

Testing the Water Quality of the Manoa Stream

Lesson 9

Objectives

The student will be able to do the following:

- Recall and define types of pollution (nitrate, phosphate, turbidity, bacteria, heat)
- Recall and define other water quality parameters (pH, dissolved oxygen, biological oxygen demand)
- Make hypotheses about the water quality in the Manoa stream based on previous observation
- Test hypotheses by carrying out water quality tests

Materials

- Water quality testing materials, one kit per group
- Worksheet for each group or each student
- Bucket
- Smaller tupperwares or containers, one per group (if desired)

Background

This unit builds on the introduction to water quality testing. This activity combines knowledge from a number of previous activities: observations of potential pollution sources, knowledge of how the water quality tests work, and previous practice making hypotheses.

Advance Preparation

Ensure that water quality kits have enough materials for each test. One kit per group is provided. Each group should have a copy of the directions, which is provided in the kits.

Each group or student should have a worksheet.

Teachers may want to pull up a bucket of water from the stream before class, or do one after class. Each group should have a smaller vessel so that they can work from a smaller subsample.

Procedure

1. Start with a review.
 - 1) What are the parameters that Water Quality Tests can test and 2) what do these parameters tell us?
 - i. Dissolved Oxygen
 1. If there is enough oxygen in water to support health
 - ii. Biological Oxygen Demand
 1. If there is too much demand on the oxygen – for instance, if there are many bacteria, then BOD will be high
 - iii. Nitrate
 1. If there are excess fertilizers or other pollutants

- iv. Phosphate
 - 1. If there are excess soaps or other pollutants
 - v. Turbidity
 - 1. If there is too much dirt in the water
 - vi. pH
 - 1. If the water is either too acidic or too basic, indirectly whether there are pollutants influencing the water
 - vii. Coliform bacteria
 - 1. If there is more than an acceptable amount of bacteria
 - viii. Temperature
 - 1. If the water is too hot, especially compared to a “normal” site – e.g. one in the riparian zone.
2. Go outside and allow students time to make observations.
 3. Each student group should make a hypothesis for each water quality parameter, writing the hypothesis on the worksheet. They should also write down a reason for making this hypothesis (e.g. rained recently so there is dirty water nearby and so turbidity expected to be high; or, observed fish in stream so dissolved oxygen must be high, etc.)
 4. Each group should carry out each water quality test, recording each result on the worksheet.
 5. Back in the classroom, each group should analyze their data and determine whether their hypotheses are correct. One way to structure the analysis is to have each of the 6 students in each group take responsibility for one parameter that returns an immediate result (of the 8 parameters, BOD and coliform take several days).
 6. Students can write up lab reports if desired.
 7. As a group, each team should report their results. As with the last activity, a large table will handle all of the data (11 groups x all parameters):
 - Dissolved Oxygen Result
 - DO Rank
 - pH result
 - pH rank
 - Temperature
 - Nitrate result
 - Nitrate rank
 - Phosphate result
 - Phosphate rank
 - Turbidity result
 - Turbidity rank
 - Coliform result
 - Coliform rank
 - BOD result
 - BOD rank
 8. In 2 and 5 days, the additional results and ranks for coliform and BOD can be added to the tables, respectively.

9. This may be a good time to have students practice making averages (if the data show a range).
10. Students should make some conclusions about the water quality in the Manoa stream, including why the water is a certain quality.

Manoa Stream Water Quality

In this activity you will take what you've learned about the Manoa Stream, Land Uses, Pollution, and Water Quality and put it all together to make some hypotheses about the water in the Manoa Stream.

Directions

1. Go outside and observe the Manoa Stream.
2. Try to remember what each water quality test examines. Write this down for each test (or parameter) in your own words.
3. Discuss with your group what you think the water quality in the Manoa Stream is. Make a hypothesis for every single water parameter. Write down your reason for why you've made each hypothesis.
4. Follow your teacher's directions for which water to use.
5. Carry out the water quality tests for each parameter. Start tests for BOD and Coliform. Be CAREFUL not to shake coliform tubes!
6. You will need to take the temperature for water from under the riparian zone and where there is no riparian zone. Your hypothesis should be about which one is hotter or cooler.
7. Record all your results and determine if your hypotheses were correct.

Water Quality Parameter	What does it test (in your own words)	Hypothesis (Number or rank predicted)	What observations allow you to make that hypothesis?	Results (Number & Rank)	Is hypothesis correct?
Dissolved Oxygen (DO)					
Nitrate					

Water Quality Parameter	What does it test (in your own words)	Hypothesis (Number or rank predicted)	What observations allow you to make that hypothesis?	Results (Number & Rank)	Is hypothesis correct?
Phosphate					
pH					
Temperature				Riparian zone No rip. zone	
Turbidity					
Biological Oxygen Demand (BOD)					
Coliform Bacteria					

