

Title: What's in your Water?

Name and Correspondence and PI:

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Abstract:

This action plan is designed to provide Earth Science students at Dunnellon High School an opportunity for a greater span and depth on the subject of biogeochemical cycles. Furthermore, it will explore the implications of human activities on natural systems of Earth. The project will tentatively take place over five 60 minute class periods. The plan will include a field trip to the rainbow river for water sample collection along with other local student provided samples. The students research the different biogeochemical cycles such as the hydrologic cycle, nitrogen cycle, and phosphorus cycle. Students test for water quality including oxygen levels, nitrogen levels, phosphorous levels and general observations about the rainbow river and other water sources. The project will also include emerging pathogens components of testing for coliforms and e-coli. Google Earth will be utilized to collect data on topographic differences and coordinates. Student should discover whether or not coliforms and e-coli are in the rainbow river and if so what its sources are. Other research questions asked include whether there a correlation between nutrient levels and the presence of coliforms, what are the possible sources of contamination and what are the future implication of these findings for the Rainbow Springs community.

The students will produce a children's book about one of the biogeochemical cycles and its relationship to rainbow springs and integrating coliforms where appropriate. The books will be shared with elementary students at Dunnellon and Marion Oaks elementary schools.

Rationale:

This activity allows students to have thematic and real world applications of the knowledge they will attain. This method of instruction is proven to be the most successful for students. Furthermore, they will have hands on methods along with reading strategies which go along with common core standards for reading in the form of CIS. Rainbow Springs is a popular site in Dunnellon, Florida used for recreation, tubing, swimming, fishing and camping. Hosts of wildlife live in the area surrounding the Rainbow Springs and river. Many businesses depend on the waters for the aesthetic value. It also helps with the hydrologic cycle of the area ensuring the subtropical climate, regular precipitation and lush vegetation of the area. The Dunnellon community as well is surrounded by a preponderance of horse and cattle farms. The fecal matter from these farms may runoff into the Rainbow River and lead to the presence of coliforms in the rainbow river.

Description of teaching unit or module(s), including expected outcomes:

This unit is about the movement of matter and energy through the different biogeochemical cycles including hydrologic, nitrogen and phosphorus cycles. It also includes the impacts of human activities on these processes. Student should know that water goes through its different cycles and can end up in various places on earth including the atmosphere, geosphere, troposphere, and bodies of water. They should know that through this cycle many structures are formed such as aquifers, and ground water. They should know the activities involved in this cycle such as condensation, precipitation, infiltration, runoff, pooling, evaporation, and transpiration. They should know that the biosphere depends on and contributes to this cycle.

More specifically they should understand that agricultural practices and other human pollutants can pollute runoff water. It is also possible that sinkholes and drought could lead to contamination of the Floridian aquifer. When abiotic or biotic feature are misplaced they become a hazard. Coliforms are naturally found the gut of warm-blooded animals, but can cause sickness when found in great amounts elsewhere.

The expected outcome is that some areas of Rainbow Springs contains coliforms. The expected source will be horse farms near the river due to runoff and differences in elevation.

Student should know what the problems are and why.

SC.912.E.6.4 Analyze how specific geologic processes and features are expressed in Florida and elsewhere.

SC.912.E.7.1: Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.

SC.912.E.7.3 Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.

SC.912.N.1.1: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

Data collection techniques and/or student assessments:

Water sampling

Coliform lab

Research about coliforms, E-coli, the hydrologic cycle, nitrogen cycle, phosphorus cycle, and water quality

Children's Book

If applicable, use of equipment lockers and/or UF visit (either in the classroom or UF campus):

Coliforms Testing Kit

ICORE summer institute elements specifically included (UF connections):

Coliform conundrum activity

Google Earth

How your proposal differs from what you normally teach, new pedagogies; how you previously taught this lesson or topic versus how you plan to teach it under your Action Proposal

Normally I teach students about the biogeochemical cycle with a focus on the hydrologic cycle. The question asked is what are the parts of the water cycle and how does it impact the structure of the earth. The main assessment is a children's book that follows the "life" cycle of a drop of water as it goes through the different processes of "life".

The modification includes not only the hydrologic cycle but research on other biogeochemical as well. It also integrates emerging pathogens information about coliforms and e-coli.

In addition, this unit includes field sampling and laboratory test, while previously it includes mostly written explanations. It also includes mapping component which is usually neglected.

Literature Cited

Nitrogen Cycle, Hydrologic Cycle, Sulfur Cycle, Phosphorus Cycle, Environment: Science and Policy for Sustainable Development Man and the Biogeochemical Cycles: Interacting with the Elements Vol. 26 No. 7
<http://www.tandfonline.com/doi/pdf/10.1080/00139157.1984.9932511>

Coliform Conundrum UF

Science Scope and The Science Teacher - NSTA
<http://www.nsta.org/publications/journals.aspx?lid=tnavhp>

Budget

• Various bottled water samples.	0.00	Various Water Sources
• Well or tap water.	0.00	Ocala Deep Well
• Clear liquid food products (white grape and apple juices)	5.00	Wal-Mart
• Tubes of coliform detection broth	0.00	UF lockers
• Flip top tubes (1 ml)	0.00	U.F. lockers
• Coliforms sample for positive control in flip top tubes	0.00	U.F. lockers
• E. coli sample for positive control in flip top tube (1 ml)	0.00	U.F. lockers
• Screw top tubes	0.00	U.F. lockers
• Sterile pipets	0.00	Dunnellon High School
• Indole reagent	0.00	U.F. lockers
• UV light	0.00	U.F. locker
• Construction Paper	5.00	Sam's Club