Will the Whirligig Beetle Sink or Float?

Background Information

Whirligig beetles range in size from 3 to 15 millimeters. Their stream-lined shape suits whirligig beetles to living in an aquatic environment. Whirligig beetles have divided eyes that allow them to see both above and below the water's surface. Whirligig beetles typically hold their long fore legs forward, paddle with their short hind legs, and swim in whirling circles on the surface of ponds or slow streams.

Whirligig beetles use the surface tension of the water to keep part of their bodies above the water surface and part of their bodies below the surface. One way to think about surface tension is to imagine that there is an invisible “skin” on the water. The whirligig beetle’s body is held up on the water by surface tension. You may observe that the beetle’s weight forms a dell, or recess, in the “skin” on the water surface. However, parts of the whirligig beetle’s body break the surface “skin.” The whirligig beetle’s hind legs break the “skin” so it can paddle, and its eyes break the “skin” so it can see under the water.

Conducting a Hands-on Experiment

One way to use this lesson is with an experiment that simulates how whirligig beetles use surface tension to float on the water. Students will also conduct a hands-on activity to see how water pollution affects the whirligig beetle’s ability to swim on the surface of the water and survive in its environment.

First, decide if you will conduct the experiment as a whole group, in small groups, or individually. If possible, have other adults available to assist groups and individuals.
Collect the materials you will need:

- bowl or large cup
- dry paper clips
- detergent or soap
- towel or paper towel

Fill the container with clean water. Create a paper clip holder by bending part of one paper clip to form an L-shape. Put a second paper clip on the paper clip holder. The second paper clip is a model for the whirligig beetle.

Ask students to predict whether they think a paper clip placed on the surface of the clean water will sink or float. Have them record their prediction in the *Will the whirligig beetle sink or float?* Science Journal page.

Use a *steady* hand to lower the paper clip holder to the water surface. Gently place the second dry paper clip on the surface and remove the L-shaped holder. If the paper clip sinks, dry it and try again.

Once the paper clip floats, ask students to record the result of placing a paper clip in the clean water in their science journal page.

Next, have students observe the paper clip by looking close to the water level. They will see that the paper clip sits in a dell, or recess, on the surface of the water. Students are observing the surface tension that allows the paper clip to float on the water.

Tell students that they will next use their model whirligig beetle to observe how water pollution might affect the bug.

Ask students to predict whether they think the paper clip will continue to float or sink after adding one drop of detergent or soap. Have them record the number of drops of detergent or soap and their predictions in the Science Journal page.

Carefully add one drop of detergent or soap to the cup, next to the paper clip, not on top of it. Depending on the concentration and chemicals used in the detergent or soap, the paper clip may remain floating or may sink. Record the result in the Science Journal page.

Adding detergent or soap to the container models how water pollution will affect the whirligig beetle. Experiment with different detergents or soaps to find the optimum amount of detergent to add to the water to make the paper clip sink by adding a number of drops. Ideally, students should be able to add one to several drops of detergent before the paper clip sinks.

Whether the paper clip floats or sinks, tell students that this might compare to how whirligig beetles might be affected by a small amount (or concentration) of pollution in the water.

Ask students to predict whether they think the paper clip will sink or float when more detergent or soap is added to the water. Have them record the number of drops of detergent or soap and their predictions in the Science Journal page. Add more drops of detergent or soap to the cup. Record the results in the Science Journal page. Repeat this process one more time.

You may repeat the experiment by increasing or decreasing the volume of water in the container and/or by using different types of detergent or soap.

You may also visit the following reference:
http://www.homeschoolscience.com/sample_lessons/sample_skaters.html

Vocabulary

- aquatic
- compound eyes
- fore legs
- buoyant
- specialized
- hind legs

Vocabulary definitions can be found in the ***Backyard Bugs*** *Glossary.*

Thinking Question

Why is surface tension, the water surface's "skin," important to the whirligig beetle? How does the amount of pollution in the water affect the whirligig beetle's life functions?

Exploratory and Extension Activities

Additional Exploratory and Extension activities are available in the *Backyard Bugs* Teacher's Guide.

Insect Habitat

Using large lengths of butcher paper have students plan and create a mural of whirligig beetles and their freshwater habitat.

Bug Poetry

Read and discuss the poem *The Whirligig Beetles* from *insectlopedia* by Douglas Florian (Harcourt Children's Books, 1998, ISBN: 0152013067). Create an idea web for the whirligig beetle based on the poem and any prior knowledge students have. Record student observations on a large piece of paper. Read the poem again after the discussion.

In the Swim

Ask students to describe how their arms, legs, and eyes help them when they are swimming. Have them discuss the different ways that our arms and legs move and different types of swimming strokes. Lead the discussion to how students might look under water while they are swimming. Remind them that people also change how they breathe while they are swimming under water. Ask students to compare the way people swim to the way whirligig beetles swim. Have students bring in equipment that people use while swimming. Have them describe the gear as well as how people use the gear. Ask students to describe whether whirligig beetles have a similar body part as the gear being discussed.

Name: _____

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Use a paper clip to model the whirligig beetle swimming on the surface of the water.		
	Prediction	**Result**
Clean water		
Water polluted with __ drops of detergent		
Water polluted with __ drops of detergent		
Water polluted with __ drops of detergent		

What might happen if the pond where whirligig beetles live becomes polluted?

_____

_____

_____

_____

Answer Key

Will the Whirligig Beetle Sink or Float?

Use a paper clip to model the whirligig beetle swimming on the surface of the water.		
	Prediction	**Result**
Clean water	*Student answers will vary.*	*The paper clip floats.*
Water polluted with __ drops of detergent	*Student answers will vary.*	*Depending on the concentration and chemicals in the detergent or soap, the paper clip may float or sink.*
Water polluted with __ drops of detergent	*Student answers will vary.*	*Depending on the concentration and chemicals in the detergent or soap, the paper clip may float or sink.*
Water polluted with __ drops of detergent	*Student answers will vary.*	*Depending on the concentration and chemicals in the detergent or soap, the paper clip may float or sink.*

What might happen if the pond where whirligig beetles live becomes polluted?

Suggested answer: Whirligig beetles might not be able to swim at the surface of the water. It might change how whirligig beetles are able to survive in their environment. Whirligig beetles might not be able to live and reproduce if the pond they live in becomes too polluted.