

Title: Reclamation Proclamation: Are there pathogens lurking near you!

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Abstract:

This action plan is designed to incorporate the biotechnology skills obtained during the ICORE 2012 Summer Institute Training into my 9th grade Zoology classroom. I would like to introduce this technology in the context of a real question that many members in this community have on their minds; “Is this water safe?” Hamilton County’s largest employer,” with 900 employees”(1), is a phosphate mine. They reclaim the land when they are through mining it usually in the form of fishing ponds and lakes. Many people fish from these ponds and lakes and have asked the question “Are these fish safe to eat?”, and “How safe is this water?”

In this module students will collect water samples throughout the county that are affected by this phosphate mine. We will use the biotechnology skills and apparatus’ learned these last two weeks. Students will then put their data together in the form of a Science Fair project. I will invite the community in for a discussion with the students and their findings. There will be a question and answer session and a brochure available for the community to take with them that we put together with all of our data for them to share at a later date.

Rationale:

Students will have the opportunity to address the question that many people in the community have been asking themselves for years. People have blamed this mine for their illnesses for years including cancers. Is there any evidence to support such outcries? I do not know! We will however, investigate to see if there is any truth to their allegations about the water not being safe! This module not only will address a topic that many people in the county hold dear to their hearts but it will allow the students to reinforce some laboratory skills they already know and incorporate some new ones.

Mining: During mining of the phosphate large amounts of water is retained in pools at the top of a pile of course restricting natural water flow downstream. When the water is not allowed to flow at its natural rate to any river or stream that it would normally run into, it will affect the water usually with an increase in salinity. Although phosphate mines reclaim the land, the land seldom returns to its natural state and thus has an adverse reaction on the water quality. The water quality continues to decrease as the phosphorous and nitrogen levels are higher than they would be naturally.

Environmental Impact: Florida soils are a natural resource for phosphate that normally do not raise our eyebrows to concern because this element stimulates growth of plankton and aquatic plants which provides food for larger organisms. When we mine for phosphates however we bring these already existing elements to the surface in mass quantities. The overproduction of phosphates and nitrogen can lead to eutrophication. "Eutrophication is the enhanced production of primary producers resulting in reduced stability of the ecosystem. Excessive nutrient inputs, usually nitrogen and phosphate, have been shown to be the main cause of eutrophication over the past 30 years. This aging process can result in the lake water quality and trophic status and in some cases periodic blooms of cyanobacteria."(2)" This over production can lead to a variety of problems ranging from anoxic waters to toxic algal blooms and decrease in diversity, food supply and habitat destruction. Eutrophication as a water quality issue has had a high profile since the 1980's, following the widespread occurrence of blue-green algal blooms in some fresh waters. Some blue-green algae can at times produce toxins, which are harmful to human, pets and farm animals."(3) This raises that all mighty strand on bias testing! The testing was done by a phosphate Research Institute. Does this not raise questions in your mind on whether or not we leaned toward one side of the scale or not, fine time to enter that topic into the curriculum. "What will phosphate mining do to water quality? We really don't know all the potential consequences because phosphate mining companies have resisted revealing their plans. We know that the present standards for reclamation don't protect water quality, and we know who pays when problems are discovered and it's not the phosphate industry."(4) Blue Green Algae also known as cyanobacteria are waterborne pathogens. "Exposure to the toxins of microcystis may lead to gastrointestinal distress. Microcystis blooms in ponds have reportedly caused the death of cows, sheep, and even dogs drinking from the water."(5)

Description of teaching unit or module(s), including expected outcome: Attached is the lesson plan we use at our school for the first week only. I will follow up with the second weeks later.

SC.912.L.14.6- Pathogenic Agents

SC.912.N.1.4- Identify sources of information and assess their reliability according to the strict standards of scientific investigations (Bias)

Expected learning outcomes:

Students will identify pathogenic microbial agents found in water sources (conduct tests on water samples we collected)

Students will describe how pathogenic microbial agents could be introduced into water sources(research phosphate mining and the effects on the environment)

Students will learn how to use the new biotechnology tools and equipment

Students will learn proper data collection techniques

Activities to achieve learning goals: This will span a little over two weeks!

August 20th

Pre-test

Journal Prompts via computer. (We have COWS (computers on wheels) in my classroom, I would like to set it up like you have it for us here)or maybe drop boxes?

August 21st

Fuzzy Microbes Activity as the Engagement part of the 5 E model(equipment locker)*

Assign students microbes from our microbe activity to research, make a poster for the classroom and present so that we are more familiar with what we will be testing for

August 22nd

Protocol lab day to learn about the lab and the basic rules, tools, equipment and techniques, let them make designer plates using the equipment lockers*

August 23rd

August 24th

Send students out to collect water samples around campus (making sure to get the agricultural area for positive feces in water test)

Using the 15 ml tubes students will collect samples of water from the cows and donkeys water trough, the pond where the cows are, fish pond by green house, fish pond at front of school, goat water trough, ducks water pan, all chicken coops water supplies, puddles, water from green house pipes and pond by football field. Students will be sure to label each tube accordingly.

August 27th

Perform water testing lab with Colormetrics equipment locker*

August 28th

Students will conduct research on the phosphate mine in our county so they understand the concerns of the community and why we are conducting our experiment.

August 29th

Field trip time, now that we tested and collected around campus off to the mining area we go

August 30th

Perform testing with colormetrics*

August 31st-?

Time to collect data, analyze results, draw conclusions and put together our science fair information for the public and make a brochure from this information.

September 3rd

Post test

NOTE: * are equipment locker needs and I will be needing them the first two weeks of school. During the first week I need the fuzzymicrobes activity and designer plates. The second week I need the Colormetrics.

In comparison: My form of teaching will not change. I have always used hands on learning, student engagement in learning and labs for learning. The difference is I will be incorporating the biotechnology learned from these two weeks at ICORE. The main difference other than using biotechnology is moving into pathogens. I usually do not teach pathogens because it is not one of my standards but I am one of the lucky ones, I am not tied down to the EOC and have room to breathe. I can still get away with it because when we do talk about taxonomy bacteria is a domain so I can tie it in there if I had too.

Literature Cited:

<http://thephospaterisk.com/issues> quotations 4

<http://www.hamiltoncountyflorida.com/> quotation 1

<http://www.water-research.net/phosphate.htm> quotation 2 and 3

<http://www.great-lakes.net/beachcast/pathogens.html> quotation 5

Supplies:

2ml tubes	pipettes	Indole reagent		
E. Coli Broth	blacklights	Sterile pipet		
detergent	Coliform detection broth			
Control for coliforms samples	Sterile water			
Water samples from environment	Control for E. coli sample			

Budget:

125 students 1 kit per 10 students this equates to:

I will have to use all of my budget on 10 kits. 10 @ \$20.00= \$200.

kits needed :

Giant Microbes with questionnaire answer cards

Designer Plates

Detecting water-borne pathogens through Colorimetric methods

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