Community in the Classroom Presentation Plan

Lesson Name Dirt: Making Dirty Water Clean!
Presenter(s) Marisa Palucis (UC Berkeley Graduate Student)

Grade Level 4 **Standards Connection(s):** Soils play a large role in physically and chemically filtering impurities from our rainwater, which in turn provides humans and wildlife with clean drinking water.

Abstract:
Your opportunity to tell teachers and kids what's going to be fun and interesting about your visit!

Soil is responsible for maintaining most biological activity on Earth. It forms through a complex process by which rocks are broken down under the influence of water and living organisms, called microbes. Depending on the environment, soils can be rich in nutrients and can store large amounts of water, both of which help plants to grow. It also provides a home for many animals, and as the students will learn today, it also acts as a filter to provide us with clean drinking water.

Vocabulary/Definitions:
3 – 6 important (new) words
Soil – commonly referred to as "the skin of the Earth"; it is formed through the breakdown of rocks and organic matter and almost every plant and animal depends on it for their survival
Filter – a device that allows water to pass through it, but traps solid particles and solutes
Solute – a solute is a substance that is dissolved in another substance (an example is dissolving a salt crystal into water – the salt is the "solute")
Soil Pores – small tunnels that exist within soils, which are often created by tree roots, burrowing animals, earthworms, and small insects – they allow water to pass through the soil very quickly
Weathering – the process by which large rocks are broken down into smaller rocks

Materials:
What you'll bring with you
What students should have ready (pencils, paper, scissors)

Will Bring: Sand, topsoil, water with "contamination" (chemical contamination will be represented by grape Kool-aid and physical contamination will be represented by a glitter/water mixture), plastic cups with holes poked in the bottom, food coloring, "field notebook" to record hypothesis' and observations, various rock and soil samples, a soil map of California

Student's Need: pencil

Classroom Set-up:
Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed

Upon arrival I would like to set up the various rock and soil samples as well as a soil map of California

Students should work in groups of 2 or 3 depending on the total number in the class: each group will get a "field notebook" to record their guesses and observations, a set of plastic cups, a baggie of sand and a baggie of topsoil, and "contaminated" water samples

Classroom Visit

1. Personal Introduction: **5 Minutes**

Who are you? What do you want to share with students and why? How will you connect this with students' interests?

I'm Marisa and I am a graduate student at Berkeley. I study hydrology, which focuses on how water moves and the effect it has on the Earth's surface. I love the environment and try to spend as much time as possible outdoors, whether that means running on trails, hiking in the mountains, or rock climbing. Because I love nature so much, I work hard to protect it, especially our forests and our water.

Currently I am studying how water moves through soils. I want to know how rain water "changes" as it travels underground and then determine how those changes affect our local streams and rivers. Today I want us to work together to learn how soils "work" and see if we can come up with some explanations for why soils are beneficial for the environment.

Topic Introduction: **10 Minutes**

Big Idea(s), vocabulary, assessing prior knowledge. What questions will you ask to learn from students?

[Hold up a rock] Who can tell me what this is? *"a rock"* What are some things you can tell me about this rock? [pass it around to the students and begin compiling a list on the board of the rock's physical characteristics, ie color, weight, shape, etc.]

[Hold up a soil sample] Who can tell me what this is? *"dirt/soil"* What are some things you can tell me about this soil? [compile another list that gives the soil's physical characteristics, and then explain how soil is actually derived from rocks]

[Compare lists] "How do you think a rock transforms into soil?" [write down guesses, and then explain briefly the main processes by which weathering occurs]

"So why do you think people study soils? Can you tell me why you think they might be important" [discuss some of the main reasons why scientists are interested in soils, ending with its role in the water cycle]

2. Learning Experience(s): **20-30 Minutes**

Demonstrations, hands-on activities, images, games, discussion, writing, measuring… What will you do, what will kids do? Describe in order, including instructions to kids.

Demonstration: "Who knows what a filter is? Let's see some common ways in which people use filters in their everyday life." [Demonstrate how a coffee filter and tea bag work. Explain in simple terms how a filter acts to trap particles or even chemicals in the water, so that once the water passes through the filter it is much cleaner]

"Do you think that soils can act as a filter? Can dirt actually make your water cleaner?" [write down reasons for why it could or could not act as a filter] "Let's try some experiments to see what happens!"

Field Work: [Explain to students that geologists do most of their work outdoors, since that is essentially their laboratory. Also talk about how before any experiments are done we always make guesses as to what we think will happen and then create an "experimental design" based on our guesses. Pass out "field notebooks" so that students can write down their observations about each soil type and the initial water conditions. Once students have finished, explain the experiment they will be performing (below)]

"So what do you think will happen to the first water sample as it is allowed to flow through each soil type? Do you think the water will flow quickly, or slowly? What do you think it will look like as it exits the soil? What about the second water sample? Please record your "hypothesizes" (guesses) in the chart provided"

[Allow students to fill in the chart in their field notebooks. Once that is complete show them how to set up the "soil cores" and the soil water "collectors." Then have them pour the water samples through the soil cores. Have them write down their observations about the water exiting the soil core into the collector.]

Experimental Design:

1. Take a 5oz cup (holes already will be poked in the bottom) and have the students fill it halfway with sand. As they are doing so, they should record their observations about the sand (color, texture, etc.)
2. The 5oz cup is then placed over the 3oz cup, which will act to catch the water that has been filtered through the sand.
3. The students will pour the first "dirty" water sample (contaminated with glitter) over the 5 oz cup. They should then record their observations about the water in the 3oz cup ("what happened to the glitter?)
4. Repeat steps 1-3, this time using the second "dirty" water sample (contaminated with Kool-aid). Again, the students will record their hypothesis as to what they think will happen, and what actually happens.
5. Now the students will investigate a more realistic system. This time they will cover the bottom of a 5oz cup with sand (~1 inch deep) and then they will fill the cup halfway full again, this time using topsoil.
6. Repeat steps 2-4.

3. Wrap-up: Sharing Experiences and Building Connections 15 Minutes

Putting the pieces together – how will students share learning, interpret experience, build vocabulary?

[Once everyone has finished their experiments, gather the class together to compare results]

"What did you observe about the water exiting the soil? Which soil allowed water to pass through faster? Why do you think this is the case? How has the water changed after it passed through these soils? Is this a good or a bad thing for our environment?

[Talk to students about how soils are very good filters, just like a coffee filter. Talk about how soils are composed of minerals that have a negative charge and these minerals pull solutes out of the water that are positively charged (explain in very basic terms). Also talk about the physical structure of soils; describe how plants and animals create tunnels, called pores, which allow water to travel very quickly depending on the size of the pores. Conclude with an

explanation on how these properties of soils can be good for keeping our water clean, but can negatively impact our soils if harmful chemicals become trapped for long periods of time.]

4. Close: **5 Minutes**

How can kids learn more? Thanks and good-bye! Clean-up.

The best place to learn more about soils is in your backyard. You can observe how the soil changes as it goes from being wet to dry, investigate the various insects and plants that live there or you could search for evidence that soil pores exist, like gopher holes or earthworm tunnels.

TOTAL 50 – 60 Minutes

Follow-up – After Presentation

Suggest students write a letter explaining "How we learned about _____?"
List or attach examples of activities, websites, connections for additional learning.

Follow up – Ask students to find their favorite place outdoors. Once they are there, have them draw what they believe is underneath their feet. Are there soil pores? Who or what created these pores? What types of plants are growing on your soil plot? Is the soil sandy? Clayey? How wet is it? Do you imagine there is a lot of water flowing through your soil? Be creative! Do some digging (if your parents are ok with it) to see if you are right ☺

Useful Websites:
Discovery Education: http://school.discoveryeducation.com/schooladventures/soil/

Attach worksheets, hand-outs, visuals used in classroom presentation.