

# Science Soil Experimentation



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## Overview:

In this lesson, students will engage in the scientific process to determine what type of soil will grow the tallest kale plants - clay, loam or silt. Students will make observations about the soil that plants grow in around the school. They will then form a hypothesis of what type of soil would be best for their plant, then conduct the experiment by planting one seed in each type of soil that provides the plant's needs of air, water, nutrients, and sunlight. After a few weeks of caring for their plants, students will estimate the height of each plant, measure the heights using standard tools, and compare the difference in height of each. Based on their observations, students will draw conclusions about which type of soil is best for kale to grow in and then will share their results.

Time Needed: 40 minutes on first day, 15 minutes on day a few weeks later

## Georgia Performance Science Standards:

- Habits of Mind (K-2):
  - SKCS1/S1CS1/S2CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.
  - SKCS7/S1CS7/S2CS7. Students will understand important features of the process of scientific inquiry.
  - SKCS3/S1CS3/S2CS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.
  - SKCS5/S1CS5/S2CS5. Students will communicate scientific ideas and activities clearly.
  
- Earth Science / Life Science:
  - Kindergarten
    - SKE2. Students will describe the physical attributes of rocks and soils.
      - a. Use senses to observe and group rocks by physical attributes such as large/small, heavy/light, smooth/rough, dark/light, etc.
      - b. Use senses to observe soils by physical attributes such as smell, texture, color, particle/grain size.
      - c. Recognize earth materials— soil, rocks, water, air, etc.

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- 1st Grade:
  - S1L1. Students will identify the basic needs of a plant: air, water, light, nutrients.
- 2nd Grade:
  - S2L1c. Investigate the life cycle of a plant by growing a plant from a seed and by recording changes over a period of time.
- Measurement
  - Kindergarten
    - CCSS.MATH.CONTENT.K.MD.A.2. Directly compare two objects with a measurable attribute in common, to see which object has “more of” / “less of” the attribute, and describe the difference.
  - 1st Grade
    - CCSS.MATH.CONTENT.1.MD.A.2. Measure and estimate lengths in standard units.
  - 2nd Grade
    - CCSS.MATH.CONTENT.2.MD.A.1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
    - CCSS.MATH.CONTENT.2.MD.A.3. Estimate lengths using units of inches, feet, centimeters, and meters.
    - CCSS.MATH.CONTENT.2.MD.A.4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

## Objectives:

- Students will express curiosity about how the world works and will understand the process of scientific inquiry.
- Students will describe the physical attributes of loam, clay, and soil, including smell, texture (smooth, rough), color (dark, light), particle size (large, small), and weight (heavy, light).
- Students will recognize earth materials soil, rocks, water, and air, and identify how they provide plants with their needs of nutrients, water, air, and light.
- Students will investigate the life cycle of a plant by growing a plant from a seed and by recording changes over time.
- Students will estimate, measure (with standard tools), and compare the difference in the height of the plants, and will communicate scientific ideas clearly.

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## Materials:

- Trowels (one per small group)
- Magnifying Glasses (one per small group)
- Kale seeds (three per small group)
- Identical cups with drainage holes (three per small group)
- Different soils: loam, clay, sand

## Outline:

- Engage: Make an Observation / Conduct Research
- Explore: Ask a Question / Form a Hypothesis
- Explain: Conduct an Experiment
- Extend: Draw Conclusions / Share Results

## Lesson Plan:

- Engage (small groups / in the garden) - 15 minutes:
  - Scientific Method: Make an Observation / Conduct Research
    - Observe the plants growing in the garden and various outdoor spaces around the school to recognize the many different types of soil that plants grow in.
    - Small groups can use a trowel to pull up some of the soil in each location then touch and look closely with a magnifying glass before articulating what they observe about the soil using the words that describe:
      - Smell
      - Texture (smooth, rough)
      - Color (dark, light)
      - Particle Size (small, large)
      - Weight (light, heavy)
- Explore (whole group / in the classroom) - 5 minutes:
  - Scientific Method: Ask a Question
    - Ask students if making those observations and doing some research into describing the types of soils brought up any questions in their mind - particularly as they plan to plant their kale seeds.
    - Guide students to asking "What type of soil will our kale seeds grow the tallest in?" (Note that if the students ask "What type of soil will the kale like the best?" or a question similar, to reframe it to address a measureable attribute like the plant's height).

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## Scientific Method: Form a Hypothesis

- Introduce students to the three main types of soil:
  - Loam: soil with equal parts of sand, silt, and clay
  - Clay: soil with the smallest particles; water does not pass through easily
  - Sand: soil with the largest particles; water passes through easily
- Allow them the opportunity to touch, smell, and look closely at each.
- Ask students to each come up with their own hypothesis to write on a sentence frame: "I think the kale plants will grow the tallest in \_\_\_\_\_ (clay, loam, or silt) because it is \_\_\_\_\_ (describing words)."

- Explain (small groups / in centers) - 20 minutes:

## Scientific Method: Conduct an Experiment

- Explain that we are going to conduct an experiment to figure out the answer. Each small group will plant one kale seed in clay, one in loam, and one in sand.
- Small groups can travel between centers to plant their bean seeds in each of 3 different types of soil (in labeled containers).
- When seeds have been planted, ask students to recall what plants need to grow and create a plan to account for each:
  - Nutrients: seeds are planted in soil
  - Air and Light: pick a location with plenty of light
  - Water: develop a plan for watering each the same amount each day

- Extend (small groups / in the classroom on a day a few weeks later) - 15 minutes:

## Scientific Method: Draw Conclusions

- A few weeks later, students in their small groups can estimate the height of their plants, measure the height of their plants using standards tools and compare the difference in the height of the three plants.
- Based on their comparison, small groups can discuss which type of soil grew the tallest kale plant for their group and brainstorm why that may be true.

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## Scientific Method: Share Results

- Each of the groups can share their results and conclusion and explain their ideas of why the experiment may have turned out as it did.
- The teacher will help students aggregate all of the groups results (recognizing that the results may not have been the same with every group) for the class to come to a broad conclusion about the best type soil for their kale plants.

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- Evaluate:

## Example Evaluation

Engage		
SKCS7/S1CS7/S2CS7.	Student participated in making an observation and conducting research.	
SKCS1/S1CS1/S2CS1.	Student exhibited curiosity in an effort to understand how the natural world works.	
SKCS3/S1CS3/S2CS3. SKE2a-c.	Student used tools (trowels & magnifying glasses) to observe).	
SKE2a-c.	Student used their senses to observe and described the physical attributes of soil.	
Explore		
SKCS7/S1CS7/S2CS7.	Student participated by asking a question and forming a hypothesis.	
Explain		
SKCS7/S1CS7/S2CS7.	Student participated in conducting the experiment.	
S1L1.	Student identified and provided the basic needs of the plant: air, water, light, and nutrients.	
S2L1c.	Student investigated the life cycle of a plant by growing a plant from a seed and recording the changes over time.	
Extend		
SKCS7/S1CS7/S2CS7.	Student participated in drawing conclusions.	
SKCS5/S1CS5/S2CS5.	Student communicated scientific ideas clearly in results.	
CCSS.MATH.CONTENT.K.MD.A.2.	Student directly compared plants to see which was taller.	
CCSS.MATH.CONTENT.1.MD.A.2.	Student estimated the height of each plant in standard units.	
CCSS.MATH.CONTENT.2.MD.A.1	Student measured the height of each plant by selecting and using appropriate tools.	
CCSS.MATH.CONTENT.2.MD.A.4.	Student measured to determine how much taller one plant was than another.	
		TOTAL: ___/100