Dirty Clues

Teacher Information

Summary:

Who stole a truck and left it at a landscaping worksite? In this lesson, students compare soil samples from the truck's tires to samples from various locations and from landscapers' boots. By observing soil components under a microscope, they determine the location of the samples and solve the crime.

Objective:

- Students will observe several soil samples, describe them, and decide if two came from the same location.

Materials Needed:

1. Soil sample from crime scene (Sample CS)
2. Soil sample from Austin's boots (Sample A)
3. Soil sample from Bill's boots (Sample B)
4. Soil sample from Caleb's boots (Sample C)
5. Soil sample from victim's yard (Sample D)
6. Soil sample from Austin's yard (Sample E)
7. Stereo microscopes
8. Slides
9. Spoons or spatulas
10. Dissecting needles
11. Small metric ruler

Procedure:

1. Read the background information to your students and then have them read "The Crime".

2. Copy the Student Information Page for each student or for each group of students. This activity works best if done in groups of 2 or 3 students.

3. Collect 5 different soil samples. Divide one of the samples into two parts. Label one part "Sample CS" and the other part "Sample A." Label the remaining samples as "Sample B," "Sample C," "Sample D," and "Sample E."

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Background Information:

Soil can serve as valuable evidence in a criminal case. Soil at a crime scene can be transferred to other locations while on a person's clothing or on a person's vehicle. That is how soil can provide a link between a crime scene and a suspect.

Side-by-side visual examination of color is the first step in comparing two soil samples. There are more than 1,000 colors of soil. Color comparison should always be done on dry samples because moisture tends to darken the color of soil.

Soil also contains a variety of materials. Under the stereo microscope, natural materials, such as animal and plant matter and artificial debris, can be seen and identified. Often, artificial debris can be found in a soil sample. This material can be helpful in determining the soil's origin. Artificial debris can include pieces of glass, paint chips, asphalt, brick fragments, and other items. These objects can make soil unique.

Under a compound light microscope, types of rocks and minerals can be identified. More than 2,200 types of minerals exist. Rocks are made of combinations of minerals and exist in thousands of varieties.

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Dirty Clues

Student Information Sheet

The Crime:

Bill Hubbard owns and operates a landscaping company. Bill and his two employees, Austin and Caleb, specialize in removing unwanted trees from land where houses are being built. All three men wear heavy-duty, waterproof boots when they work.

When Bill and his workers arrived at the work site this morning, they found an abandoned truck. Caleb called the police, and an investigator was sent over immediately. The truck was quickly identified as one that had been stolen the night before. The truck happened to have been stolen from Austin's neighbor.

The investigator carefully looked over the truck, trying to find any clues about what had happened to it and how it had arrived on the work site. The investigator noticed that some of the dirt on the tires and wheels were fresh. Most of the soil that he could see looked like dirt from the work site. However, this recent dirt was layered on top of some other soil. The bottom layer of dirt was clearly different from the work-site soil.

The investigator collected some of both layers of soil from the crime scene truck. He carefully packed the soil samples in plastic bags and labeled them "Crime Scene Soil Samples—wheels of truck." He then asked each member of Bill's crew to give him soil samples from their boots. He was suspicious of these men because one of them was a neighbor of the victim. Soil samples were also taken from the victim's yard, and from Austin's yard.

Procedure:

1. Place about one-half teaspoon of "Sample CS" on a microscope slide. Describe and record the color of the sample in the Data Table.

2. Place the slide under the stereo microscope and focus under low power. Then change to high power and sharpen the focus.

3. Examine the contents of the slide carefully. Separate the oil with the dissecting needle if necessary.

4. Count the number of pieces of plant matter in the sample. Record this number in the Data Table.

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5. Count the number of soil particles that are larger than 5mm (millimeters). Record this number in the Data Table.

6. Examine the soil for any artificial debris. List and describe the debris in the Data Table.

7. Repeat steps 1-6 for the other soil samples.

Data Table
Description of Soil Samples

Samples	*Color*	*Number of pieces of plant matter*	*Particles larger than 0.5mm*	*Type and number of artificial debris*
CS				
A				
B				
C				
D				
E				

Name_____ Date_____

Questions

1. How can soil be used as evidence in a crime?

2. What types of artificial debris might be found in soil?

3. Which two soil samples are most alike in color?

4. Which two soil samples are most alike in amount of plant matter they contain?

5. Which two soil samples are most alike in the number of particles, 0.5mm or larger, that they contain?

6. Which two soil samples are most alike in the artificial debris that they contain?

7. Based on your findings, is the crime-scene soil sample the same as any of the other soil samples? Explain your answer.

8. In at least one or two paragraphs, write an end to this criminal investigation. Make sure your story goes along with your findings from the lab.

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Answers

1. Soil at a crime scene can be transferred to other locations. It can be carried on a person's clothing or shoes or on a car. Soil that can be linked to a crime scene and a suspect can provide a link between the two.
2. Pieces of glass, paint chips, asphalt, brick fragments, and other items.
3. CS and A
4. CS and A
5. CS and A
6. CS and A
7. Yes, it is the same as sample A.
8. Answers will vary.