



Rock Solid Geology Lab

By Susan Cabello

Supplementing the section on tire tread marks, and to emphasize the importance of geology in forensics, the students are introduced to soil (sand) sample analysis. This will be my third year teaching this subject in a low income, high risk high school. Martin High School is also changing to block schedule so I have had to reduce a complete year curriculum to two new school years in one. Most of the equipment I already have from when I first started teaching and I had everything stored away. I have one or two labs per week and almost everything in the labs I have either bought or created. I make my own prepared slides. The students make their own black lights using their cell phones, additional microscopes using their cell phones, fingerprint powder from used ink toner cartridges, and makeup brushes for fingerprint bushes. Everything is homemade except for the school microscopes. Please see the sidebar for more details.

After the tire tread mark lab I give a small introduction to geology with how to visualize percentages of soil (sand) samples. The samples are taken at locations within a mile perimeter from the high school.

Students must view each sample side-by-side with evidence samples under a stereo microscope. They must note differences in colors, the sand shapes, the sand textures, and come to the conclusion of whether they have the correct matching location, or they do not. If they find a match then they will examine the Laredo (our area) map from which they can tell where that sample was taken and thus locate the crime scene.

Included below are teacher instructions for how to take soil samples and for preparing the sand samples.. I had sand samples in my geology lab that were used instead of soil. It's easier on the students because sand is larger in particle size and therefore easier to view. If you do not have sand on hand you can take your own soils samples. Here in Texas much of our soil is sand.

If you take a sampling of soils from around your location at intervals of a mile apart, and you have those samples on prepared microscope slides, then it is easier to locate the possible site of a crime which has soil samples as evidence.

Materials:

- Six prepared soil slides in a microscope slide box identified by GPS Number, or location
- Sample of soil from crime scene in a Ziploc bag (CS evidence)
- Six prepared slides
- Scoopula
- Micropipette
- Small plastic containers
- Six sandwich baggies with different sands labeled (knowns)
- Map of home town
- (Wall-e) Stereo Microscope (2x-4x)
- (Photos 1 & 2)
- Beaker with water
- Sandwich baggies with unknowns

TEACHER SLIDES:

Materials

- Six clean slides per group of 4 students (I have 24 students)
- Six Clean slide covers
- Six Microscope slide box
- Six original soil samples from six different locations
- Six Ziploc bags
- Toothpicks
- Superglue

Procedure

1. Take a clean microscope slide and place a drop of superglue in the center.
2. Take a sample of soil sample #1 and place it on the glue.
3. Identify sample number one by writing Sample #1 on the Ziploc containing that sample soil and the microscope slide. If using other identification markers such as GPS coordinates, make sure it's the same on the Ziploc and the prepared slide. If using the actual Location, make sure it's on the Ziploc and the prepared slide.
4. Using the toothpick spread the soil sample on the slide carefully, evenly, and not clumped together.

5. Place the slide covers carefully on the slides.
6. Let the slides dry overnight.
7. Place six different slides in each Microscope slide box
8. Now you can place each box with the other student materials on each lab table and let the researching begin.

HOW TO TAKE A SOIL SAMPLE

In order to take a good soil sample for a forensics lab, first get a map of the area surrounding your school. This can be a paper map from your local tourist board or Chamber of Commerce or one from Mapquest.com or Google Maps. Using the legend, mark off a perimeter you have easy access to. Only take soil from dry areas. Make sure the tools you will be using are clean if not new. (You do not want to contaminate the sample) Remember to treat this like your laboratory. If your school allows field trips you could take your students to help you with this.

Materials:

- Local area map (Paper or digital)
- 1-6 Soil-sampling probe(s), auger(s), or simple spade(s) or shovel(s) (DO NOT use galvanized or brass tools, they may contaminate the soils samples)
- 1-6 Small clean plastic container per sample
- 1-6 gallon size Ziploc® bag(s)
- Sharpie® or marker (any color)
- 1-6 Small brush(es) (car whisk broom, or 5" paint brush)

Procedure

1. After acquiring a map, use the legend of make your own legend to select six or more sample sites.
2. With a Sharpie® or marker make a mark on your sample sites. You can also use GPS coordinates.
3. Using one of the four mentioned digging tools go to the first site. I prefer to use a garden spade, you can find one at the Dollar Tree, and they are light and inexpensive.
4. When you get to the first sample site, brush the area lightly to remove erosion soil until you see the area topsoil (harder soil). **Remember** to thoroughly wash the brush after use or use a new (clean) one on the next sample site.
5. Dig a V-shaped hole, approximately 4-6" deep.
6. Cut a thin slice (approximately ½ " down the side of the V-shape,
7. Place your first sample into the plastic container. Take two more samples from the first sample site using the sample procedures and place sample into same plastic container.
8. Mix the samples well in the plastic container.
9. Fill a gallon Ziploc® bag approximately 1/3 of the bag and label the bag with the Sharpie® with Sample 1, the exact location (Street Names) and/or GPS coordinates.
10. DO NOT forget to fill the holes back in with the hole soil and other unused soil to avoid tripping accidents.
11. Continue following steps 3-11 for the other 5 sample sites.

After you take your labeled Ziploc® baggies back to school you can prepare the slides for the lab and choose your crime scene location slide.



Photo 1

STUDENT SLIDE PREPARATION PROCEDURE:

Step 1: Arrange your prepared slides in a comfortable order. Some place them by number, some by GPS numbers, some by location description. The system depends upon what is more comfortable for the researcher. (Photos 3 & 4)

Step 2: Take the sample of the evidence and prepare a slide. To do this follow the remaining steps. (Photos 3 & 4)

Step 3: Place a drop of water in the center of a clean microscope slide.

Step 4: Taking some of the evidence sample and place it on the water in the center of the slide.

Step 5: Using a toothpick spread the sample around, evenly and not clumped, but not too spaced out.

Step 6: Apply the clean slide cover and label it with the Crime Scene (CS) Evidence number.

Step 7: Turn your compound microscope on. (Photo 3)

Step 8: Take your first prepared slide and place it side by side with the CS sample. Write notes or sketch samples. (Photo C)

Step 9: View both slides through both microscope magnifications and check for similarities and consistencies in color, shape, and size of grains. Also check for included vegetation if applicable.

Step 10: Go through all your prepared samples using the same procedures. View each side by side with the CS sample until you find the correct location and identify it for the CSI team.

IMPORTANT: Remember to take your time. If working with groups of more than two, let all students view the samples and write their own notes. After all students have viewed all samples compare notes and see if you all confirm. If not then go back and see why there is a difference.



Photo 2

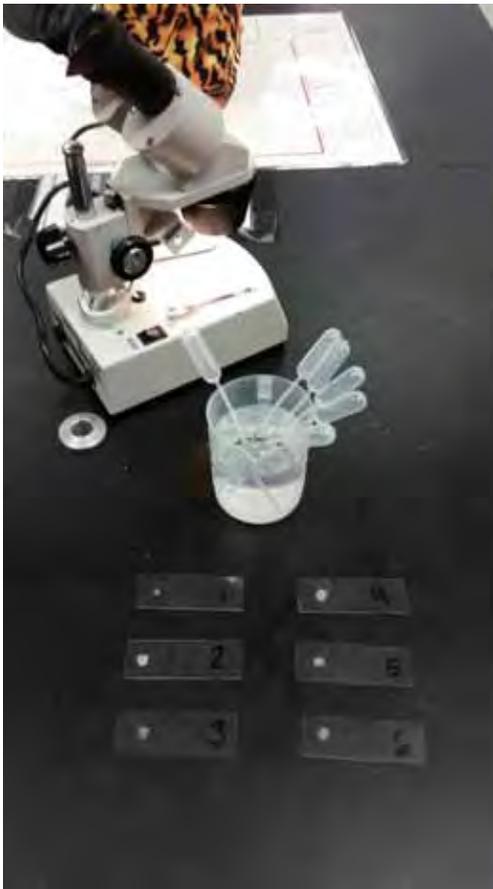


Photo 3

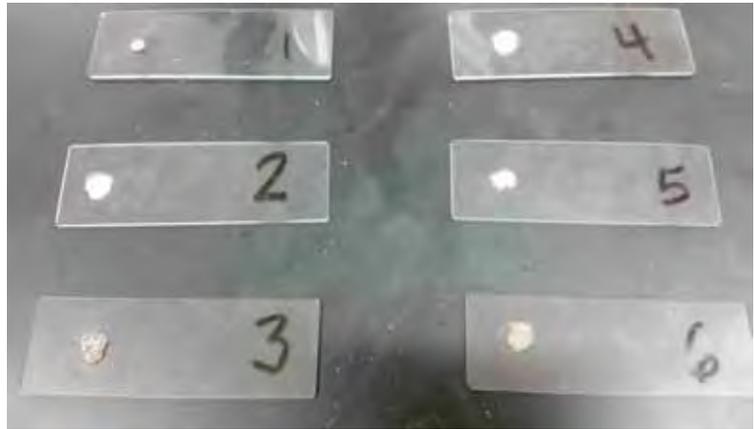


Photo 4



Photo 5



This is a very dirty photo