ACTIVITY 21

SINK OR SWIM

WHAT ARE THE SPECIAL STRUCTURES THAT ALLOW FISH TO STAY UP IN AND MOVE THROUGH THE WATER?

SCIENCE SKILLS:
- observing

CONCEPTS:
- Most fish are well-adapted as swimmers.
- Fish have special structures such as fins which enable them to move through the water.
- Most fish have a swim bladder which regulates their buoyancy.

MATH AND MECHANICAL SKILLS PRACTICED:
- dissection

SAMPLE OBJECTIVES:
- Students will be able to do an orderly dissection to investigate a question.
- Students will be able to list and locate the fins of a typical fish.
- Students will be able to locate the internal organs of a fish

INTRODUCTION:

Observing the external and internal anatomy of a BONY FISH is one way to answer the main questions that this lesson poses: how do fish move through the water and how do fish keep their vertical position within it? Your students will also learn about other fish adaptations and characteristics while observing and dissecting a fish. Contrary to what students may think, a dissection is a clean, neat and organized activity. It is not a cut, slice, hack and saw proposition; rather, each part must be carefully unwrapped from the other organs nearby. It should be thought of as uncovering the layers, one by one, so as not to harm the layer below. It is important to stress this with the students before beginning any dissection. Simple scissors with one sharp point and one rounded point are the only cutting tool needed.

MATERIALS:

For each group:
- a fish that has not been cleaned (seafood market or grocery store or caught during a vacation; keep on ice or frozen; thaw under cold running water 1/2 hr before use)
- newspapers or a dissecting tray
- one pair small sharp scissors (one point side pointed, one rounded)
- one probe (can be a coffee stirrer or round wooden stick)
- one pair of tweezers (useful but not required)
- paper towels
- work sheets

For the class:

- microscope (if available) or hand lens or magnifying glass
- one fish for demonstration (about 1 ft or so in length)
- small balloons
- a clear container of water into which one fish will easily fit
- safety pins or needle and thread‘s

LESSON PLAN:

BEFORE CLASS: The best fish for dissection are ones you catch and immediately freeze. You could put out a call among your students to save and freeze fish from a fishing trip with their parents. Put the fish on ice immediately upon being caught and in the freezer as soon as possible. The insides turn to mush if the fish are allowed to sit around. Fresh fish from the grocery store are not nearly as fresh as one would wish. Thaw in cold running water shortly before class. Saltwater fish frequently have a larger swim bladder than freshwater fish. Practice dissection and prepare a fish to serve as a model for the students by dissecting it and labeling the internal organs in advance. If you plan to do the fish printing activity, do it BEFORE the dissection. NOTE: no sample answers are provided since the variety of answers equals the variety of fish used.

DURING CLASS:

METHODS: Introduce this activity by reviewing the adaptations of other organisms for life in different places in the water. Some have special appendages to slow their rate of descent through the water; others have structures that allow them to live on the surface tension. But what about fish? What do they have that keeps them from sinking and enables them to occupy different levels in the water? Students will no doubt mention fins, but is there anything else? How about studying the external and internal anatomy of a fish to find out?

Discuss safe use of scissors and rules for behavior during dissection. Students tend to want to stick their fish in somebody's face to hear screams. Pass out the fish and work sheets and let teams proceed while you circulate to keep things going.

When the students have completed their dissections, find out if they found a swim bladder. Try this demonstration to see how it works. First ask students to predict what will happen when a dead fish, that has already been frozen and thawed, is placed in a tub of water. Try it! If it is not rotten, it will sink. Now, make a small cut with scissors in the underside of the fish (beginning at the vent opening). Insert a very small balloon, inflated just a little, into the opening. Use a needle and thread or safety pins to close the cut and hold the balloon in place. Does the fish sink or float when placed in a container of water now? This demonstration shows how a fish's swim bladder actually works to keep the animal suspended in the water, although its actual position will not be correct. You might also try taping a balloon to the fish's back for a demonstration of balance.

USING YOUR CLASSROOM AQUARIUM:

Observe live fish in an aquarium; note especially which fins are used, how they are used, and how easy or difficult it appears for different species of fish to remain suspended in the water. Do some remain motionless, hanging in the water? Which fins are used for swimming? Do all your fish swim in the same way?

EXTENSIONS:

1. During dissection, have students remove sections of the backbone and/or the jaws and teeth. These can be cleaned, dried and preserved for later observation by removing as much of the flesh as possible, placing the bones in a jar of bleach for several days and then setting them somewhere safe to air dry
2. Show the film "What is a Fish?" This 22 minute Encyclopedia Britannica film #2033 includes footage of a dissection as well as sections on adaptations. Even though this is an ancient film, it is excellent.
3. Compare the differences, both internal and external, between sharks and bony fish by dissecting a shark with your students. Sharks can be obtained from biological supply companies, fishermen, and sometimes fish markets (especially if you let them know you're looking for one). Several manuals exist concerning shark anatomy and are available from biological supply houses. One major comparison would be the large oily liver of a shark, which provides its buoyancy in place of the bony fish's swim bladder. Some sharks also swallow air at the surface for temporary buoyancy.
4. A good addition to a fish anatomy lesson is an art activity called fish printing. This activity also fits into social studies if you are studying Asia.

The Japanese invented "gyotaku" (gyo=fish, taku=rubbing) as a means of recording their catch. (A fish print never lies!) Gyotaku (pronounced ghio-ta-koo) has since evolved into an art form and is a good way to gain appreciation for the beauty and variety of marine organisms. Fish printing may be done on paper or fabric; directions are similar and given for both.

MATERIALS:

- fish (any fish that is fairly flat and has obvious scales)
- newspaper
- paper towels
- newsprint (rice paper is traditional but expensive)
- water soluble paint or textile ink
- stiff-bristled paint brushes
- thumbtacks or tape

This can be rather messy and time-consuming, so plan accordingly. If you use textile paint, the students may make a T shirt or other item. Use cotton cloth for best results.

1. Before the class, wash the fish carefully and thoroughly with soap and water to remove the mucus. Plug the mouth and gills, and vent (if possible) with paper towels so the fish will not leak.
2. Paint the fish. Do not to use too much ink. Thin the ink or paint if necessary. Stroke the brush from head to tail, but do not paint the eye. Paint fins and tail last, since they tend to dry out quickly. You may also brush the fish from tail to head to catch ink under the edges of scales and spines and improve the print if you use a thin coat of paint.

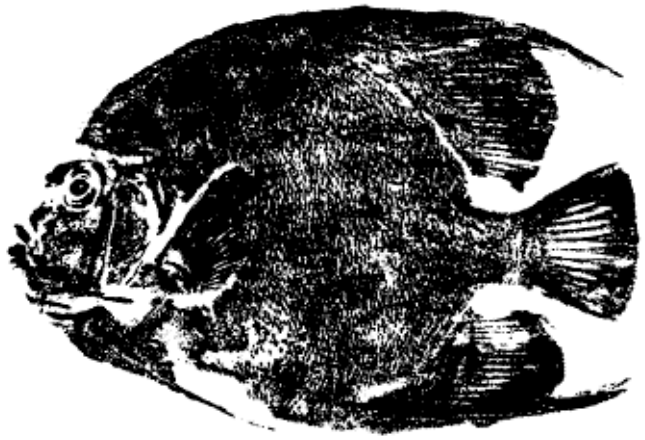
3. If the newsprint paper under your fish became wet with ink during the painting process, move the fish to a clean piece before printing. Otherwise your print will pick up leftover splotches of color.

4. Carefully lay a sheet of paper over the fish. Taking care not to move the paper, use your hands to press the paper over the fish. Press the paper gently over the fins and tail. Be careful not to wrinkle the paper or you will get a blurred or double image. If printing a shirt, put a layer of newspaper inside the shirt so that the paint does not seep through.

5. Slowly and carefully peel the paper off. Paint in the eye with a small brush. The prints tend to all look alike, so have students write their names on them and tack or tape them to dry.

6. Once a fish has been painted, it must be washed and dried before changing colors. If this is not feasible, use paper towels or a damp sponge to remove as much paint as possible.

7. Fabric items should be ironed (cotton setting) from the reverse side for 30 seconds to set the color and washed in mild detergent.



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Name Answers depend on the fish used.

I. THE OUTSIDE

A. What is your fish's general shape? _____

_____

Draw your fish in the space below and label all its fins and other parts as you do this worksheet:

B. Feel the surface of the SKIN. What does it feel like? _____

_____

The skin is covered with MUCUS which helps protect from disease.

C. Most bony fish have tiny pieces of bone in their skin called SCALES. Scales help waterproof the fish's skin and also help protect the fish. Remove a scale and observe it under the microscope or a hand lens.
Draw the fish's scale:

Does the scale have rings? _____

How many rings can you count? _____

What might the rings tell you? _____

_____

D. Is there a line down the side of your fish? _____ Most fish have a LATERAL LINE which senses movement in the water near the fish. Label the lateral line on your diagram if your fish has one that can be seen.

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Name Fish anatomy does vary