

Water is Life....
Teaching Biology through A Disease Model and Human Impact

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Abstract

The purpose of this study is to improve student achievement in Water Biology using a Disease Model. Students will be exposed to inquiry based lab work, lecture, case studies and current research. Students will investigate the properties of water. The unit will also focus on the naturally occurring pathogen, *Vibrio vulnificus*, and its impacts on the humans, *Homo sapiens* and shellfish in the Indian River Lagoon. (CDC, 2016).

At the conclusion of this unit, students' scientific methods, lab procedures, and investigative research skills will be improved. Students will create an infographic for *V. vulnificus* virus that lives within the Indian River Lagoon and its impact on humans. The infographic will allow students to apply their water knowledge to human effects on the environment. Pre and Post Personal Meaning Maps will be created to measure student growth.

Rationale

In Florida, all students are required to take a Biology course or Biology course equivalent for graduation. Students are also required to take the Biology End of Course Exam generated by the state of Florida. Students and parent are often uneasy with the amount new content, strict pacing and the inevitable Biology EOC. With a reduction in student seat time due to testing, school events, field trips, early release days and mandatory testing, students are receiving less instructional time.

Satellite Senior High School is a small barrier island school with an enrollment fluctuating at or around 1380. We are bordered by the Atlantic Ocean and the Indian River Lagoon. Many of our students have deep roots in the community with alumni parents and grandparents of SHS. SHS is also in close proximity to Patrick Air Force Base and Cape Canaveral. As a result, we have a transient population of military children. Brevard County Schools are open enrollment. Any student may register at any school with an open seat as long as transportation is provided by the enrolling family. Based on the Schools, District and State Public Accountability Report, 2015 - 2016, Satellite Senior High School has the following makeup: White, 79.1%, Black or African American, 2.9%, Hispanic or Latino, 9.3%, two or more races, 7%, Disabled, 10.3%, Economically Disadvantaged, 19.6%, Female 48% and Male, 52%. Science Assessment Results, 2015-2016, (EOC and FSAA), percent of all student scoring satisfactory or above, Satellite HS, 74%, 96% tested, District, 62%, 98% tested, State, 56%, 98% tested.

Biology I or Biology Honors is the first science class most of our incoming freshman take. It may also be their most rigorous and challenging course they take their first year of high school. Many of the concepts are new and the vocabulary can be overwhelming to proficient and developing readers. Many of the Biology topics have not been introduced in elementary or middle school, like biochemistry, genetics and evolution. Students may also view science as irrelevant to lives. Poor organizational and inadequate study skills hinder knowledge acquisition and application.

On a very positive note, students are inquisitive and want to learn. They are fascinated by their bodies and anything gross. Medical applications and diseases catch their attention. They want to learn about diseases their family and friends may have or overcome. Students want science and Biology to have meaning for them. They want to discuss current research on disease, therapies, and medical advances.

Intervention

The *National Science Education Standards* defines scientific inquiry as diverse ways in which scientists study the natural world and propose explanations based on the evidence derived from their work. NSTA adds that scientific inquiry reflects how scientists come to understand the natural world, and it is at the heart of how students learn. Children learn by doing, interacting and communicating ideas.

Water is life is the overarching theme of the unit with connections to the student and environmental health. As an introductory activity, students will create a personal meaning map to gauge their understanding of water and pathogens. Students will then be tasked with an inquiry lab diving into the properties of water using the Claim, Evidence and Reasoning Model, CER. Through lecture, video clips, and readings on *Vibrio vulnificus* within the Indian River Lagoon, students will gain a better understanding of the importance of water as a life source as a result of its uniqueness, but also possibility that pathogens may be present. Students will also gain an awareness of the diseases and the human impact on our environment. They will be asked to create an Infographic to highlight awareness of *Vibrio vulnificus*. Students will share their work through Carousel Discussion, then a post personal meaning map will be given to gauge their understanding of taught material.

This is change in my teaching. I have lectured on the topic of water and given my students scripted water labs. The unit ended with a standardized test. I am looking toward improving my teaching practices for student mastery.

Data Collection Analysis

- Personal Meaning Map pre and post
- Water is Life Inquiry Lab with CER
- Pathogens in Shellfish: selective agar use for presumptive identification
- Infographic on *Vibro* to share with peers and home
- Pipetting by Design
- Daily Tickets out of the Door

Connections to CATALyses Summer Institute

The following listed identifies the activities and lecture slides from the CATALyses Summer Institute:

- Lesson Plan - [Pipetting by Design](#)
- Salemi- Emerging Pathogens, slide 29, 36, 42
- Stoffer- CATALyses Evaluation Workshop
- Bascomo - Virulence and Pathogenicity, slide 4-8, 12-18

Literature Cited

National Research Council (1996). *National science education standards*. Washington, DC: National Academy Press.

National Science Teachers Association - NSTA. (n.d.). NSTA Position Statement. Retrieved June 24, 2017, from <http://www.nsta.org/about/positions/inquiry.aspx>

School Public Accountability Reports 2015 - 2016. (n.d.). Retrieved June 23, 2017, from http://doeweb-prd.doe.state.fl.us/eds/nclbpar/year1516/nclb1516.cfm?dist_schl%3D5_6011&sa=D&ust=1498324804822000&usg=AFQjCNFWLyvbjdfmc5XL84MKfy50QAs--g

Vibrio Species Causing Vibriosis. (2016, October 24). Retrieved June 24, 2017, from <https://www.cdc.gov/vibrio/index.html>

Permissions

Permission forms for laboratory and class assignments are signed at the start of the term. No further permission are needed for the action plan to be implemented.

Water is Life Unit Lessons, Activities and Resources

Class length - 48 minutes

Day 1 and 2

[Personal Meaning Map](#) - Pre Unit

Prompt - Properties of Water

[Properties of Water Lab](#)

Share out CER from Properties of Water

Day 3

Video Clip - [Liquid Awesome](#) with [Guided Questions](#)

Class discussion on the Properties of Water

Reading - [Water, health and ecosystems](#)

Ticket Out the Door

Day 4

[Pipetting by Design](#)

Day 5

[Personal Meaning Map](#) - Pre Unit

Prompt - Pathogen

Video Clip - [V. vulnificus What You Need To Know](#)

Video-Clip - [Oh Shuck! | Oyster Farming: Threat of Vibrio Infection](#)

Reading - [Vibrio vulnificus Health Education Kit Fact Sheet](#)

Reading - [Vibrio](#)

Ticket Out of the Door

Day 6-7

Lab - [Pathogens in Shellfish: selective agar use for presumptive identification](#) - lesson adapted to use *V. vulnificus* in addition

Day 8-10

Students will utilize [Piktochart](#) to create an Infographic detailing the pathogen *V. vulnificus* humans and the water.

[Gallery Walk](#) to share Piktochart with peers

Post Personal Meaning Map for water and pathogen.

Personal Meaning Map - Post Unit

Prompts

1. Properties of Water
2. Pathogen

Time Frame: Early September, 2017