

Lesson Plan: WHAT FLOATS, WHAT SINKS, AND WHY?

Class: 1st and 2nd Class

Subject: Science

Strand: Energy and Forces

Strand Unit: Forces



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Aim / Learning Objective:

Students will investigate floating and sinking with a range of materials and objects. Students should make and test predictions about objects that will sink or float and group objects based on these criteria. Students will also develop an understanding of how fish swim in the ocean.

Skills:

Students will have developed questioning and predicting skills as well as the following:

- Observing, Predicting, Investigating and experimenting, Estimating
- Analysing: Sorting and classifying
- Recording and communicating

Materials:

- A bowl / container of water
- A selection of different types of objects (that won't be destroyed by being placed in water) such as stones, metal spoons, wood, feather, plasticine etc.
- Pen and paper for recording the results.

Preparation / Background Information:

What is Buoyancy?

- Buoyancy is the upward force that keeps objects afloat. The upward buoyancy force is equal to the amount of the weight of fluid displaced by the body of the object. This force enables an object to float.
- Neutral buoyancy is achieved when the mass of an object equals the mass it displaces in a surrounding medium. This offsets the force of gravity that would otherwise cause the object to sink. An object that has neutral buoyancy will neither sink nor rise.
- Negative buoyancy is achieved by either increasing the object's own weight or decreasing its displacement, so that it sinks.
- Positive buoyancy is when the total weight of an object is less than the total weight of water it displaces, so that the object rises to the surface.

How do Fish rise and Sink in the Water?

- To swim in the water, a fish must reduce its overall density by increasing its volume without significantly increasing its mass. Most fish do this with what is known as swim bladder. A swim bladder is like an expandable sac (like human lungs). A fish uses its gills to reduce its overall density by filling its bladder with oxygen collected from the surrounding water.
 - When the bladder is filled with oxygen (gas), the fish has a greater volume, but its weight doesn't greatly increase.



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- When the fish expands its bladder, water is displaced and experiences a greater force of buoyancy.
 - When a fishes bladder is inflated, its volume is increased and the fish is pushed to the surface – floating.
 - When a fish's bladder is deflated, its volume is decreased and it sinks to the ocean floor.
 - To stay at a particular level, a fish fills its bladder to the point at which it displaces a volume of water that weighs what the fish weighs. In this case, the forces of buoyancy and gravity cancel each other out – causing neutral buoyancy and the fish stays at that level.
- Most fish rise and sink using this method. However, some species don't need a swim bladder because they spend all their life moving along the ocean floor searching for food. Other fish, such as rays and sharks don't have a swim bladder. They use their liver which provides 70% of buoyancy needed to float. They also move in the water by propelling themselves forward with their fins.

Activity:

1. Discuss with students why some items sink/ some items float, use the terms “heavier than water” or “lighter than water”. If an item is heavier than water it will sink. If it is lighter than water it will float.
2. Show the students the items which will be tested. Ask the students to predict which items will float and sink. Place each item in the water one at a time and observe if it sinks or floats.
3. Record the results making a list of which items floated and which items sunk.
4. Draw a table or graph showing the results. Group the items based on if they floated or sunk.
5. Ask the students why they think some items floated and some items sunk?
6. Get the students to use plasticine to learn about displacement of water to float (flatten it out to float) / sink (rolled up in a ball to sink). Also observe what happens to a balloon in water when it is not blown up (e.g. solid mass) and blown up (expanded with air in it).
7. Get the students to research using the web to find out how fish float and sink in the water?
8. The students can also research how sharks and rays float and sink in the water.