Grade Level: Fifth grade

Duration: 4 weeks

Driving Question for the Unit: What is a foot under your feet?

Next Generation Science Standards

Standard 5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact

- Science and Engineering Practices: Developing and Using Models; Using Mathematical and Computational Thinking; Obtaining, Evaluating, and Communicating Information
- Disciplinary Core Idea: 5-ESS2.A Earth Materials and Systems
- Crosscutting Concepts: Scale, Proportion, and Quantity; Systems and System Models

Learner Outcomes for the Unit:
Assessments for the Unit:
- Pre-Assessment: KWL
- Post Assessment: Soil Presentation to Greenhouse

Overall Plan: The purpose of this unit is to introduce project-based learning to a fifth-grade class. Students will explore soil, make observations and design experiments using soil. They will learn how to classify soil and will discover that soil can vary a great deal. They will also learn how to write a procedure and to follow it to conduct an experiment. They will construct diagrams and graphs and use them to analyze their soil samples. The Top Soil Tour by La Motte will be used to test the soils. There are many jumping-off points that develop along the way. It is difficult to look at this plan linearly. It is meant to be more fluid. Some students will be ready to conduct experiments before others. Time needs to be built in for these individual projects.

Materials needed for this unit: Top Soil Tour by LaMotte (includes reagent tablets that test soil texture, pH, nitrogen, phosphorus, and potassium, plus enough sample test bags for 50 students), test tubes with screw tops, graph paper, poster board, markers, journals, soil samples, computer access, rulers, distilled water, light bank, radish seeds, video camera, magnifying glasses, and microscopes

PBS Unit At A Glance				
PBS Title: What is a foot under my feet?				
Week 1				
Monday	Tuesday	Wednesday	Thursday	Friday
• Introduction to Soil • Introduction to Journal writing • KWL chart	• What is Soil? • Soil Observations	• Continue what is soil • Generate questions	• Soil Texture and Classification	• Soil Texture and Classification
Week 2				
Monday	Tuesday	Wednesday	Thursday	Friday
• Testing soil pH • Making soil extraction • Learning how to collect data	• Nutrient cycle and Soil extraction	• Testing soil for Nitrogen • Importance of Nitrogen to plant growth	• Testing soil for Potassium • Intro to Periodic Table	• Phosphorus Testing
Week 3				
Monday	Tuesday	Wednesday	Thursday	Friday
• Finish up Top Soil Tour • Begin individual exp • Intro to procedures, Variables and Controls • Radish races	• Intro to collaboration • Intro to scientific method • Radish races	• Designer Soil Project • Radish races	• Designer Soil Project • Radish races	• Designer Soil Project • Radish races
Week 4				
Monday	Tuesday	Wednesday	Thursday	Friday
• Designer Soil Project Presentations • Radish races	• Radish races	• Radish races	• Radish races	• Radish races

Journal Entry Guidelines for Soil Observations

Name_____
Date_____

Soil Observation and Classification

What I:

See	Hear	Smell	Feel

Try to sort the soil into piles that have the same type of ingredient in each pile. Divide the box below into the number of piles you have. Describe each of your piles by the way they look and feel.

Now share with a neighbor then answer the questions below using complete sentences:

Does your neighbor have the same number of piles?

How are you and your neighbor's soils the same?

How are they different?

Whose soil is better?

How do you know?

Write down two questions you still have about soil.

Rubric for assessing KWL and soil observation journal entries:

Category	**4**	**3**	**2**	**1**
Date	All entries are dated	At least 3 of the weeks entries are dated	Just one of the entries are dated	No entries are dated
Entry of what you did on this date.	There is an entry for each day. The entries have complete sentences and are written neatly.	There is an entry for at least 3 of the days. They are made up of complete sentences.	The entry is written in a complete sentence.	Entry has no complete sentences or there is no entry
What did you learn?	Entry is made in at least three of the week's entries and is in a complete sentence.	Entry is made at least twice in the week's entries and is in a complete sentence.	At least one entry is made and it is in a complete sentence.	Entry has no complete sentences or there is no entry
What do I wonder?	Entry is made in at least three of the week's entries and is in the form of a question that may lead to further investigation.	Entry is made in at least two of the week's entries and is in the form of a question that may lead to further investigation.	Entry is made in at least one of the week's entries and is in the form of a question that may lead to further investigation.	Entry has no complete sentences or there is no entry

Journal Entry Guidelines for Soil Investigations

1. Date All Entries
2. In your journal/logbook, please generate at least 3 questions about today's topic that you would like to research further.
3. Meet with the teacher to discuss your list of questions.
4. Decide on which question to investigate and write it in your journal labeled as Question.
5. Take some time to really think about your question and come up with a Claim or Hypothesis. What do you believe the answer to this question is? Write this in your journal and label it.
6. Design an experiment that will help you to answer your question. Make sure to write the materials and the procedure in your journal/logbook.
7. Conference with the teacher and have them give you the go ahead to start your experiment.
8. Conduct your experiment and collect your data each day. Make sure you date each entry.
9. Once you have concluded your experiment you may begin analyzing your data.
10. You must make a data table that includes the dates and times of collection along with the observations. **Label this Evidence**. See the teacher so that this may be added to your journal.
11. Using this data table you must construct a graph. You may use graph paper or excel. The graph must contain a Title, the horizontal and vertical axis must be labeled with units of measurement included. The numbering of the axis must be consistent. Label this evidence. See the teacher so that this may be added to your journal.
12. Take some time to look at your evidenced and think about what it tells you.
13. Make an entry in your journal/logbook that states whether your evidence supports your claim and why or why not. (in 1 or 2 sentences)
14. Make an entry in your journal labeled Reasoning and begin explaining:
    - What happened,
    - Why you think it happened,
    - What would you do differently,
    - What would you do next?
15. Please number them as they are numbered here.

Rubric for assessing investigation journal entries:

Category	4	3	2	1
Are the 4 essential categories present?	All categories are present and labeled.	All categories are present but all are not labeled	1 or 2 categories are missing.	More than two categories are missing
Is there a dated entry for each day?	Each day is dated.	80 % of days are dated.	60 % of days are dated	Below 60% of days are dated.
Is there a complete data table for results?	Data table is complete	Data table is missing 1 of the required areas	Data table is missing 2 of the required areas	No data table present
Is there a graph that is completely labeled?	Graph is completely labeled.	Graph is missing one requirement.	Graph is missing 2 requirements	Graph is missing more than two requirements
Do the results support the claim? Why or why not?	Question is answered and has an explanation	Question is answered with a weak explanation	Question is answered no explanation	Question is not answered or explained
Is the reasoning fully explained? (what happened, why you think it happened, what would you do next, what would you do differently)	All four areas are addressed.	Three of the four areas are addressed	Two of the four areas are addressed.	Less than two of the areas were addressed