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Float, Sink, Think!

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Quickies

If you have an idea that facilitates science teaching, jot it down and send to Editor, *Iowa Science Teachers Journal*, Biology Department, University of Northern Iowa, 50613. Be sure to include the name of your school and position. Here are some recent contributions.

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Float, Sink, Think!

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The following is a typical question asked at the end of physics units dealing with buoyancy:

> "A barge loaded with scrap iron is in a canal lock. The captain orders his crew to dump all of the scrap iron overboard. What happens to the water level in the lock?"

I have asked this type of question to both high school and college physics students. Of course, answers are given which predict an increased, a decreased, or an unchanged water level.

After the predictions are made, small groups of students are provided with some simple equipment and asked to design an experiment to determine the answer to the barge question. The equipment comprises plastic or milk carton "barges", aquaria or tanks, sets of masses, and water.

The students waste little time in deciding to float the "barges" in water and filling them to capacity with mass pieces. The water level is marked at the side of the aquarium. Then the masses are carefully "thrown overboard". This causes a definite lowering of the water level.

A discussion follows with some students correctly explaining why the water level drops. Other students are still not quite sure.

Archimedes' principle provides the reasons for what was observed. This principle states that a body completely or partially submerged in a fluid is buoyed up with a force equal to the weight of the displaced fluid.

Thus, while floating, the "cargo" displaced a volume of water which had a weight equal to the weight of the mass pieces.

When the masses were totally immersed in water, they displaced a volume of water equal to their own volume. Because the mass pieces have a density much greater than water, the weight of the displaced water was not nearly equal to the weight of the "cargo". While afloat, the volume of displaced water is much greater than when the masses are in the water.

This has proven to be a successful culminating activity on buoyancy and a convenient review on density.

Answer to the lock question: The water level at the side of the lock will be lower.