

**Duration: 4 days (1 hour each)**

### MATERIALS

2 paper cups per child  
Containers to catch water  
Newspapers  
Magnifying glasses  
Chart paper  
Soil Color charts  
Paint swatches (optional)  
Science Journals  
Overhead – Properties of Soil

### RESOURCES

Book: [Dirt: Jump into Science](#) by Steve Tomecek

Book: [A Handful of Dirt](#) by Raymond Bial

[Blueprint For Life/Work Designs – The Quick Reference Guide](#)

### INSTRUCTIONAL METHODS

Direct Instruction  
Cooperative Learning  
Brainstorming  
Discussion  
Small Group Discussion



### LESSON OBJECTIVES

- ✓ Students will explore and experience work-related activities at school (BP 9.1.2, 9.1.5)
- ✓ Students will understand that an Agricultural Engineer finds solutions to issues involving plants, animals, and the natural environment
- ✓ Students will explore and describe a variety of soils and find similarities and differences among them
- ✓ Students will compare the absorption of water by different soils, and describe the effect of moisture on characteristics of the soils.

### BACKGROUND INFORMATION

Professional Engineers and Geoscientists are involved in every part of our daily lives ... the houses we grow up in and schools we learn

in, the cars we drive and roads we travel, the natural resources we use and the environment we affect. We depend on engineers and geoscientists to improve our quality of life and enhance our range of opportunities, all while protecting the environment.

Agricultural Engineers are involved in the development of more efficient machines to seed, harvest and process crops, work on irrigation projects, and help increase crop yields. They also help find ways to sustain our natural resources by preventing soil erosion and conserving water systems.

### MOTIVATIONAL SET

Explain to students that today, and over the next couple of days, they will all be agricultural engineers. They are to study soils on the school grounds, record information about the two different types in their science journal, and create a web that exemplifies the properties of each kind of soil. Before reading a book about soil: [Dirt: Jump into Science](#) by Steve Tomecek; or [A Handful of Dirt](#) by Raymond Bial, have the students use their prior knowledge to tell you what soil is, what is in it, and where they think soil comes from.

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## PROCEDURE

*Sections of this lesson plan were adapted from a Grade Three Lesson Plan, Properties of Soil, developed by the Ohio Department of Education.*

### DAY ONE

1. Take students out to the schoolyard. With one of their paper cups, have them collect soil samples from the playground (sand) and with the other cup, they will collect soil samples from the front flowerbed (dirt). Once they return to class, have them cover their workspace with newspaper. Students draw two large circles on the paper. Explain that the engineers would now begin classifying each type of soil by the properties that they had. Have them pour one soil sample into one circle, and the other into the second circle. Pass out magnifying glasses. Give them some time to do some free exploration before they are asked to begin classifying. Discuss with the students what label we could give to these two soil samples (sand and dirt, 1 and 2, flower bed and playground). Once consensus is reached, have them label their circles.
2. Show overhead of the classification chart, or draw on the board:

	Color	Texture	Drainage
Sand			
Soil			

3. Explain that we will first explore the property of color, or how the soil looks. Have students try to match a crayon color to each of their soil samples. Pass out the soil color charts to each student (this is available for download from the APEGS website [www.apegs.sk.ca](http://www.apegs.sk.ca), click 'About Us', 'Youth Programs'). Explain how agricultural engineers would use similar charts to determine the soil's property of color. Students cut out the rectangle in the middle of the chart and lay it over their first soil sample. They try different crayon colors in each square to try and make a match. They continue until they find the one that best matches. Have them circle their best match. Repeat for the second soil sample using a new color chart. Once they have found their colors, students can share them as you record on a t-chart paper – colors for sand and colors for soil. (Another option for matching soil colors is by using paint swatches from hardware stores). Students need to put soil samples back into cups with their names on each for future use, fold up their newspapers and they need to thoroughly wash their hands.
4. Students need to record in their science journals two to three sentences summarizing what they learned about the property of color today and how engineers use that information to categorize soils.

### DAY TWO

5. Review the chart on the overhead that reviews the properties of soil we are going to explore. Review the job of an agricultural engineer and how they need to investigate the properties of soil to help them determine which soil helps plants grow best.
6. Pass out newspapers and soil samples. Have students pour their samples back into the appropriate circle. Give them another opportunity to explore and examine their soil samples

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with a magnifying glass. Review the colors we used to describe the sand and dirt soil samples. Explain that today we are going to examine the property of texture. Texture means how a soil feels. Give students an opportunity to feel each soil sample. Have them record their findings on a piece of paper labeled Texture of Sand/ Texture of Soil. Students need to put soil samples back into cups with their names on each for future use, fold up their newspapers and they need to thoroughly wash their hands.

7. Have them share their findings as they are recorded on a t-chart labeled Texture of Sand/ Texture of Soil. Discuss the different terms used to describe the texture of each soil. Discuss how soil is different at different locations.
8. Students need to record two or three sentences in their science journal about the property of texture, including a drawing of each type of soil with some descriptive words to match their drawing. Their writing should include the understandings that soils from different locations can have different textures, and that texture means the way that something feels.

### **DAY THREE**

9. Explain that agricultural engineers also want to know how well water and air moves through soil. We have studied the properties of color and texture. Now we want to look at how well air and water can flow through each soil sample. Too little drainage means the plants could rot because it would always be too wet. Too much drainage means that plants would not get enough water to drink and they would die.
10. Have students keep their soil in their paper cups. Spread out newspapers onto desks. Students poke a small hole in the bottom of each cup. Pass out an empty container to each student to catch the water that runs through the cups. Have students pour  $\frac{1}{2}$  of a paper cup full of water into their first soil sample. Observe findings. Repeat for the second soil sample.
11. Record on a t-chart labeled: Drainage for Sand/Drainage for Soil. Students share their findings. Discuss which soil would be better for plant growth and why. Students write two or three sentences about the property of drainage in their science journal. They should include the understandings that different soils hold water differently and that soils with the right amount of drainage aid in plant growth.

### **DAY FOUR**

13. Review and discuss the soil properties that have been explored; color, texture and drainage. Explain that agricultural engineers use this information to determine which soil would promote the best plant growth. Explain that today they are going to summarize their learnings by creating a Properties of Soil Web. In their science journals, students need to create a title of their web in the middle of their page: Properties of oil with a large bubble around it. From that they need to create the three properties; color, texture and drainage each in their own bubble, spaced apart adequately. From each bubble, they need to come up with some of the findings that we brainstormed on the t-charts. For example, around the bubble "color", students need to write down some of the colors that they found for sand and dirt. When they are finished, each bubble should have some words branched around it that would display their deeper understandings about the properties of soil. After they have finished their webs, the class should return their soil samples back outside to the location they took them from.

## DEBRIEF

Allow students time to discuss the following questions:

1. What are some properties of soil?
2. Which field site would be better for growing plants and why?
3. Why did we return the soil samples to the location we took them from? (Sustainability)
4. What does an Agricultural Engineer do? What would you like/dislike about this type of work?
5. What other types of jobs might there be in the agricultural or engineering field?

## ASSESSMENT RUBRIC

<b>3</b>	<b>EXCEEDING</b>	Science journal is complete with no significant errors.	Student made reasonable and accurate predictions.	Student recorded accurate observations about the properties of soils.	The student was actively engaged in exploring work-related activities in the home, community, and school.
<b>2</b>	<b>MEETING</b>	Science journal has all areas filled in with few significant errors.	Student made reasonable predictions.	Student recorded observations about the properties of soils.	The student was mostly engaged in exploring work-related activities in the home, community and school.
<b>1</b>	<b>BEGINNING TO MEET</b>	Science journal is mostly incomplete and contains significant errors.	Student made unreasonable predictions.	Student recorded observations about the properties of soils are incomplete or have significant errors.	The student was rarely engaged in exploring work-related activities in the home, community and school.
<b>0</b>	<b>NOT YET MEETING</b>	Little or no attempt at completing science journal.	Student made no predictions.	Student made little or no attempt to record observations about the properties of soils.	The student was not engaged in exploring work-related activities in the home, community and school.

This lesson plan is available for download at [www.apegs.sk.ca](http://www.apegs.sk.ca) (click "About Us", "Youth Programs").