

# Don't Get Wet

## Summary

Students move objects in glasses filled with water by placing magnets on the outside and using a nail-magnet system.

## Time Frame

1 class periods of 30 minutes each

## Group Size

Individual

## Materials

For the Teacher:

Large glass or clear plastic container of water, such as a wide-mouth gallon jar or small aquarium.

Several small objects that are attracted by a magnet, such as: paper clips, small nails, thumb tacks.

Strong magnet, such as an alnico magnet.

For the Student: (individual or small group)

Small glass or plastic cup.

Several small objects, such as paper clips, small nails, or tacks.

One magnet.

One large iron nail.

## Background for Teachers

Magnetic fields pass through water and will attract objects containing iron, steel, nickel, or cobalt in the water, provided the magnet is strong enough to attract the objects across the distance from the outside of the glass container to the objects.

Test the variable of the thickness of the glass container first by demonstrating the magnetic attraction through an empty glass before testing the attraction through water.

This investigation is intended to show that magnetic fields can also pass through an iron nail and turn the nail into a temporary magnet when a strong magnet is touching the head of the nail.

Experiment with the nail-magnet system by picking up small paper clips outside the water container before picking up objects in the water.

As you or your pupils remove objects attracted by the nail-magnet system, you may discover that the magnet will lift more under water than in the air. The water supports the objects in a way that air cannot. For this reason, you may remove objects you are experimenting with at the water's surface much as a fisherman would net a fish.

## Intended Learning Outcomes

Observe simple objects, patterns, and events and report their observations.

Demonstrate a sense of curiosity about nature.

Cite examples of how science affects life.

## Instructional Procedures

As a group demonstration, place several small objects in the bottom of a large glass or plastic container and fill the container with water.

Challenge students to think of a way to remove the objects from the water without getting wet. Accept and list any responses given. You may want to test some of the students' ideas. Show students a strong magnet (alnico is recommended) and suggest that you try to use the magnet to remove the objects.

Predict whether the magnetic field can travel through the water. Will it travel through the glass or plastic container?

Working individually or in small groups, instruct students to place an object in their glass or plastic cup. Move their magnet on the outside of the cup to see if the object is attracted by the magnetic field when the object is inside the container. Ask the question, "Will the magnetic field pass through the container?"

Add water to each cup until it is about half full. Allow students the opportunity to test their prediction by holding the magnet against the side of the container and dragging the object or objects it attracts to the top of the water.

Demonstrate construction of a nail-magnet system by holding a long nail with the magnet against the head of the nail. Ask students to predict whether the magnetic field will pass through the iron nail.

Working individually or in small groups, allow students time to experiment with constructing their own nail-magnet system by picking up objects from the desk or table. Predict whether the nail magnet system will work in the water. Encourage students to try the system with their cups of water and different small objects. Picking up more than one object will depend on the strength of the magnet. Clean up and return to the large group demonstration.

Challenge students again with the original question. Students should now be able to tell two ways to remove the objects from the tank without getting wet.

Demonstrate by using the magnet on the outside of the large tank and removing objects by dragging them up the side of the container.

Demonstrate placing the large nail in the tank near the objects and then holding the magnet against the head of the nail. Move the nail close enough to pick up the objects in the water. How many objects will the larger system pick up?

Congratulate students on successfully being able to remove the objects without getting wet.

### Extensions

Count and compare the number of paper clips that can be lifted in water and the number that can be lifted in the air using a magnet system.

Float corks with pins or tacks in a small flat glass pan or dish of water. Let students navigate the corks with magnets. Hold the magnet underneath the container and navigate the corks. Does it make a difference if pans made of different materials are used?

### Assessment Plan

Have each student demonstrate his or her ability to remove an object from a glass of water using a magnet and a nail-magnet system.

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