

Water Scenario: Sewage Spill into Biscayne Bay

Purpose

To use a hypothetical case study to learn about environmental health issues associated with water, recreational water, and sewage.

Overview

A scenario is introduced and students use an inquiry-based learning module to generate questions, draft a research plan, and generate possible solutions. Each exercise develops the story further and emphasizes critical thinking and problem solving.

Time

1 two-hour block class period for the Scenario and one class period devoted to research or as a homework assignment

Key Concepts

Water is one of our most important resources.

Clean water is necessary for good health of both people and the ecosystem.

Sewage contamination poses a threat to human health and the health of the environment.

Analysis of data using mathematics, mapping skills and critical thinking can help us determine the source of an environmental health problem.

Skills

Generating questions

Making a research plan

Working in a group

Reading carefully and critically

Sharing information with others

Organizing research material

Materials

Video – News coverage of the sewage spill incident

Student Worksheet and Press Releases (Found in front of Water Scenario Activity)

Overhead projector

Facilitator Preparation

You will be acting as a guide for the students' own research and analysis of the presented case study. You should be familiar with the AMBIENT Teachers' Guide to Water and Sewage before starting the segment. Each exercise has a teacher's key

providing guidance as to what direction the students need to be heading in order to proceed to the next step. If students go off on a tangent, bring them back to the water contamination issue with a focused question. The segments are designed to alternate small group discussion with whole class inter-group presentation.

Background

This Scenario is based on a real life event of a break of a large sewage pipe in Miami Dade County (Florida) resulting in spilling of significant amounts of sewage into the marine waters of the surrounding bays and islands. Some of the issues to be raised include: What does sewage in marine waters do in terms of human health? Ecological health? How do we know if there is a problem? And how do we know that there is no longer a problem? How do we prevent such problems in the future?

Procedure

I THINK THIS SHOULD BE GIVEN AS A STUDENT WORKSHEET.

Biscayne Bay is the beautiful shallow bay that sits between downtown Miami and the Atlantic Ocean. The Bay is a popular area for boating and recreation and is surrounded by residential and commercial areas such as Miami Beach and Key Biscayne. The beaches of Miami Beach in particular generate a large part of the area's tourist revenue. Biscayne Bay is also nearby a number of marine wildlife preserves and coral reefs.

With the sewage breakage, beaches are now closed to swimming and all other water activities.

You are a teenager in Miami who frequently goes with your family to Hobie Beach, a beach known for excellent windsurfing. Your family, friends, and you swim, fish, play, and eat at the beach.

Questions for your group:

- 1) What is the problem?
- 2) What do we know?
- 3) What do we need to know?
- 4) What might a "solution" be?

Using transparencies and/or hardcopy have the students read about the scenario and answer the questions. The questions can be answered by individuals or as groups. Use the scenario to develop a list of questions to be answered as the Module progresses. Group these questions by topic to organize their research into this issue. As a homework or separate class assignment, again either as individuals or groups, have the students begin to research the importance of water, recreational waters, and the impact of sewage.

Structuring the Investigation

Students should be asked (in groups or as individuals) to write up their questions and organize them by topics. Then they should seek out resources (web, library, government agencies and reports, “grass roots” organizations, news organizations, etc) to answer each of the questions. A final work product would be the questions, organized by topic, with resources researched and identified for each question as a beginning to the Water AMBIENT Module.

Students are to be divided into groups and will research various aspects of the scenario. Topics easily researched include:

- What is sewage?
- Health effects of sewage contamination of water (both drinking and recreational marine water)
- Risk factors for sewage contamination
- Dangers of sewage contamination in the short and long term
- How to protect oneself and one’s children from the effects of sewage contamination

Students should prepare a class presentation on their group topic, using transparencies or other presentation media (such as PowerPoint®) to present to their colleagues and answer questions.

Other resources and websites of possible interest:

Environment:

<http://www.stlwaterfrontcouncil.org/sewage.htm>

<http://www.thenaturalhome.com/septic.html>

<http://www.fao.org/docrep/T0551E/t0551e05.htm>

<http://www.epa.gov/ost/beaches/local/sum2.html>

<http://www.epa.gov/OST/beaches/local/sumtable.html>

<http://www.epa.gov/safewater/ecoli.html>

Human Health:

<http://www.sccwrp.org/pubs/annrpt/97/ar16.htm>

<http://es.epa.gov/ncercqa/progress/grants/95/water/sobsey99.html>

<http://www.cdc.gov/ncidod/dpd/parasites/waterborne/default.htm>

<http://www.nap.edu/books/0309048265/html/203.html>

<http://www.hse.gov.uk/pubns/indg197.htm>

http://www.cdc.gov/ncidod/dpd/parasiticpathways/swimming/healthy_swimming_tips.htm

<http://dcm2.enr.state.nc.us/Other%20Stuff/pumpout/Sewage.htm>

Student Assessment

Give the following scenario question components to each student as a guide to their Scenario and subsequent research on water and sewage issues:

- ❖ Decide what facts are for the Water Scenario
- ❖ Create a series of questions about the Water Scenario in terms of additional information you will need; class participation is important
- ❖ Organize these questions by topic
- ❖ Seek out resources to answer these questions and begin to collect the data to answer these questions
- ❖ Write up your questions, organized by topics, with the resources you have identified

Give the following presentation design components to each student team as a guide to their group presentations:

- ❖ Decide what is important about their findings.
- ❖ Design an overhead that summarizes the information (may need 2 or more sheets).
- ❖ Practice and keep their presentation within the time allotted.
- ❖ Each group member should take part in the presentation, even if just to read or explain one piece of the presentation.

Assign points for the following components of the scenario question products:

- ❖ Were the facts correctly identified and distinguished in the Water Scenario?
- ❖ Were the whole range of questions developed?
- ❖ Did the individual/groups participate in generating the questions and class discussion?
- ❖ Were the questions organized by topics?
- ❖ Were resources identified to begin to answer each question?
- ❖ Were proper science terms used?
- ❖ If applicable, were the students able to work in teams to formulate the questions, organize them, and seek out resources?

Assign points for the following components of the team presentation:

- ❖ Is the overhead easy to read?
- ❖ Were pictures/maps/illustrations used?
- ❖ Were proper environmental health terms used?
- ❖ Was the presentation easy to understand?

- ❖ Is each member actively taking part in the presentation?
- ❖ Did the group report their source?
- ❖ Could the group answer questions from the audience?

Additional Reading

Haile, R.W., Witte, J.S., Gold, M., Cressey, R., McGee, C., Millikan, R.C., Glasser, A., Harawa, N., Ervin, C., Harmon, P., Harper, J., Dermand, J., Alamillo, J., Barrett, K., Nides, M., and Wang, G., 1999. The health effects of swimming in ocean water contaminated by storm drain runoff. *Epidemiology*, 10:355-363.

Pruss, A., 1998. Review of epidemiological studies on health effects from exposure to recreational water. *International Journal of Epidemiology*, 27(1):1-9.

Answer KEY

Questions for your group:

1) What is the problem?

Generate questions about why the dumping of sewage into the marine waters of a recreational beach is a problem. What is in sewage? Why is it harmful? What do the authorities have to do to respond to the problem? What do individuals have to do?

2) What do we know?

Existing knowledge, rumors/myths, past experience, facts in the paragraph find out any prior knowledge or experience

3) What do we need to know?

What are the consequences of sewage exposure? To people? To animals? To the environment? Does this affect the food chain? How do you know if the water is safe or not? What is the usual water quality of this beach and how do we know? Why is clean water important? How do we make water clean? What do we do with sewage? What are the alternatives?

4) What might a "solution" be?

Fix the pipe and clean up the water? How do we prevent future problems? Are there other sources of sewage that we need to be worried about? How do we deal with these types of sewage sources?