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Guam Public School System 2013

Lesson Plan

Lesson Title: Testing Ocean Water Quality and possible impacts from human activity.

Subject: Marine Biology

Grade Level: 11th &12th graders

Length of Lesson: 210 minutes or 3 hours and 30 minutes

Next Generation Science Standards: HS Interdependent Relationships in Ecosystems

Science and Engineering Practices
Engaging in Argument from Evidence
§ Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)
§ Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-8)
Disciplinary Core Ideas
LS2.C: Ecosystem Dynamics, Functioning, and Resilience
Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)

Crosscutting Concepts
Cause and Effect
§ Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8),(HS-LS4-6)
Stability and Change
§ Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

Lesson Objectives:

- The students will be able to conduct water quality testing
- The students will be able to form hypotheses regarding water quality while taking into consideration human activities (farming, golf courses, and sewage treatment plants), water flow/turnover in the area, and other factors such as rainfall and erosion.
- The students will be able to formulate solutions for areas of poor water quality.

Anticipatory Set: Discussion: 30 minutes
What is water pollution?

Lesson Background information:
Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers, and groundwater). Water pollution occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Water pollution affects plants and organisms living in bodies of water on Guam. In almost all cases the effect is damaging not only to individual species and populations, but also to the natural biological communities.

Water pollution is a major global problem, which requires ongoing evaluation and revision of water resource policy at all levels (international down to individual aquifers and wells). It has been suggested that it is the leading worldwide cause of deaths and diseases

How does water pollution impact Guam?

Where have you seen water pollution on Guam before?

Part 1: Dissolved Oxygen
Carbon Dioxide
Nitrate
pH
Salinity
Turbidity
Phosphate
Alkalinity

Part 2: Total coliform bacteria
Escherichia coli

The students will test each parameter on water from 12 different Guam beaches, including near-shore, off-shore and river mouths. The testing will be conducted in the classroom.

Student Outcomes:

- The students will understand the significance of the different parameters of water quality.
- The students will discuss possible causes of variation with a focus on human activity at each site (recreation, golf courses, agriculture, sewer treatment facilities).

Time: Part 1

One 30-minute session to discuss each parameter and form hypotheses.
Two class periods of 1.5 hours each to complete the lab.
One 45-minute session to compile the data and discuss the results.

Time: Part 2

One 30-minute session to discuss the rationale behind the tests and form hypotheses.
One 30-minute session to prepare the Colipates (followed by a 48 hour incubation).
One 45-minute session to record the data and discuss the results.

Materials:

LaMotte Test Kit
Marine Science Testing Outfit
Basic Bacterial Analysis Kit
Incubator, UV Lamp, 50 Coliplate Kits