

Lesson Title: Floating Paperclip

Lesson Overview: Students will investigate balanced and unbalanced forces by investigating why some objects float and others sink.

Topic(s): Motion & Stability: Forces and Interactions

Grade or Grade Band: 3rd Grade

Lesson Objectives:

- Perform an investigation in balanced and unbalanced forces
- Describe the forces that make objects sink or float
- Describe the result of adding soap to the investigation

Next Generation Science Standards:

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball causing movement; and, balanced forces pushing on a box from both sides not causing any motion.]

North Dakota Standards:

3-PS2-1 Plan and conduct an investigation to prove the effects of balanced and unbalanced forces on the motion of an object.

PS2.A: Forces and Motion – Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces action on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object’s speed or direction of motion.

Time Needed (estimate): 30 minutes

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Preparation/Materials

Background knowledge students must have to be successful:

Students should have experience with why some objects sink and others float. Third graders should also have a basic understanding of gravity.

Differentiation and accommodation to support learning for all students:

Essential terminology:

- Surface tension- the attraction of liquid particles at the surface of the liquid
- Surfactant- any substance that has the ability to reduce the surface tension of a liquid

Websites: <https://youtu.be/saz9p2Gi-Ww>

Materials needed:

- Paperclips
- Large bowls or containers
- Water
- Soap
- Paper towels

Procedure/Activities

Engage: Display several classroom objects and ask students to predict which ones will sink and which ones will float. Be sure to have a variety of objects and allow students to observe as you drop them in water. Discuss any objects that surprised them and didn't perform as predicted. Tell students we will be investigating an object that can sink or float based on how it is placed in the water.

Explore: Hand out the water, containers, and paperclips to the students. Ask students to drop the paperclip into the water and see what happens. Most students will find the paperclip will sink. Have them record what happened to the paperclip on the Floating Paperclip Lab Report. Ask students to think about what forces are causing the paper clip to sink. Some students may say weight or gravity, both forces. Inform students that if they are very careful, they can get the paperclip to float. Allow students time to investigate the best way to get the paperclip to float. If students are having difficulty getting the paperclip to float, have them watch the ND EPSCoR Floating Paperclip video: <https://youtu.be/saz9p2Gi-Ww>. (Only watch to minute 1:33)

After watching the video, allow students time to experiment with the paper towels and attempt to get the paperclip to float. Once students have successfully made the paperclip float, show students the Dawn dish soap. Ask students to predict what will happen when dish soap is added to the water. Allow students time to write down their predictions on the Floating Paperclip Lab Report.

Explain: Students should have the opportunity to observe the paperclip floating on the water and then sinking due to the addition of the dish soap. Play the remainder of the NE EPSCoR Floating Paperclip Video: <https://youtu.be/saz9p2Gi-Ww>. Ask students if the forces of gravity and weight are what caused the paperclip to sink. Inform students that the force keeping the paperclip afloat is called Surface Tension. When water molecules are touching each other, they have an attraction that helps them to stay together. When dish soap is added it is able to weaken the surface tension allowing the paperclip to sink.

Extensions for learning more about this topic:

Science: Challenge students to find more objects to rest on top of the water

Writing: Conduct a short research project to build knowledge on the topic of surface tension

Math: Measure and estimate liquid volumes and masses of objects using standard units.

Evaluation of learning

Listen to discussions as student complete the Floating Paperclip Lab.

Evaluate the Floating Paperclip Lab Report for correct and complete answers.

Name: _____

Floating Paperclip Lab Report

1. What happened when you first placed your paperclip in the water?
2. How were you able to get your paperclip to float?
3. What do you think will happen when you add the dish soap to your water?
4. What happened when the dish soap was added to the water?
5. What force allowed the paperclip to float?