Lesson #4

A "Sedimental" Journey – Sediment Collection

Objectives:

- The learner will display comprehension of the scientific sample collection process by participation in a collection activity.
- The learner will display application of mapping skills by using a map to plot the locations of sediment samples for further reference once data about the samples is obtained.

National Science Education Standards:
SI 1, SPSP 2, HNS 2

Benchmarks:
3B, 5D, 11A, 12C, 12D,

Materials:

Various collection containers will be needed. There may include plastic or glass bottles with wide mouths, water containers, or buckets.

Background:

To create the modified Winogradsky column, a sample of sediment is first needed. The collection of this sediment will be important, as the activities that follow will all be based on the samples collected. The sampling procedure is relatively simple and does not require a lot of equipment. You may decide to sample with the students or gather samples on your own. Either way, this can be an exciting adventure for the students. If you do decide to sample on your own and then bring the sediment into the classroom, a digital camera can be a valuable tool. You may decide to take pictures of the locations where you get your samples and then share those pictures with the students.

Finding the right sampling site will depend on your location. These activities will be using the iron oxidizing and reducing bacteria in the sample to illustrate concepts to the students. While a better sample will yield faster, better results, you should still see all of the processes described in the lessons with whatever sediment you are able to acquire. With variations in sediment come variations in the time required to see the results of the bacteria at work in the column. Be sure to have patience if your sample takes slightly longer to fully develop the characteristics described in the lessons.

When choosing your site, there are a few things you can look for. If you have any swamps near you, it may be easy to find what looks like an oil slick lying on the top of the water in the swamp. This isn't actually oil, but instead it is iron oxidizing bacteria with iron clinging to them. If you see this, scoop some up and try it in your column. You may also find these in other areas with standing water. If you don't see any of these you should look for dark colored sediment. Sometimes you will also see sediment with an iron red color to it. This may also be rich in iron bacteria. It is suggested that you test out your sample sites first by setting up your own bottle with the sediment sample to check how well it works. This will also allow you to try the other activities on your own before doing them with your students.

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Preparation:

The only preparation required for this activity is gathering the materials you will need. You may want to wear a pair of old sneakers or rain shoes when sampling because you will be near the water.

Warm-Up:

Ask students how they would gather a sample of sediment from a lake, stream, river, pond, or swamp. Discuss safety concerns involving sample collection. Instruct students to stay out of the water and to be careful not to slip on the wet ground near the water.

Procedures:

1. Begin by bringing your sampling equipment to the site.
2. First collect water. The amount of water you need will depend on how many bottles you plan on making. Be sure to plan accordingly.
3. It may be helpful to attach a plastic beaker on the end of pole or purchase a commercially available sampling pole.
4. Place your water sample in the collection bottle and put the cap on.
5. Using your beaker and pole, or a small shovel, scoop up a sample of sediment from the side of the sampling site. It is advisable to try to dig into the sediment to get more than just the top layer of sediment. Place the sample in a storage container and cap it.
6. See the Assessments section to decide which assessment activity should follow. The assessment you use will depend on your situation and how you will be collecting the sample.

Variations and Follow-Up Activities:

As was mentioned before, you may decide to do your sample collections on your own without the students. If you do this, it is suggested that you use a digital camera to photograph the sites the samples were taken from. This will allow you to share your experience with your students. If a digital camera is not available, other options include a video camera or a regular 35mm camera.

As another variation for this lesson, you could have students collect their own samples from areas near their homes. Discuss the procedures for collecting samples and practice the procedure in the classroom with a pail of mud and water. When students are ready, supply them with a plastic spoon and reclosable bag to collect the sample. Spend some time discussing the samples once the students bring them in. Compare the different samples which students collected and make predictions about how they may grow differently. If using this variation, be sure that when you are comparing bottles based on the food source you put in them, you use samples from the same location. Discuss this with the students and share with them the concepts of variables and controls as well as the importance of changing only one variable at a time.

All of the lessons following this one will serve as follow-up.

Assessments:

If you decide to have your students join you in the collection process, they should keep a log of the locations where the sediments were collected. They can then plot these locations on a map. If you collect from more than one site, students can then compare their results for the various tests they will be conducting to look for correlations between sample site and data collected. You may also have students write about their experiences in their science logs.

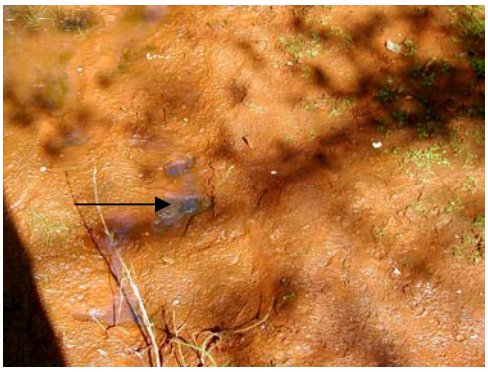
Observations:

Although this was a relatively short lesson, I found it to be an integral part of the module. Students needed to understand why it was important to have good samples to work from and why it is important to keep good records about the origins of the samples. This all goes into using good laboratory technique, and it is never too early to start introducing this.

I was unable to arrange for my students to go out and do sediment collection. Instead I used the pictures included in this lesson. Give students the opportunity to talk about what they see in the pictures and what they would expect if there were in the field themselves, and you will find that their experience is still a stimulating one.

A "Sedimental" Journey – Sediment Collection

Muddy stream bank with some iron bacteria visible. The top of the mud is aerobic with a reddish-brown color. Black anaerobic sediment can be found just below the surface.



Close-up view of iron-oxidizing bacteria forming a film on a small puddle. These films form where anaerobic water seeps up to the surface where oxygen is present.

A small pond with large amounts of oxidized iron present as coatings on the vegetation. This indicates a high concentration of iron in the water.

Close-up view of iron oxides coating the surface of algae. Many other minerals are precipitated with the iron.