

Action Module Title:**Are Our Waters Safe to Drink?**

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Abstract:

Students have a difficult time visualizing the microbial world as being real. This new Action Module will help Pasco High School's Marine Science students (11th and 12th graders) to immerse themselves in the world of water quality and marine pathogens with three luxurious, real-life inspired labs and a presentation showcase of career options in biotechnical science fields. The Action Module will encompass 14 days of various learning pedagogies to enrich and engage the students into the microbial world of water quality and marine pathogens. Projects include a career focused research presentation, water quality-testing lab, and multiple water-borne pathogen scenarios and labs.

Rationale:

This Action Module will target 11th and 12th grade Marine Science students in four classes (100 students) at Pasco High School. The Microbial World Unit - Chapter 5 (January, 2013) - is a difficult one to teach the students to visualize microorganisms due to the absence of newer scientific equipment at the school level and lack of good lab suggestions in the district map / textbook level.

"Are Our Waters Safe to Drink?" will expand the current unit into a real-life, scenario-rich module. The students will receive high-level lab experiences that will spark their inner scientist and increase their participation and knowledge on water quality and marine pathogens. This will be accomplished through three new labs, career research presentation, article jigsaw, and associated up-to-date emerging pathogen knowledge.

Description of teaching unit or module, including expected outcomes:

Florida Science Standards covered in the module:

SC.912.L.14.6– Pathogenic Agents

SC.912.L.18.12 – Properties of Water

SC.912.L.14.52 – Immune System and its Functions

At the end of this Action Module SWBAT (students will be able to):

...describe the similarities and differences between a virus, protozoa, and bacteria.

...discuss what is an emerging pathogen.

...read a data table and analyze the results of a water quality test.

...describe the functions of an antibody and an antigen in a human immune system.

...discuss a real-world medical mystery based on a water-borne pathogen.

Module Outline:

- Pretest Assessment
- Introduction to Water Quality and Marine Pathogens
- Watershed / Pollution Sources: Pasco County to Tampa Bay
 - Water Quality Testing with Colorimetric Methods
- Water-borne Pathogens: *E. coli*, *V. cholerae*, coliforms, red tide, Hepatitis A and E, *Cyclospora*, mycobacteria, and cryptosporidium.
 - Article Jigsaw
 - Dot Blot Simulation with *E. coli*
 - Medical Mystery of Epidemic Proportions Activity with *V.cholerae*
- Science Careers
 - IRC Research and Presentation
- Summary / Review of Module
- Post Test Assessment

Data collection techniques and/or student assessments:

- Pretest and Post Test Assessments
- Labs, Lab Reports and Lab Reflections
- Research Project and Presentation

Use of equipment lockers and/or UF visit:

- Pipetting by Design
- Medical Mystery of Epidemic Proportions – Cholera (revised Science Take-Out Kits)
- Dot Blot Simulation
- Detecting Water-borne Pathogens through Colorimetric Methods

ICORE Summer Institute elements specifically included:

- Topics from Dr. Max Teplitski's lecture on "Water-borne Pathogens"
- Topics from Dr. Judith Johnson's lecture on "Molecular Biology of *V.cholerae*"
- Water Quality Test Lab using Colorimetric Methods
- Dot Blot Test by Dr. Houda Darwiche
- Medical Mystery of Epidemic Proportions Activity

Differences in pedagogies previously used to teach this unit or module:

Normally within the Microbial World Unit presentation, this teacher includes a basic microscope lab with observations, drawings, and analysis, which include examples of diatoms, marine protists, and marine plants. It is one lab within a large unit. Other parts of the unit include introduction, vocabulary with quiz, objectives (main ideas), article summaries, reading comprehension, classification / field guide lab, notes, review, and assessment.

By using the Action Proposal's module after taking the ICORE course, this teacher will add three more hands-on experiences, biotechnology career discussions, and real-life connections to the Microbial World Unit. The real-life connections are the biggest improvement to this particular unit and also the expected engagement increase in the students.

Literature cited:

Marine Biology. 8th edition. Castro and Huber. 2010.

www.who.int

www.edis.ifas.ufl.edu/ss189

www.edis.ifas.ufl.edu/fy1138

www.tpwd.state.tx.us/landwater/water/envirnonconcerns/hab/redtide

www.bfhhd.wa.gov/info/coliform.php

www.cdc.gov

www.waterbornepathogens.org

www.cleanwaterfortheworld.org

Budget and budget justification: \$200.00 ICORE grant

item	Vender / Source	Cost
Code 10 handheld 6" Black Lights (6)	Blacklight.com	\$47.94

Invis-ID UV pens – waterproof (1)	Blacklight.com	\$ 5.99
4pk AA batteries (6)	Blacklight.com	\$ 17.94
Sustainable Earth white plain easel pad 4 pk (1)	Staples.com	\$ 64.99
Permanent Markers 4pk (6)	Staples.com	\$ 26.94
Ball 5ct plastic freezer jars (6)	Target.com	\$ 53.34
Water Quality Testing with Colorimetric Methods (4 classes at \$20 per class)	ICORE	\$80.00

Total Cost

\$ 297.14 plus S/H *

*If over \$200.00 grant allowance; alternate means will be searched for Action Module to be completed. Sources include the following: Lead Money from state, principal funds, and science department funds.