

THE ADVENTURES OF FRED FISH

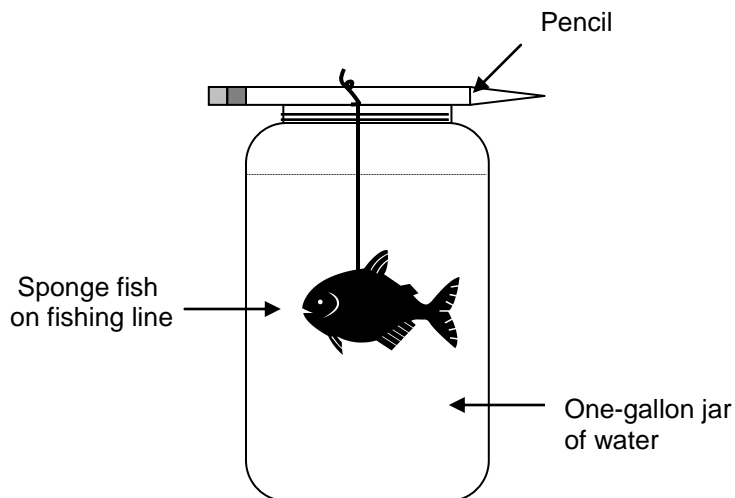
PART I:

Students will demonstrate the affects of pollution on water using a story of Fred Fish.

Materials:

Small paper cups with the following:
(2 T unless specified)

2. Soil
3. Brown sugar
4. Syrup
5. Salt
6. Paper
7. Soapy water (2 drops soap in 2 T water)
8. Chocolate pudding
9. Green food color (2-3 drops)



1-gallon jar filled with water (include the lid for Part II)

Fred Fish tied to a 6" string on a pencil (adjust as needed for depth)

Advance Preparation:

- Label small paper cups with numbers 1-8. Add the specified ingredients listed for each number. For green food color, use the actual bottle.
- Tie the sponge fish on a fishing line that is secured on a pencil as shown. (If necessary, attach washers or a weight to hold the fish in the water.)
- Copy and cut the page of sentence strips for the story.
- Fill a gallon jar with water.

Procedure:

1. Introduce the activity by showing the students the jar of water. Add Fred Fish and begin the story line. Select students to individually come to the jar to read a sentence strip and add the materials described for each step. (Students should not read the information that tells what to add.)
2. After adding the first ingredient, ask, "How's Fred?" In the subsequent steps have the students ask in unison, "How's Fred?"
3. Students can illustrate each step in a journal to later make a cartoon to communicate Fred's travels. Discuss the responses to "How is Fred?" Let them decide individually in their journals what will happen to Fred after the last ingredient is added.
4. Once the story is complete, move to Part II.

1) Fred is a fish. Imagine Fred's home, a clean river meandering through a protected wilderness area. HOW IS FRED? Fred has lived in this stretch of the river all his life. But he wants an adventure. Although he is surrounded by a rich ecosystem in his deciduous forest home, he wants a change. Fred is going on an adventure. He is swimming downstream.

2) Fred swims into farm country. He passes a freshly plowed riverbank. It begins to rain and some soil erodes into the river. (Dump soil into Fred's tank.) HOW IS FRED?

3) Fred nears a suburban housing development. Homeowners have added lawns and plants for aesthetic appeal. Some fertilizer from the yards washed into the river a while back. (Pour brown sugar into Fred's tank.) The fertilizer made the plants in the river grow very fast and thick. Eventually the river could not furnish them with all the nutrients they needed, and so they died and are starting to decay. Their decomposition is using up Fred's oxygen. HOW IS FRED?

4) Fred sees a large object ahead, and it is crossing the river. What is moving across it? This is a first. Fred swims under a highway bridge. Some cars traveling across it are leaking oil. The rain is washing the oil into the river below. (Pour syrup into Fred's tank.) HOW IS FRED?

5) During a recent cold spell, ice formed on the bridge. County trucks spread salt on the road to prevent accidents. The rain is now washing salty slush into the river. (Pour salt into Fred's tank.) HOW IS FRED?

6) Fred swims past the city park. What is this new life form in the river? Is it alive? Seems to just sit along the edge of the water. Some picnickers did not throw their trash into the garbage can. The wind is blowing it into the river. (Sprinkle the paper dots into Fred's tank.) HOW IS FRED?

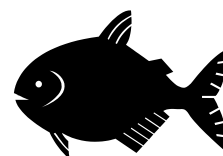
7) Several factories are located down river from the city. Although regulations limit the amount of pollution the factories are allowed to dump into the river, the factory owners do not always abide by them. (Pour some soapy water into Fred's tank.) HOW IS FRED?

8) The city's wastewater treatment plant is also located along this stretch of the river. The pollution regulations are not as strict as they should be. Also a section of the plant has broken down. (Add chocolate pudding for sludge.) HOW IS FRED?

9) Finally, Fred swims past a hazardous waste dump located on the bank next to the river. Rusty barrels of toxic chemicals are leaking. The rain is washing these poisons into the river. (Put two drops of green food coloring into Fred's tank.) HOW IS FRED?

References:

Adapted from *Water, Stones and Fossil Bones*, National Science Teacher's Association. 1991



CLEANING FRED'S WATER

PART II:

Students will build a model to demonstrate a natural method designed by engineers for removing contaminants from soils.

Materials:

plastic spoons

alum

2 3-liter bottles

Funnel

8 ounce cups (1/team)

marker to label cups

cotton balls

paper towels

water filter kits (1/team)

- 2 or 3-liter bottle cut in half with the top inverted as a funnel into the lower half.
- cotton in the bottle mouth and cheesecloth secured over the mouth with a rubber band

A work station with the following materials in tubs or containers:

- charcoal (more expensive and possibly limited per team)
- landscape rocks (1 inch diameter)
- pea-sized gravel
- coarse sand
- fine sand

Advance preparation:

Prepare a work station with tubs of materials.

Prepare water filter bottles by cutting 2 or 3-liter bottles in half. Invert the top half into the bottom half.

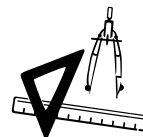
Procedure:

1. Remove Fred Fish from the water jar, and secure the lid on the bottle. Shake the contents briefly to thoroughly stir.
2. Pour the water into cups for class teams. Each team should have a cup of Fred's water.
3. Have students add 1 teaspoon of alum to the sample and gently stir for a few minutes to bind the soil in the water. Alum attaches to the soil and makes it settle to the bottom (practice in actual water treatment)

Teacher Page

4. At this point, explain to students they will engineer a water filter to clean the water. However, they must first have a design that justifies their choices before building the actual model. Choices will come through investigation of the materials to determine filtering properties. They will be limited to the materials provided.

5. From the data derived, students will create a final drawing with measurements and labels.



6. Once students have a design plan, the teams will present their solutions. They will explain the components and justify the design. Additionally, they will include predictions regarding the performance of the filtering system.

7. Next, have students build the filters with the materials specified in their designs. Once the apparatus is complete, students will pour Fred's water into their system. They will need to later check the filter they design to see the clarity of the water.

8. Have students verify the performance of the design. Does it perform as predicted? If not, they should analyze their design and make adjustments in their design drawing. Again, they should provide justifications for the performance and predictions for the outcome prior to making the proposed changes.



9. Students will then modify their design as proposed and once again verify the performance predicted.

Looking at Models:

Explain that the bottle is a model that shows how water plants filter water. Discuss how the model is similar and how it is different from the actual water treatment in a municipal plant (limits of a model).

Extension:

Have students sort the components of the filter system by using different sizes of screen. Assign them the task of designing the experiment.

Reference:

Gaylynn Chapman, City of Lubbock Education Specialist. Lubbock, Texas. 2000.