT

Objectives: Students will be able to…
1. name the six stages of the plant life cycle and identify these stages in the garden.
2. plant seeds in germination bags for observations.

Materials/Prep Work:

- ☐ Plant Life Cycle **poster**, available in *Curriculum Visuals* in the Table of Contents.
- ☐ **Labeled pictures** of each stage of the plant life cycle
- ☐ **Draw** a large circle with empty boxes for each stage of the plant life cycle for Activity 1
- ☐ Prepare bean baby necklaces
  - ☐ **Small ziplock jewelry bags** with a hole punched near the top
  - ☐ **Wet cotton ball** inside each bag
  - ☐ **2 beans per bag**
  - ☐ **String** to tie a necklace
- ☐ **Radish seeds** to sprout for L3: Life Cycle Salad, with **small pots and soil** in which to plant *(Radish seeds are a good choice for this activity because of their sort germination period)*
- ☐ *Optional*: Plant Life Cycle worksheet (one per student) attached below
- ☐ *Optional*: Pencils and/or markers

> *Note: Contact Trader Joe's or a local grocery store this week to see if they can donate flowers for the next lesson (L2: Flowers and Seeds).*

Lesson Steps:

Introduction: Welcome and Engage *(10 minutes)*

- **Greet** the class and hand each student a bean (or other seed) as they walk into the classroom space. Tell them to carefully observe their seed.
- **Ask**: What is the job of a seed?
  - Write students answers on the board
- **Say**: Today our science question is, "Why do plants change over time?"

- **Show** students pictures (or real examples) of different phases of the plant life cycle.
  - Ask for student volunteers to hold the pictures in front of the class.
  - Work together as a class to put the photos in order from first to last. (Have students vote by pointing left or right to indicate the correct order.) Continue this activity until you have the order: SEED, SEEDLING, PLANT, FLOWER, POLLINATOR, FRUIT
  - **Discuss** what comes from a fruit and ask if the cards should stay in a line. Help students understand that life cycles are cyclical, and ask the student volunteers to arrange themselves in a circle to emphasize the point.
- **Show** students the *Plant Life Cycle* poster to reiterate.

Activity 1: Let's Make A Plant Life Cycle *(10 minutes)*

- **Explain** the activity directions:
  - Students will collect plant parts in different stages of the life cycle from the garden to add to an outline drawn by the instructor beforehand
    - *Set up: Draw a circle with big empty boxes where students can place each item. Draw the seed and pollinator, as these can be difficult for students to collect in the garden.*
  - **Demonstrate** how to look for each phase of the life cycle and provide examples.
  - **Review** which plants students can or cannot pick from.
  - **Demonstrate** how to properly pick items from the garden and place them in the cycle model.
- Have students complete the activity. Challenge each student to find every stage of the life cycle in the garden.

> *Note: Be sure to clearly mark plants that students can/can not pick from. Another option is to pre-pick items from the garden and have students place them in the correct place in the circle. If using one big model creates conflict for the class, pre-draw multiple models and have students work in small groups.*

Activity 2: Bean Babies! *(10 minutes)*

- **Remind** students of the bean seeds they observed at the beginning of the class. Give each student 2 beans and ask them to describe the bean to a partner.
- **Distribute** bean baby bags, **show** students the wet cotton ball and **ask** them why they think the bean needs a wet cotton ball inside.
- **Demonstrate** how to put the beans inside of the bags and wear them as necklaces.
- **Tell** students that the bags will hang in their classroom (or other accessible space) where they will be able to observe them the following week.

> *Note: It can be helpful to store bean babies in a warm space inside. If the garden educator does not have access to an indoor space we suggest asking the classroom teacher to take them inside.*

Activity 3: Sprouting Sprouts! *(5 minutes)*

- **Show** students the radish seeds that will be used in L3: Life Cycle Salad
  - **Ask** students what stage of the plant life cycle will come next. Have them share out.
- **Start** SPROUTS for next lesson's plant life cycle salad. (This can be a demonstration for the full class or an activity for small groups of students to complete.)
  - **Fill** small plastic plant containers with potting soil. Using your index finger, make small holes (depth of first knuckle).
  - Drop in 2-3 seeds, cover, and water.

Closing: *(10 minutes)*

- **Ask** students to share predictions about how their bean will change over the next week.
- **Review** parts of the plant life cycle by calling out the stage and having students repeat and it and act it out.
  - SEED (Students squat down and put their arms around their legs to make a small ball like a seed underground)
  - SEEDLING (Students stand halfway up to show growth and hold their hands out to make small leaves)
  - PLANT (Stand all the way up, stretch out arms and face palms upward to make a full grown plant)
  - FLOWER (Turn one hand into a cup shape, like a flower)
    - Remind students that flowers attract pollinators
  - FRUIT (Turn the other hand into a "pollinator" that visits the "flower." Make the "flower" turn into a juicy fruit. Adding a buzzing sound will help students remember the pollinator.)
  - SEED (Students squat down and put their arms around their legs to make small ball like a seed underground)
    - Remind students that inside of the fruit are seeds, which will sprout and form new plants.
- **Revisit** the focus question "Why do plants change over time?"
  - Have students share out to check for understanding.

Additional or Alternative Activity: Use the worksheet attached below to have students go on a life cycle scavenger hunt in the garden.

Name: _____

Plant Life Cycle Scavenger Hunt!

Can you find these life cycle stages in the garden?

Life Cycle Stage	Yes/No
A **seed**	
A **sprout** (small young plant)	
An **adult** plant	
A plant with a **flower**	
A plant with a **fruit**	
A **pollinator**	

Sketch your favorite lifecycle stage below.

Name: _____

Plant Life Cycle Scavenger Hunt!

Can you find these life cycle stages in the garden?

Life Cycle Stage Yes/No

A **seed**

A **sprout** (small young plant)

An **adult** plant

A plant with a **flower**

A plant with a **fruit**

A **pollinator**

Sketch your favorite lifecycle stage below.

TITLE | FLOWERS AND SEEDS

GRADE | Second Grade

UNIT | 1

LESSON | 2

OVERVIEW | In this lesson, students will perform a play as a way of introducing the concept that plants produce flowers to attract pollinators, which helps them make new plants. They will further their understanding of this concept through a flower dissection.

Time: 45 minutes

Focus Question: What is the job of a flower?

Key Terms: FLOWER, POLLEN, NECTAR, POLLINATOR

Objectives: Students will be able to…
1. describe the parts of a flower.
2. explain that the purpose of a flower is to produce seeds.
3. explain the role of pollinators in flower reproduction.

Materials/Prep Work:

- ☐ **Flowers** with big, visible parts for dissection--Alstroemeria/Peruvian lilies, Tiger lilies, or tulips are good options. See if Trader Joe's or a local grocery store can donate flowers.
- ☐ ***Plant Life Cycle* poster** (found in Curriculum Visuals, linked in the Table of Contents)
- ☐ ***Parts of a Flower* poster** (found in Curriculum Visuals, linked in the Table of Contents)
- ☐ **Images** of a flower turning into a fruit--passion fruit vines illustrate this really well.
- ☐ **Magnifying glasses**
- ☐ **Clipboards, pencils**
- ☐ **Science notebooks** or **worksheet** (attached below)
- ☐ *Optional*: **tape**
- ☐ **Pollination Play props**:
  - ☐ 2 cups labeled "nectar"
  - ☐ 2 bags of pom-poms labeled "pollen"
  - ☐ 2 necklace signs labeled "flower" on one side and "seed" on the other
  - ☐ 2 necklace signs labeled "bee"
  - ☐ bee props (a pipe cleaner proboscis, wings, antennae, etc.)

Lesson Steps:

Introduction: Verbal Scavenger Hunt *(10 minutes)*

- **Greet** students at the garden entrance
  - **Ask** students to share what they learned in the last class.
- **Tell** students to find one flower in the garden and observe it closely (note that all students should have their own flower).
  - **Think-pair-share**: "What is special about your flower?"
    - **Tip**: *If you ask students to pick a flower it can be helpful to teach or review the Rule of 10. This rule asks students to only pick flowers from a plant that has 10 or more flowers.*

- **Think-pair-share**: Why do plants make flowers of so many different colors, shapes, sizes, and smells?
  - Have students share out and record answers on the board.
- **Say**: Today our science question is, "What is the job of a flower?"

Activity 1: Flower Dissection *(10 minutes)*

- **Explain** that students are detectives, trying to crack the case of "What is the job of a flower?"
- **Demonstrate** how to carefully handle a flower while dissecting. Explain that students will need to be gentle in order to keep all parts of the flower intact.
- **Distribute** clipboards, pencils and notebooks. Give each pair of students a flower and magnifying glass.
- **Instruct** students to separate the flower into different parts, making 3-5 observations and questions.
- **Share** questions and observations, writing them on the board.

Activity 2: Pollination Play *(10 minutes)*

- **Ask** students "What animals have you seen near flowers? What are those animals doing when they visit a flower?"
  - Have students talk to a partner and then share out.
  - Record answers on board.
- **Define** POLLINATOR: an animal that helps plants make fruit. Use the Parts of a Flower poster to **explain** that pollinators do this by moving pollen from one part of a flower to another part.
- **Explain** that four students will act out a short skirt to explore how insects and other animals play an important role in the plant life cycle. *(As you call students up to participate, give them the props outlined above in the materials sections.)*
  - **Select** 2 students to be flowers and 2 students to be a pollinator of their choice.
  - Have the student bees act out drinking NECTAR (have all students say together) from a flower, getting POLLEN (have all students say together) stuck to them in the process.
  - Have the student bees then visit another FLOWER and trade POLLEN before going back to their hive to make honey.
  - The student flowers then become SEEDS, at which point they give their tags to other students. These new students become new FLOWERS. Repeat a few times.

Activity 3: Flower Dissection Part 2 *(10 minutes)*

- **Instruct** students to go back to their flowers and try to find the following:
  - POLLEN
  - The pieces of the flower that hold the POLLEN
  - The pieces of the flower that collect POLLEN when pollinators come to drink nectar
  - The pieces of the flower that attract POLLINATORS
- **Distribute** worksheets. Students can tape the pieces of the flower to the worksheet/notebook, draw them, or simply sort them and compost the pieces when finished.
- **Circulate** and help students as needed.

Closing: *(5 minutes)*

- **Ask**: How do flowers attract pollinators?
- **Review** the *Parts of a Flower* poster, asking students to share their observations from Activity 3.
- **Revisit** the focus question: "What is the job of a flower?"

Optional Activity: This lesson does not focus heavily on the transformation of flower→ fruit→ seed, which is an important concept to grasp. There are a few activities that could be done to elaborate upon this topic:

- If there are plants in your garden available for this activity, students can try to sketch the different steps in flower/fruit development. Passion vine is a great living example of this transformation.

- Alternatively, if there are plants that have gone to seed, students can tape a bud, flower, fruit and/or seed to a worksheet or notebook.

- If you do not have enough plants for all students to observe their own, you can also pass around examples of each stage from one plant (poppies work well for this).

Additional Information:

NGSS:
[LS2.A] Interdependent Relationships in Ecosystems: Plants depend on water and light to grow. (2-LS2-1) Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

Classroom extensions: Read ***The Reason for a Flower*** by Ruth Heller

Blog Links:

1. K. Owyang (2015, May 11). “Bees + Flowers + Pollination = Honey!” [Web log post]. Retrieved June 14, 2019, from https://educationoutsideafy.wordpress.com/2015/05/11/bees-flowers-pollination-honey/

Name _____ Date _____

Pollen	Pieces that hold pollen
Pieces that collect pollen	**Pieces that attract pollinators**

TITLE | PLANT LIFE CYCLE SALAD

GRADE | Second Grade

UNIT | 1

LESSON | 3

OVERVIEW | In this lesson, students will review the life cycle of plants by preparing a salad with ingredients that represent an example of each stage.

Time: 45 minutes

Focus Question: What is the job of a flower?

Key Terms: LIFE CYCLE, SEEDS, SPROUT, SEEDLINGS, LEAVES, FLOWERS, FRUITS

Objectives: Students will be able to…
1. describe the plant life cycle.
2. follow directions to prepare a salad.

Materials/Prep Work:

- ☐ **Printed Plant Life Cycle Salad Recipe** (attached below)
  - ☐ Cutting boards
  - ☐ Scissors
  - ☐ Jar with lid
  - ☐ Measuring spoons
  - ☐ Measuring cups
  - ☐ Strainer
  - ☐ Salad tongs
  - ☐ Small trays or bowls for serving -- one per student
  - ☐ Sunflower seeds
  - ☐ Radish sprouts from L1: Plant Life Cycles
  - ☐ Lettuce (or other leafy green)
  - ☐ Strawberries
  - ☐ Edible flowers (chive, borage, nasturtium, pineapple sage, etc.)
- ☐ **Hand sanitizer or hand-washing station**
- ☐ *Plant Life Cycle* **poster**, available in *Curriculum Visuals* in the Table of Contents.
- ☐ **Clipboards, pencils**
- ☐ **Crayons/colored pencils**
- ☐ *Optional*: Examples of recipes with pictures or illustrations

Note: This lesson involves eating. Before the lesson, check in with the classroom teacher about students with food allergies!

Lesson Steps:

Introduction: Plant Life Cycle Yoga (*5 minutes*)

- **Greet** the class at the garden entrance.
- **Provide** hand sanitizer or ask students to wash their hands at a hand-washing station.
- **Lead** students to the seating area.
- **Show** students the radish sprouts from **L1: Plant Life Cycle**.
- **Act** out the plant life cycle as a group, as taught in **L1: Plant Life Cycle** and summarized below. Reference the *Plant Life Cycle* poster as needed.
    - Begin with all students pretending to be SEEDS (crouched down, holding onto knees). Then grow into SPROUTS (stand up a little, knees are still bent, two hands out like little leaves) and SEEDLINGS (stand up and reach out arms a little more). Grow a FLOWER (make a flower shape with one hand), turn the flower into a FRUIT (clasp hands together), and finally open the fruit to show SEEDS (open fruit hand and point to imaginary seeds).

Activity 1: Cooking *(10 - 15 minutes)*

- **Introduce** students to the salad ingredients and read through the recipe together.
- **Make** the salad. See recipe for directions.

Activity 2: Drawing the recipe *(10 -15 minutes)*

- After students complete their cooking station, **distribute** examples of illustrated recipes for students to look at. (See Blog Links below for an example.)
- **Instruct** students to read and illustrate their the Plant Life Cycle recipes with their own drawings.
- **Distribute** the recipe for students to complete their illustrations while waiting to cook.

> *Tip: Students in Activity 1 will finish at different times. Set up Activity 2 to be self directed or facilitated by another educator so that students can transition from Activity 1 to Activity 2 with minimal support.*

Activity 3: Eat *(10 minutes)*

- **Pass out** small trays with forks, adding a small portion of salad to each. **Explain** that students should wait for everyone to be served before eating.
- **Thank** the garden and **eat** the salad together.
- **Ask** students to name the parts of the salad that represent each phase of the plant life cycle. **Record** answers on the board.

Closing: *(5 minutes)*

- **Revisit** the science question of the day “What does the plant life cycle taste like?”
- **Share** appreciations for the group and the food.

Blog Links

K. Owyang (2014, December 19). “What’s Cooking in the Outdoor Classroom?” [Web log post]. Retrieved June 14, 2019, from https://educationoutsideafy.wordpress.com/2014/12/19/whats-cooking-in-the-outdoor-classroom/

Plant Life Cycle Salad

Materials:

- ☐ **Cutting boards**
- ☐ **Scissors**
- ☐ **Plastic knives**
- ☐ **Jar with lid**
- ☐ **Measuring spoons**
- ☐ **Measuring cups**
- ☐ **Strainer**
- ☐ **Salad tongs**
- ☐ **Small trays or bowls for serving** (one per student)
- ☐ **Instruction cards** for each ingredient station, as described below

Recipe:

Ingredients

- Sunflower seed - SEEDS
- Radish sprouts - SPROUTS
- Lettuce (or other leafy green) - ADULT PLANT
- Strawberries - FRUIT
- Edible flowers (chive, borage, nasturtium, pineapple sage, etc.) - FLOWERS

Dressing

- 1 tablespoon honey
- 1 tablespoon balsamic vinegar (optional)
- ¾ cup olive oil
- 2 pinches of salt

Instructions

1. Divide the ingredients into stations. Include an instruction card with instructions on how to complete each station. (Sunflower seeds can be added at the end of the salad).
   - Radish sprouts - Harvest sprouts from tray with scissors. Wash sprouts with water and pat dry with a towel.
   - Lettuce - Harvest lettuce from the garden (if you have it growing), wash lettuce, gently rip off each leaf and tear into 3-4 pieces.
   - Strawberries - Harvest from the garden (if you have them growing), wash, use plastic knives to cut off green tops and then cut each berry into 8 pieces.
   - Edible flowers - Harvest from the garden (if you have them growing), remove excess stems and leaves, wash.
   - Dressing - Add each ingredient to a Mason jar and take turns shaking until fully mixed.
2. Assign groups of students to each ingredient station. Have them work together to complete the station.
3. Once finished, ask students to add the ingredients to large salad bowl and wash all dishes.

TITLE | WORM LIFE CYCLE

GRADE | Second Grade

UNIT | 1

LESSON | 4

OVERVIEW | In this lesson, students will observe an example of an animal life cycle by looking at different stages of a worm's life cycle.

Time: 45 minutes

Focus Question: How does a worm change over time?

Key Terms: LIFE CYCLE, EGG, HATCHLING, JUVENILE WORM, ADULT WORM

Objectives: Students will be able to…
1. identify each stage of the worm life cycle.
2. use magnifying lenses to make detailed observations of worms.

Materials/Prep Work:

- ☐ **Worm bin**
- ☐ **Scoops of worm bin material in containers** (used lunch trays or small yogurt work well)
- ☐ **Parts of a Worm poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ **ABCDEs of Scientific Drawing[1] poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ **Examples of eggs, hatchlings, juvenile worms and adult worms** in small containers (baby food jars or small test tubes work well)
- ☐ **Signs for each stage of the worm life cycle**, placed at different stations around the garden.
- ☐ **Magnifying glasses**
- ☐ **Science notebooks**
- ☐ **Clipboards, pencils**

Lesson Steps:

Introduction: Mystery Creature *(10 minutes)*

- **Greet** students at the garden entrance
- **Introduce** worms with a riddle. Give students clues describing a worm. Ask students to put their finger on their noses when they "knows" the answer. Remind them not to shout out the answer.
  - **Say**: This creature…
    - Has no eyes, no ears, no nose.
    - Has a mouth, but no teeth.
    - Breathes through its skin.
    - Has five hearts.
  - Once most or all students know the answer ask them to all say it on the count of three.
- **Ask** students to share with a friend some of the things they've noticed about worms as they walk to the seating area.
  - Have students share out and record on board.
- **Say**: Today our science question is, "How does a worm change over time?"

Activity 1: Worm Life Cycle *(15 minutes)*

- **Show** students different stations with examples of worms at different life cycle stages.
  - EGG, HATCHLING, JUVENILE WORM, ADULT WORM
  - **Review** the expectations about working with live animals in the garden.
- **Explain** that students will be observing and recording each stage of the worm life cycle with a scientific drawing in their science notebooks.
  - Make sure to emphasize that they should label the stage and follow the ABCDEs of scientific drawing. Have the poster visible for reference.
- **Demonstrate** how to **rotate** through stations.
- **Divide** students into groups and assign them a station.
- **Circulate** through stations helping students make and record observations.
- Once students have finished each station transition back to the seating area.
- **Debrief** as a class and draw the life cycle on the board.
- **Collect** science notebooks.

Activity 2: Worm Bin Observation *(15 minutes)*

- **Demonstrate** proper worm-handling techniques.
- **Distribute** scoops from the worm bin to small groups.
- Students will **observe** castings with magnifying glasses.
- **Challenge** students to find each stage of the worm life cycle.
- **Circulate** to help students find different stages of the worm life cycle.
- **Show** the *Parts of a Worm* poster for students to reference while they make observations.

Closing: *(5 minutes)*

- **Think-pair-share**: What did you observe while looking at the worm bin material?
  - Have students share out and record on board.
- **Revisit** focus question: “How does a worm change over time?”
  - Have students share out and record on board.

Additional Information:

NGSS:
[LS1.B] Growth and Development of Organisms: Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

Classroom extensions: Read *Yucky Worms* by Vivian French

References:

1. ABCDE’s of Scientific Drawing. Full Option Science System, Lawrence Hall of Science, U.C. Berkeley. Science Notebooks In Grades 3-6, p. 16

TITLE | INSECT LIFE CYCLE

GRADE | Second Grade

UNIT | 1

LESSON | 5

OVERVIEW | In this lesson, students will learn the different stages of an insect life cycle through a story, bug hunt, and evolution game.

Time: 45 minutes

Focus Question: Do insects have babies?

Key Terms: EGG, LARVA, PUPA, ADULT

Objectives: Students will be able to…
1. describe the stages of an insect life cycle.
2. compare insect and plant life cycles.

Materials/Prep Work:

- ☐ **Images** of:
  - ☐ The life cycle stages of different garden insects, particularly darkling beetles
  - ☐ A caterpillar
- ☐ **Bug boxes** or **clear vials** for catching bugs
- ☐ **Insect Life Cycle poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ ***Plant Life Cycle*** poster (available in Curriculum Visuals, linked in the Table of Contents)
- ☐ **Clipboards, pencils**

Lesson Steps:

Introduction: A Beetle Mystery *(10 minutes)*
- **Meet** students at the garden entrance
- **Ask**: "How do you know something is young or a baby?"
  - Have students discuss as they walk to the seating area.
  - **Call** on a few students to share out answers and record on the board.
- **Show** students a picture of a beetle pupa. **Ask** students to share what they notice.
  - Have students make guesses and record on the board.
- **Say**: Today our science question is, "Do insects have babies?"

Activity 1: Beetle Story *(10 minutes)*

- **Tells students a story**: Once upon a time Bob and Beverly Beetle decided to start a beetle family. They burrowed into the ground to make their cozy beetle home where Beverly laid their baby beetle egg. They were so excited to welcome baby beetle into the family. They waited and waited and waited next to their egg, hoping to see the moment it hatched, when Little Bobby Beetle would enter the world. Finally, the day came. The egg trembled and cracked open, but to their horror what emerged did not look like a beetle at all! It was long and squirmy and it kind of looked like their caterpillar neighbor (**show** image). Though confused, and somewhat terrified, they continued to take care of this creature. As Bobby Beetle grew larger and larger, he shed his skin several times.

One day, Beverly Beetle went to check on Little Bobby Beetle who did not look like a larvae any longer! Instead, all that she could find in Little Bobby Beetle's room was a hard, white shell where he once was (show image). Bob and Beverly Beetle were so sad, thinking they had lost their precious Little Bobby. Months went by, and Bob and Beverly had started to give up hope of ever seeing Little Bobby again. They decided to keep this mysterious white, shell-like thing in Bobby Beetle's room to remember him. And then, one day, months later, when Bob and Beverly were having their morning breakfast of dead broccoli leaves, they heard a rumbling in Little Bobby Beetle's room. Their little beetle hearts were beating so fast, nervous and scared of what they might find behind the door. They took a deep breath, and together pushed the door open and there they saw LITTLE BOBBY BEETLE! He finally looked just like them (**show** image)! Little Bobby Beetle had entered the final stage of his life cycle and had become a full grown adult beetle. He had six jointed legs, two antennae, one thorax, one abdomen, and a head. Bob and Beverly were so happy to have Bobby back and the little Beetle family lived happily ever after. THE END.

- You can add movements and sounds or change the names of the beetles in the story to fit your students' needs and context.

- **Think-pair-share**: What do you think happened in this story?
  - Record student answers on the board.

Activity 1: Insect Life Cycle Hunt *(10 minutes)*

- **Introduce** the terms EGG, LARVA, PUPA, ADULT and show images or examples for each.
- Have students make up hand motions for each stage.
- **Show** images of the life cycle stages of different insects that might be in the garden.
- **Review** expectations for handling live animals in the garden.
- **Instruct** students to try to find insects at different stages in their life cycles, catching them in bug boxes or cups. *(If your garden doesn't have many insects or they are hard to find, collect some real life examples prior to class for students to examine).*
- **Share** what students found with a gallery walk.

Activity 2: Plant and Insect Life Cycle Comparison *(10 minutes)*

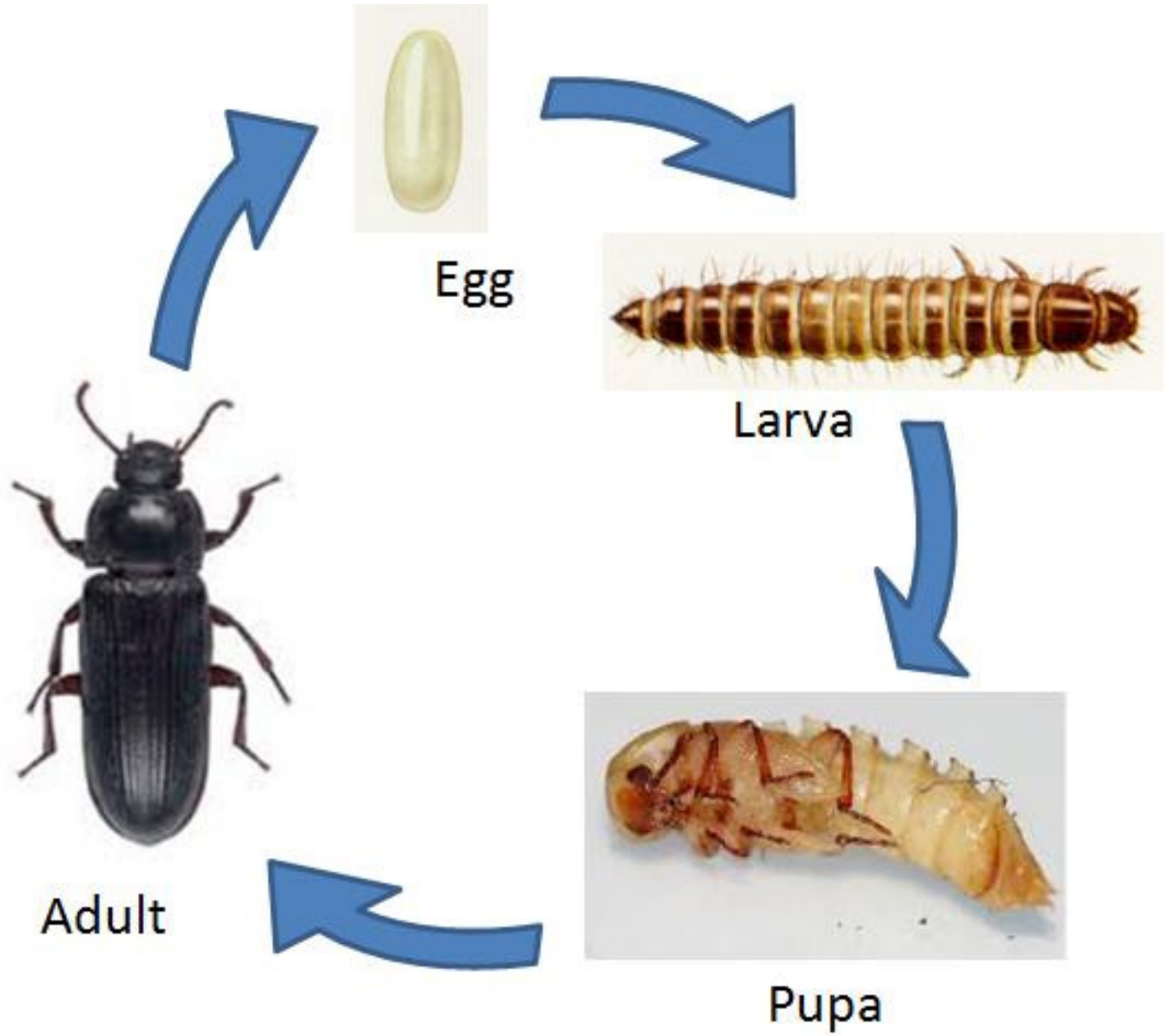
- **Split** students into groups of 3-4. Show students the Plant Life Cycle and Insect Life Cycle posters.
- **Ask** students to record 3-5 answers on a piece of paper for the following questions about the life cycles:
  - How are they the same?
  - How are they different?
  - What do you still wonder? What questions do you have?
    - Share out as full group.

Closing: *(5 minutes)*

- **Revisit** focus question: "Do insects have babies?"
  - Have students share out and record.

Additional Information:

NGSS:
[LS1.B] Growth and Development of Organisms: Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)



L. Sim. (2014). Darkling Beetle Life Cycle [image]. Retrieved on June 4th, 2019 from http://cpsteamwork6.weebly.com/animal-life-cycles.html

Second Grade Unit 2: Soil and Decomposition

OVERVIEW:

This unit familiarizes students with the components of soil and how they are created. Lesson 1 (Decomposition Experiment pt. 1) connects some of the topics covered in Unit 1, worms and insects to soil. Lesson 2 introduces students to the decomposers in the garden. Lessons 3 and 4 (Soil Composition pt. 1 & 2) introduce students to soil "ingredients," and in Lesson 6, students use edible ingredients to make a Soil Stir-Fry. In Lesson 5 (Decomposition Experiment pt. 2), students revisit their decomposition experiments and review how this process helps create healthy soil.

FOCUS QUESTIONS:

1. What happens to our garbage over time?
2. What would our garden look like without decomposers?
3. Where does soil come from?
4. Is all soil the same?

NGSS:

[ESS1.C] The History of Planet Earth: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)
[LS2.A] Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
[LS2.B] Cycles of Matter and Energy Transfer in Ecosystems: Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

Unit 2: Soil and Decomposition

Lesson #	Title	In this lesson, students will...
1.	**Decomposition Experiment, Part 1**	Be introduced to the concept of decomposition and set up a decomposition experiment by placing a variety of objects in a bag of moist soil for one month. Students will observe if and how the items decompose over time. Students will draw each object and make a simple prediction about whether or not it will decompose.
2.	**Decomposers in the Garden**	Explore the garden and hunt for the FBI (fungus, bacteria, and invertebrates). Students will record their findings in their science notebooks and generate questions about the organisms they found.
3.	**Soil Composition, Part 1**	Work in small groups as space travelers trying to decipher the composition of soil.
4.	**Soil Composition, Part 2**	Review soil components and try to make soil using rocks, water, air and organic matter. Students will use tools to compare different soil types.
5.	**Decomposition Experiment, Part 2**	Revisit their decomposition experiment and observe the results. Students will record their observations and relate their discoveries to the components of soil.
6.	**Soil Stir Fry**	Make a stir fry with different ingredients to represent the components of soil: quinoa/rice/black rice (soil), black beans and sunflower seeds (rocks), salt and cumin (minerals), and leaves (organic matter).

TITLE | DECOMPOSITION EXPERIMENT PART 1

GRADE | Second Grade

UNIT | 2

LESSON | 1

OVERVIEW | In this lesson, students will be introduced to the concept of decomposition and set up a decomposition experiment by placing a variety of objects in a bag of moist soil for one month. Students will observe if and how the items decompose over time. Students will draw each object and make a simple prediction about whether or not it will decompose.

Time: 45 minutes

Focus Question: What happens to our garbage over time?

Key Terms: DECOMPOSITION, DECOMPOSE, SOIL, ROT

Objectives: Students will be able to…
1. explain the concept of decomposition.
2. set up an experiment.
3. record observations and make predictions via writing and scientific illustration.

Materials/Prep Work:

- ☐ **Small plastic trash bags**
- ☐ **Soil**
- ☐ **Items for decomposition experiment**
  - ☐ **Sticks**
  - ☐ **Bread/bagels**
  - ☐ **Sporks**
  - ☐ **Apples**, cut in half
  - ☐ **Rocks**
  - ☐ **Banana Peels**
  - ☐ **Paper**
- ☐ **Worksheets**
- ☐ **Clipboards, pencils**

Lesson Steps:

Introduction: Decompo-what? *(10 minutes)*

- **Greet** students at the garden entrance.
- **Two-minute challenge:** Instruct students to look for something on the ground of the garden that they think belongs in the trash and bring it to the seating area.
  - **Collect** student objects in a large bin or on a table.
- **Hold up** one item at a time, including items that you will put in the experiment bag. For each item, **ask**: "What will happen to this item as it sits in our garden over time?"
  - Record student answers on the board *(also record them on paper in order to reference them during part 2 of the experiment).*
- **Say**: Today our science question is, "What happens to our garbage over time?"

Activity 1: Experiment Setup *(25 minutes)*

- **Explain** that students will set up an experiment to see how different items change over time. They will make observations after a few weeks to see what has changed.
- **Demonstrate** how the experiment will be set up and how to fill out the worksheet.
  - **Option 1: Whole class experiment**
    - **Distribute** worksheets, clipboards, and pencils.
    - Garden educator chooses the materials that will go in the decomposition experiment bag.
    - Garden educator places trays with individual items around garden.
    - In small groups, students rotate to visit to each tray and record their predictions.
      - *If students need increased support, fill out the first item as an example for the class.*
    - **Place** all items in the bag. Fill with soil and tie closed. If necessary, label bag.
  - **Option 2: Small group experiment**
    - **Distribute** worksheets, clipboards, and pencils.
    - In small groups, students decide which of the items provided by the garden educator they would like to put in the bag. They can also select additional items from the garden.
    - Students record the items added to the bag and write their predictions.
      - *If students need increased support, fill out the first item as an example for the class.*
    - **Place** all items in bags. Fill with soil and tie closed. Label bags with student names.

Closing: Reflect on Set-Up *(10 minutes)*

- **Think-pair-share** predictions.
  - Record student answers on the board.
- **Revisit** focus question: “What happens to our garbage over time?”

Additional Information:

NGSS:
[ESS1.C] The History of Planet Earth: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

Classroom Extensions:

- Show a view of a bowl of fruit decaying, in “Still Life.” [Jonathan Pascual]. (2013, May 27). Still Life by Sam Taylor-Wood [Video File]. Retrieved from https://www.youtube.com/watch?v=BJQYSPFo7hk

Blog Links:

- T. Colonnese (2015, February 26). “Spring Valley Green Schoolyard: Decompose, Break Down!” [Web log post]. Retrieved May 23, 2019, from https://springvalleygreenschoolyard.wordpress.com/2015/02/26/decompose-break-down/

Name _____ Date _____

Decomposition Experiment

Question:

What happens to different objects when they sit in a bag of moist soil for a month?

Materials:

- ☐ Plastic bag
- ☐ Moist soil
- ☐ Objects: stick, bagel, plastic spork, apple, plastic cup, banana peel, and paper

Procedure:

1. Gather all the materials for the experiment.
2. Put moist soil into the plastic bag.
3. Look at each object and draw each object in the "Before" boxes
4. Make a prediction about each object - will it change after one month? Circle yes or no. If you circle yes, write how you think the object will change over one month.
5. Place all objects in the bag with soil and tie the bag shut.
6. Wait one month.
7. After one month, open the bag and pour it out onto a tray. Search for the 7 objects and draw each one that you find. Make a conclusion about each object. Did the object change after one month? Circle yes or no. If you circle yes, write how the object changed.
8. Do you see any patterns (things that are the same or different) in the objects that changed and the objects that didn't change?

Object	**Before**		**After one month**	
	Draw the Object	Predict: Will the object change after one month?	Draw the Object	Conclude: Did the object change after one month?
1. Stick		yes / no		yes / no
2. Bread		yes / no		yes / no
3. Spork/ plastic cup		yes / no		yes / no

Object	Before		After one month	
	Draw the Object	Predict: Will the object change after one month?	Draw the Object	Conclude: Did the object change after one month?
4. Apple		yes / no		yes / no
5. Rock		yes / no		yes / no
6. Banana peel		yes / no		yes / no
7. Paper		yes / no		yes / no

TITLE | DECOMPOSERS IN OUR GARDEN

GRADE | Second Grade

UNIT | 2

LESSON | 2

OVERVIEW | In this lesson, students will explore the garden and hunt for agents of the FBI (Fungus, Bacteria, and Invertebrates). Students will record their findings in their science notebooks and generate questions about the organisms they found.

Time: 45 minutes

Focus Question: What would our garden look like without decomposers?

Key Terms: DECOMPOSITION, DECOMPOSER, FUNGUS, BACTERIA, INVERTEBRATES

Objectives: Students will be able to…
1. identify FBI in the garden.
2. explain that FBI help break down organic matter.
3. record the decomposers they find and generate questions about them.

Materials/Prep Work:

- ☐ **Members of the FBI** displayed on trays
  - ☐ **Moldy bread/food**
  - ☐ **Invertebrates (worm, roly poly, etc)**
  - ☐ **Mushroom and/or other fungus**
  - ☐ **Other examples from the garden**
- ☐ **Containers/cups** to collect FBI members
- ☐ **Magnifying glasses**
- ☐ **FBI Decomposers poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ **Worksheet** (attached below) or science notebook to record findings and write questions
- ☐ **Images** of common garden decomposers
- ☐ *Optional*: **Costumes** to dress students at fungus, bacteria, and invertebrates

Lesson Steps:

Introduction: FBI Introduction *(10 minutes)*

- **Greet** students at the garden entrance.
- **Two Minute Challenge**: Instruct students to find a leaf on the ground and bring it back to the seating circle. (If the garden does not have enough decomposing leaves, collect leaves from a different source and pass them out to students.)
- Have students get into groups of 4-5.
  - **Ask**: Do all of the leaves look the same? How do they look the same or different?
  - Have students discuss in the answer in small groups.
- In the same small groups, have students arrange the leaves in order of most green/fresh/new to most brown/dead/old looking.
- **Think-pair-share**: What is happening? Why do the leaves look different?
  - Have students share out their answer.

- **Introduce** the word DECOMPOSE. Use the FBI Decomposers poster as a visual.
  - Write it on the board and have students make up an action for DECOMPOSE.
- **Say**: Today our science question is, "What would our world look like without decomposers?"

Activity 1: FBI Hunt *(10 minutes)*

- **Challenge** each group of students to find a place in the garden where DECOMPOSITION is taking place.
  - Suggest areas like under logs, rocks, or old plants. You can also pre-mark spaces in the garden for groups to explore.
  - Once students have found DECOMPOSITION, have them look closely at the area.
  - Walk around between the areas and prompt students to think about what they notice.
- **Transition** students back to the seating area and have students share out one thing they noticed in their area.
  - Record answer on the board.
- **Think-pair-share**: What do all these things have in common?
- **Introduce** the terms FUNGUS, BACTERIA and INVERTEBRATES and explain that the FBI help break down organic matter in the garden.
  - Use the *FBI Decomposers* poster as a visual.
- **Share** with students that members of the FBI are hiding throughout the garden. Explain that it is their mission to find the FBI.
- **Think-pair-share**: What members of the FBI are in our garden?
  - Share out and record on board.

Activity 2: Record Findings and Ask Questions *(10 minutes)*

- **Distribute** worksheets with examples of FBI/DECOMPOSERS.
  - In their groups, students will return to the area in the garden where they located decomposition happening.
  - They will use the worksheet to identify DECOMPOSERS and generate questions about their findings.

Activity 3: What is the FBI? *(10 minutes)*

- **Introduce** the members of the FBI (students can be dressed as fungus, bacteria, and invertebrates or the garden educator can introduce them with hand motions).
  - FUNGUS: give students examples of fungus (mushrooms, mold, etc). Have students make the shape of mushrooms with their bodies.
  - BACTERIA: give students examples of bacteria (beneficial in yogurt, lives in and on bodies, and can also make people sick). Have students shout "bacteria!"
  - INVERTEBRATES: have students feel their spines with their fingers. Share that invertebrates are creatures with no backbone. Have students give examples of invertebrates from their FBI hunt.
- **Share** that the FBI are DECOMPOSERS. **Review** what DECOMPOSERS do.

Closing: *(5 minutes)*

- **Discuss** FBI/DECOMPOSERS.
  - How do DECOMPOSERS benefit the garden?
  - Where else might we find members of the FBI?
- Revisit focus question: "What would our garden look like without decomposers?"

Additional Information:

NGSS:

[LS2.A] Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

[LS2.B] Cycles of Matter and Energy Transfer in Ecosystems: Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

Classroom extensions:

- Listen to the song, "FBI (Fungus, Bacteria, and Invertebrates)" by the Banana Slug String Band. [Banana Slug String Band]. (2011, March 21). FBI (Fungus, Bacteria and Invertebrates) [Video File]. Retrieved from https://www.youtube.com/watch?v=cBzXhOO-MEc.

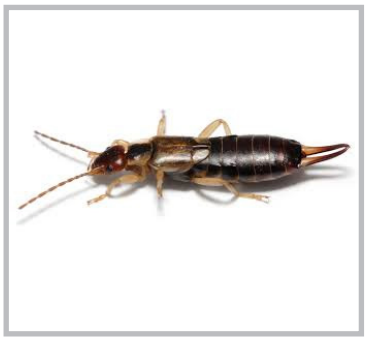
Name _____ Date _____

Decomposers in our Garden

Circle each decomposer you find around the garden.

1. Worm

2. Mite



3. Earwig

4. Slug

5. Centipede

6. Sow Bug

7. Milipede

8. Spider

9. Beetle

10. Mushroom (fungus)

11. Ant

12. Springtail

Decomposers are important because

_____

Brainstorm questions you have about the decomposers you found.

_____

TITLE | SOIL COMPOSITION PART 1 (ADAPTED FROM THE "SPACE TRAVELERS" LESSON IN LIFE LAB'S *THE GROWING CLASSROOM* ACTIVITY GUIDE[1])

GRADE | Second Grade

UNIT | 2

LESSON | 3

OVERVIEW | In this lesson, students will work in small groups as space travelers trying to decipher the composition of soil.

Time: 45 minutes

Focus Question: Where does soil come from?

Key Terms: SOIL, MINERALS, WATER, AIR, ORGANIC MATTER

Objectives: Students will be able to…
1. identify four different components in soil.

Materials/Prep Work:

- ☐ **Soil Composition poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ **Soil** in containers
- ☐ **Tweezers** for each group
- ☐ **Trowels** for each group
- ☐ **Magnifying Glasses** for each group
- ☐ **Worksheet** for each group (attached below)
- ☐ **Clipboards, pencils**

Lesson Steps:

Introduction: *(10 minutes)*

- **Greet** students at the garden entrance.
- **Explain** that the class will be transported to another place and that they will have to use their imagination to solve an important mystery.
    - **Ask** students to get into their spaceship and close their eyes (Have them act it out by putting their hands over their heads in a pointed spaceship shape). Count down from 10.
- **Tell a story**: Imagine that we are scientists from the Planet Zog, journeying to Planet Earth on the Star Ship Zogma. We have been chosen to make an important journey. The people of Zog are growing tired of raiding other planets for food, and want to find out how to grow their own food. Our astronomers have detected a faraway planet called Earth, which appears to be covered in green plants. Our computers have analyzed the reason for this and it appears to be a combination of sun, water, air, and a brownish-gray substance called "soil." On Zog we have plenty of sun, water, and air, but no soil covering the rocky ground. It is difficult for us to believe that all of Planet Earth's food comes from this substance. Our mission as scientists is to find this material called "soil," dissect it, and record each and every ingredient in our computer. This will allow us to learn the secret of this material so we can make soil back on Planet Zog. Upon landing we will break into groups of scientists. Each team will use the specially designed tools that our engineers have created just for this purpose. Remember: It is crucial to the success of our mission that each and every substance found in the soil be recorded.

Activity 1: Soil Dissection *(15 minutes)*

- **Divide** students into small groups for them to begin their investigation.
- **Distribute** trowels, tweezers, magnifying lenses, worksheets, clipboards and pencils.
- **Instruct** students to find a scoop of soil and bring it back to their investigation station. Have students dissect the soil and write down the different things they find.
    - Many groups will list among their ingredients "dirt" or "brown stuff." Challenge them to figure out what the brown stuff is. The simplest answer: It's just smaller pieces of all the other ingredients.
        - *Note: Giving silly names to tools (i.e. a "Super Scientific Soil Scooper" instead of a spoon) is a great way to excite students more!*

Activity 2: Soil Recipe *(15 minutes)*

- **Return** to the circle. Allow each team to share what they found in their soil.
    - Make a list on the whiteboard.
- **Reveal** the *Soil Composition* poster, showing the soil "ingredient" categories (45% Minerals, 25% water, 25% Air, and 5% organic matter).
- **Write** MINERALS, WATER, AIR and ORGANIC MATTER as headings on white board. Go through each of the ingredients that students found and list them under the correct heading.

Closing: *(5 minutes)*

- **Ask** students to get back in their space ships. Count down from 10 and head back to Planet Earth.
- **Ask**: What would our Earth look like if we did not have soil?
- **Revisit** the focus question "Where does soil come from?"

Additional Information:

NGSS:
[ESS1.C] The History of Planet Earth: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

References:

1. Jaffe, A., Appel, G. (2007) The Growing Classroom. South Burlington, Vermont: National Gardening Association.

Name _____ Date _____

Save Planet Zog!

What is the recipe for soil?

1. _____ 10. _____
2. _____ 11. _____
3. _____ 12. _____
4. _____ 13. _____
5. _____ 14. _____
6. _____ 15. _____
7. _____ 16. _____
8. _____ 17. _____
9. _____ 18. _____

Name _____ Date _____

Save Planet Zog!

What is the recipe for soil?

1. _____ 10. _____
2. _____ 11. _____
3. _____ 12. _____
4. _____ 13. _____
5. _____ 14. _____
6. _____ 15. _____
7. _____ 16. _____
8. _____ 17. _____
9. _____ 18. _____

TITLE | SOIL COMPOSITION PART 2 (Adapted from the "Space Travelers" lesson in Life Lab's *The Growing Classroom* activity guide[1])

GRADE | Second Grade

UNIT | 2

LESSON | 4

OVERVIEW | In this lesson, students will review soil components and try to make soil using rocks, water, air and organic matter. Students will use tools to compare different soil types.

Time: 45 minutes

Focus Question: Is all soil the same?

Key Terms: SANDY, CLAY, LOAMY, DECOMPOSITION, WEATHERING

Objectives: Students will be able to…
1. understand that soil forms very slowly, over a long period of time.
2. observe and compare different types of soil.

Materials/Prep Work:

- ☐ Space travelers **worksheets** from L3: Soil Composition Pt. 1
- ☐ **Bucket or bin** for each group
- ☐ **Water** in buckets, distributed around garden, or another water source
- ☐ Cups/watering cans for collecting water
- ☐ **Trowels** for each team
- ☐ **Clipboards**
- ☐ **A picture** comparing the size of soil particles
- ☐ At least **3 different types of soil**: Clay, Sandy and Loamy - may need to be sourced from different locations
- ☐ **Different sized sifters** (If you don't have sifters you can use large plastic containers with different sized holes punched in the bottom)
- ☐ **Signs** for eachs soil station: Clay, Sandy and Loamy
- ☐ **Soil Composition poster** (available in *Curriculum Visuals*, linked in the Table of Contents)

Student Prior Knowledge: Students should have an understanding of the components of soil through L3: Soil Composition pt. 1.

Lesson Steps:

Introduction: Save Planet Zog *(5 minutes)*
- **Greet** students at the garden entrance
- **Explain**: We will be heading back to Planet Zog. Ask students to get in their spaceships and count down from 10.
  - Ask students to share what they remember about soil from the last class.
  - Remind them of the components of soil using the Soil Composition poster
- **Say**: Today the science question is, "Is all soil the same?"
  - **Explain** that it will be their mission to discover the answer to help Planet Zog.

Activity 1: Make Soil *(10 minutes)*

- **Divide** students into the same groups from the previous lesson.
- **Distribute** the worksheet from the previous lesson, as well as a bucket or bin for students to make soil.
- **Instruct** students to collect the materials written on their worksheets from around the garden. (The garden educator can also pre-collect and provide all materials.)
- **Challenge** teams to use the raw ingredients to manufacture soil (For example, scraping rocks together, breaking twigs apart, and adding water and air.)

Activity 2: 100 year Process *(10 minutes)*

- **Return** to the circle and collect materials.
- **Ask**: Were you able to make soil? Why or why not?
- **Explain** that each inch (show an inch with your fingers) of soil requires more than 100 years to form, by the processes of WEATHERING and DECOMPOSITION. WEATHERING is when rocks and minerals are broken down by weather, including rain, wind, and ice. Our hands and tools cannot equal the power of weathering and decomposition! Also, soil is alive, with more than 100 billion microorganisms living in a pound of soil (fill a bucket with a pound of soil to show students), in addition to the roots, insects, worms, and other living things we can see in the soil. There is no recipe that could duplicate this substance so full of life and so necessary for life!

Activity 3: Soil Comparison *(15 minutes)*

- **Explain**: Not all soils are the same. The minerals in soil can be all different sizes. Introduce the terms SANDY, CLAY and LOAMY and show a diagram of soil particle size.
- Have teams **rotate** through different soil stations, sifting different types of soil at each station in order to observe the different particle sizes in the soils. Ask students to compare and contrast the different soil types.

Closing: *(5 minutes)*

- **Class Discussion:**
  - How were the soils similar? Different?
  - What plants do you think would grow best in the clay soil? Sandy soil? Loamy soil?
  - What type of soil do we mostly have in our garden?
- **Revisit** focus question: Is all soil the same?
  - Share out and record answers on the board.

Additional Information:

NGSS:

[ESS1.C] The History of Planet Earth: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

References:

1. Jaffe, A., Appel, G. (2007) The Growing Classroom. South Burlington, Vermont: National Gardening Association.

TITLE | DECOMPOSITION EXPERIMENT PART 2

GRADE | Second Grade

UNIT | 2

LESSON | 5

OVERVIEW | In this lesson, students will revisit their decomposition experiment and observe the results. Students will record their observations and relate their discoveries to the components of soil.

Time: 45 minutes

Focus Question: What happens to our garbage over time?

Key Terms: DECOMPOSITION, DECOMPOSE, ORGANIC MATTER, ROCKS/MINERALS

Objectives: Students will be able to…
1. observe that organic matter decomposes while other matter does not.
2. explain that decomposition takes time.
3. communicate their observations to their classmates.

Materials/Prep Work:

- ☐ **Bags** with soil and experiment items from L1: Decomposition Experiment Part 1.
- ☐ **Decomposition Experiment Worksheets** from each student from L1: Decomposition Experiment Part 1.
- ☐ **Trays**
- ☐ **Clipboards, pencils**
- ☐ **Crayons/colored pencils**
- ☐ **FBI Decomposers poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ *Optional*: **Soil Composition poster** (available in *Curriculum Visuals*, linked in the Table of Contents)

Student Prior Knowledge: Students know that decomposers help organic matter break down into smaller components (**L2: Decomposers in the Garden**). Students also understand that soil is made of organic matter, rocks/minerals, water, and air (**L3: Soil Composition Pt.1** & **L4: Soil Composition Pt.2**).

Lesson Steps:

Introduction: Decomposition Exploration *(5 minutes)*
- **Greet** students at the garden entrance.
- **Remind** students they set up a decomposition experiment at the beginning of the unit.
- **Ask**: "Do you remember what items we put in our experiment?"
  - Have students list out answers, record on the board
- List items one by one and **ask** students to share with a partner what they think has happened to the item.

Activity 1: Revisit Decomposition Experiment *(20 minutes)*

- **Demonstrate** how to fill in the worksheet with observations. If necessary, fill out an example as a class.
- **Distribute** worksheets, clipboards, and pencils.
  - **Option 1: Whole Class Experiment**
    - Unveil the items from the bag one at a time.

- Choose one item to look at as a class. **Discuss** what students notice.
- Place other items on trays and have students place them around the garden.
- Dismiss students to **record** their observations about the items as they rotate through the stations.
- **Remind** students to include detail when drawing and to use descriptive words.

- **Option 2: Small Group Experiment**
  - **Distribute** bags and trays to each group.
  - Students remove items from the bag and record their observations in their group.

Activity 2: Observation Explanation *(10 minutes)*

- **Ask** students to share their observations about each item. **Ask**:
  - Which items decomposed? What is your evidence that they decomposed?
  - Which items did not decompose? What is your evidence?
- **Record** student observations on the board by dividing the items into categories (decomposing and not-decomposing).

Closing: *(10 minutes)*

- **Reflect** on the experiment results together through the following questions:
  - How can you tell if an item is decomposing?
  - What do the decomposing items have in common?
  - What would the decomposing items look like in one more month? In a year?
  - Do all items decompose at the same rate?
  - What do you still wonder about the items in the experiment?
- **Revisit** the focus question: “What happens to our garbage over time?”

Additional Information:

NGSS:
[ESS1.C] The History of Planet Earth: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

TITLE | SOIL STIR FRY

GRADE | Second Grade

UNIT | 2

LESSON | 6

OVERVIEW | In this lesson, students will cook a stir fry that contains black rice or quinoa (soil), black beans and sunflower seeds (rocks), salt and cumin (minerals), and greens from the garden (organic matter).

Time: 45 minutes

Key Terms: ORGANIC MATTER, ROCKS, MINERALS

Objectives: Students will be able to…
1. name the ingredients of soil.
2. harvest from the garden and practice their cooking skills.

Materials/Prep Work:

- ☐ **Materials** from Black Bean Quinoa Stir fry (attached below). *Note: Using red or black quinoa for this recipe to make it more soil-like. Black rice is another great option that students may prefer. You could also add in some noodles to represent worms- get creative!*
- ☐ **Stir Fry Recipe** printed (one per student)
- ☐ **Soil Composition poster** (available in *Curriculum Visuals*, linked in the Table of Contents)
- ☐ **Science notebooks**
- ☐ **Pencils, markers, crayons, etc.**

Student Prior Knowledge: Students should have an understanding of the components of soil from **L3: Soil Composition Pt. 1** and **L4: Soil Composition Pt. 2**

Note: This lesson involves eating. Before the lesson, check in with the classroom teacher about students with food allergies.

Lesson Steps:

Introduction: Eat Dirt! *(5 minutes)*

- **Greet** students at garden entrance.
- **Provide** hand sanitizer or ask students to wash their hands at a hand-washing station.
- **Ask students to name** the ingredients of SOIL (MINERALS, ORGANIC MATTER, AIR and WATER). Use the *Soil - Composition* poster as a guide.
    - Include movement or hand gestures for students to use as the say the names
- **Explain** that students will be eating soil during the lesson!
- **Ask** students to turn to a partner and make guesses about how we might eat soil.

Activity 1: Cooking Stir Fry *(20 minutes)*

- **Review** proper cooking procedures (Keeping hands off of the hot stove top, washing hands, etc.)
- **Prepare** the soil stir fry as described in the recipe below.

Activity 2: Soil Stir Fry Recipe *(10 minutes)*

- **Discuss** how each ingredient in the recipe represents a part of SOIL.
  - There is WATER in the ORGANIC MATTER, quinoa and oil.
  - By stirring we are adding AIR.
  - ROCKS are represented by quinoa, seeds and beans.
  - Smaller MINERALS are salt and cumin.
- **Instruct** students to record the recipe in their science notebooks, drawing a picture of each ingredient and connecting it to the different elements of soil.

Closing: Enjoy! *(10 minutes)*

- **Pass out** small trays with forks, adding a small portion of stir fry to each. Instruct students to wait for everyone to be served before eating.
- **Thank** the garden and eat together.
- Ask students to name which parts of the stir fry represent each part of soil.
  - **Record** answers on the board with pictures.
- **Ask** students to share their favorite parts of the stir fry.

Black Bean Quinoa Stir Fry

Materials:

- ☐ **Stove**
- ☐ **Pan**
- ☐ **Spoon** for stirring
- ☐ **Bowls filled with water** for washing harvested produce
- ☐ **Plates, spoons/forks**

Recipe:

Ingredients

- ¼ cup oil
- 2 tsp cumin
- 4-5 cloves garlic, minced
- 1 can black beans, drained and rinsed
- Greens from the garden, one leaf per student (kale, spinach, chard, tatsoi, etc.)
- ⅓ cup sunflower seeds
- Salt & Pepper
- 3 cups pre-cooked grain (Using red or black quinoa for this recipe to make it more soil-like. Black rice is another great option)
- *Optional*: other veggies of your choice!

Instructions

1. Prepare quinoa, garlic, and beans ***before class***.
2. Demonstrate how to harvest greens from the garden. Make sure greens are properly identified.
3. Instruct students to harvest 1-2 leaves each
4. Demonstrate how to wash leaves in large wash bins with water
5. Instruct students to rip leaves into bite sized pieces and place them into a large bowl.
6. Heat 2 tbsp oil, cumin and garlic over low-medium heat.
7. Add leaves one handful at a time, letting students stir or add leaves if desired.
8. Continue cooking leaves, adding oil as needed. When all leaves are tender, add beans, quinoa, and seeds.
9. Season to taste. Serve and enjoy!