Oysters in a Clear Bay

Grade Level: 2-5

Subject Area: Life Science

Virginia SOL:
2.1; 2.6
3.1; 3.6; 3.10
4.1; 4.5; 4.9
5.1; 5.6

Objectives:
Students will:
- Understand sources of pollution in the Chesapeake Bay
- Understand the role oysters and other organisms play in filtering the Bay
- Construct a filter

Summary:
Students will complete a filter building challenge in order to better understand the important role that oysters and other types of bivalves play in keeping the water in the Bay clean and helping to remove pollutants.

Vocabulary: filter, pollution, restoration

Materials (included in box):
- Cotton balls
- Gauze (2 types)
- Gravel
- Beans
- Rubber Bands
- Strainer
- Sponge
- Coffee Filter
- Straws
- Funnels (3 sizes)
- Newspaper
- Judges worksheet
- Design instruction
- Price list

Not included:
- Dirt
- Water
- Jug
- Stopwatch
- Graduated cylinder

Background information:
Oysters are a staple of the Chesapeake Bay ecosystem. They serve a number of important roles such as being a food source, an important habitat, and contributing strongly to the Chesapeake Bay economy. Oysters also serve an important role in helping filter our waters. Oysters along with clams and mussels are part of a group of shellfish called bivalves, and they eat by filter feeding. In this process, the oysters take in water through a siphon, and then separate the food to digest. Whatever else is found in the water besides food is compacted and released, which then settles to the bottom of a body of water. As a result, oysters are very efficient at water filtration.

Oysters used to dominate most of the Bay. In the late nineteenth century, there were so many oysters that they could filter the Bay in less than a week! Due to overfishing and oyster diseases, it now takes the current population of oyster nearly a year to filter the same volume of water! Oysters can filter about 2.5 gallons of water in an hour which means they are quite efficient! Because there are fewer oysters now then their used to be, it is important to find other ways to help with water pollution.

Procedure:

Introduction

1. Ask students if they know any sources of pollution for the Chesapeake Bay, and discuss possible source such as fertilizers, chemicals, sediments/dirt, plastics, sewage etc.
2. Tell students that they will be doing an activity in which they will compete to build the best filter. Ask if they think a human-made filter will ever be able to compete with the filtering capacity of an oyster.

Activity

1. Divide students into groups of 2-5. Each group will be designing and building filters, with a budget of $100 of play money. Tell students that they will be judged based on three categories: speed, cost, and water clarity after filtering. Each group should receive a copy of the design worksheet. The judges (either a subset of students or the teacher) should have their instruction sheet with the judging criteria.
2. Students will need 20-30 minutes to work through the design process including drawing their idea, budgeting supplies, and building the model.
3. Have all students come together and place their filters along the front of the room. The judges will test each of the designs in front of the class for everyone to see, recording the results on their judge's worksheet. Students will need to report the final cost of their filter to the judges during testing.
4. Depending on age, you may also want to have your students identify the constants, and independent variables in their experiment before judging begins (same amount of dirt and water every time).
5. Judges announce the winners of the design contest!

Wrap up

1. Ask students if their filters worked as well as they thought they would. Thinking about the rate at which an oyster filters, do they think they have any designs that work better

(*likely the answer is no*). What would they change about their design after pilot testing?

2. Ask students about some sources of pollution that affect the bay (*sediment, excess nutrients, chemicals)*. Explain that oysters can help to filter many of these types of pollutants out of the water. Most importantly, oysters filter out sediment and excess nutrients. This is essential because when the water gets too murky, sunlight cannot reach underwater plants. Excess nutrients can cause a variety of issues. Often, too many nutrients will cause large amounts of algae to grow in the water and create algae blooms, which use up the water's oxygen, and can sometimes be toxic.

3. Ask students about how cost impacted their filters. Did they find money to be an obstacle while they were building? Oyster restoration is another option for helping to keep our waterways clean. By throwing old oyster shells back into the water, they can help create spaces for new oysters to grow. By monitoring how many oysters we take out of the water and taking steps to increase the number of oysters in our waterways, we can help the natural system. Restoration of oyster reefs is important for the Chesapeake Bay, both for creating healthy habitats for the people who live there, and for ensuring that people can use the resources in these habitats for years to come.

4. Clean up! Have students disassemble their filters, rinse off any reusable pieces and return them to the box. As an extension, students could create a second filter using knowledge gained from the pilot to see if they can beat their score.

Names of students in group: _____

Class Period: _____ Date: _____

Oysters in a Clear Bay – Filter Lab

1. Come up with a team name: _____

2. Name at least 2 natural filters for the Chesapeake Bay:

Filter Materials Price List

Material	Price
Cotton Balls	$2.00
Gauze (small)	$10.00
Gauze (large)	$30.00
Gravel	$20.00/handful
Beans	$10.00/handful
Rubber Bands	$1.00
Strainer	$40.00
Sponge	$25.00
Coffee Filter	$8.00
Straw	$1.00
Funnel (small)	$40.00
Funnel (medium	$35.00
Funnel (large)	$30.00
Newspaper	$1.00/sheet

3. Use the space below (or the back of the paper) to create a budget and a sketch of your group's filter design. You only have $100 to build a filter, spend it wisely!

***Judges will be scoring on: the speed the water is filtered, the cost of materials, and the clarity of water (how clear the water is) after it is filtered. ***

Special Instructions for the Judging Committee

Please read the following instructions:

- You will be scoring the filters by three scoring areas. The scoring areas will include:
    - Time to filter water (Speed)
    - Cost of Materials (Cost)
    - Water Clarity after filtering

- Decide how much water and dirt you will use to test each filter. (ex. 1 cup water)

- Use chart below to write down each Team name and score their filters.

- Ask the teacher to help you assemble the tools you will need to test the filters.
    - A jug of dirty water (mud, silt, algae)
    - A graduated cylinder
    - A stopwatch (or clock)

- Instruct the groups to bring their filters to a central location.

- Explain the scoring areas to the rest of the students by reading the first bullet point.

- Test and score each filter! Write the results on your chart. When you are finished, discuss the results and select a winner.

Filter-Off Results

Team Name	Time	Cost	Clarity

Using the Information Collected, answer the following questions:

1. Which group's filtered the water fastest?

   _____
   _____

2. Which group's filter had the clearest water?

   _____
   _____

3. Which group's filter was the least expensive?

   _____
   _____

4. Is there a clear winner?

   _____
   _____