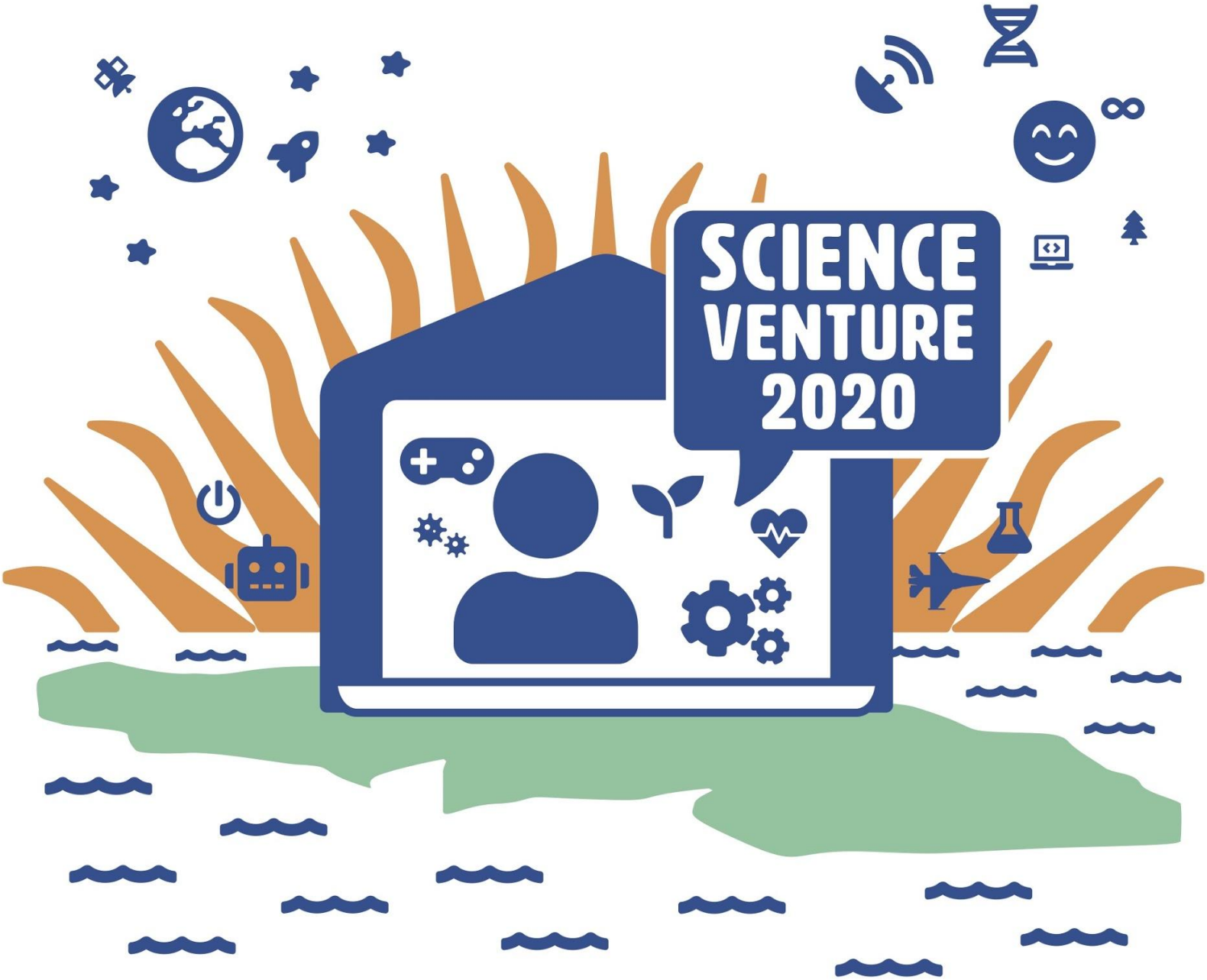


Oceanography

How Do Sharks Float?

Students discover how sharks float by making their own floating shark models. Students will also have the opportunity to design fins for their shark, with the goal of getting maximum lift.

Materials

- Toilet paper tube
- Tape
- Coins, rocks, or other small & heavy materials
- Cooking oil
- Balloon or plastic ziploc bag
- Cardboard or other recycled/craft materials
- Container or basin to hold water

Safety Considerations

- Be sure to complete this activity in an area that can get wet

Keywords & Concepts

How do sharks float?

- Many bony fish have a **swim bladder**, which is an internal organ that they can fill with air in order to control how high they float.
- Sharks do not have a swim bladder. Instead, they have a large liver filled with oil. Because oil is **less dense** than water, all of this oil helps sharks float in the ocean.
- Sharks also use **lift** from their fins to help them float, similar to how an airplane needs wings to lift off the runway. The fins help quite a bit; if sharks stop swimming, they will sink.
- Shark skeletons are largely made of **cartilage**, which is lighter than bone. This also helps sharks float by reducing their overall weight.

How Do Sharks Float?

What makes something float?

In order for things to float on water, they need to be less dense, or lighter, than water.Density compares how much space an object takes up in relation to how much matter it has.

For example, let's say we have a slice of swiss cheese and a slice of cheddar cheese, both of the same size. We'd say the swiss cheese is less dense, because it has lots of holes in it! The swiss cheese has less matter, but it takes up the same amount of space as the cheddar cheese. The cheddar cheese is more dense because it doesn't have any holes. The cheddar cheese has more matter, but it takes up the same amount of space as the swiss cheese.

Which do you think would weigh more?

- The cheddar cheese! Even if it's a tiny difference, when a slice of cheddar cheese is compared to a slice of swiss cheese in the same size, the cheddar would weigh more.

Summary: When a certain amount of one object weighs more than the same amount of a second object, we say the first object is more dense and the second object is less dense.

- That's why things like pool noodles or inflatable pool toys float; the foam and/or air that they contain is lighter than water.
- Things like rocks and coins sink because they are heavier than water; imagine holding a few coins in one hand and a bit of water in the other hand. Which one is lighter? The water is!

How Do Sharks Float?

Procedure

Steps:

1) Use a sideways toilet roll to represent a shark. Tape rocks, pennies, or other small and heavy objects to the underside of your toilet paper tube. Feel the weight of the toilet paper tube. It's a lot heavier than it was before! Sharks are generally heavy because they're really big, so they have large bones and large organs that weigh a lot.

2) Fill your basin with water, then place your toilet paper tube sideways in the water. Does it float or sink? Why might this happen? Does it relate to the weight you added?

3) If it doesn't sink at first, add more objects to the toilet roll until it sinks.

4) The toilet roll will now sink because of all the coins/rocks attached to it. Coins and rocks are denser than water, which is why they sink.

5) To simulate a shark's oily liver, fill a balloon or ziploc bag with some cooking oil. Place the bag or balloon inside the toilet roll, securing it with tape if needed. Feel the weight of the toilet roll again. It most likely feels heavier than last time, because of the added oil.

6) Put the roll back into the basin with the oil inside it. Does it float more than last time? Why do you think adding oil helped the shark float?

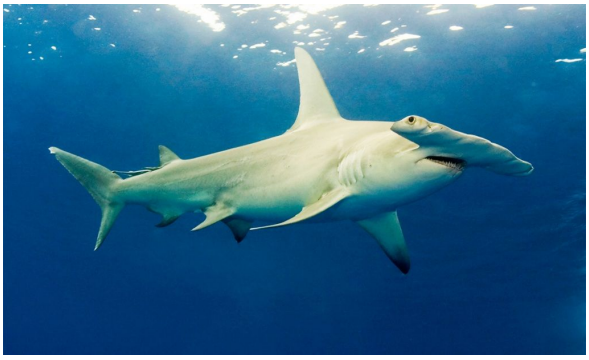
7) Even though adding the oil made the shark heavier, oil itself is less dense than water. Because of this, the oil wants to float and will help lift the shark in the water as well.

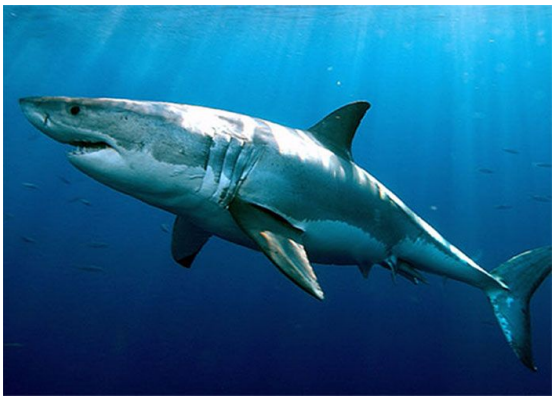
8) If your shark model doesn't float differently than last time, you may need more oil.

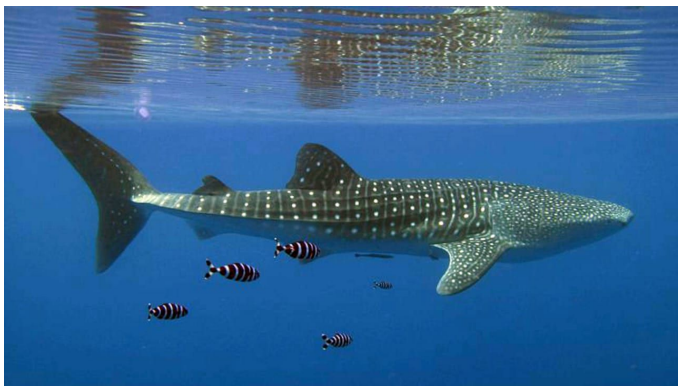
9) Keep experimenting with the amount of oil needed to make the shark float. Can you add or remove oil to adjust how high or low the shark swims?

How Do Sharks Float?

Sharks also use the lift of their fins to help them float. Check out some designs of real life shark fins:







Steps

1) Now that you've seen some real-life shark fins, try designing fins to help your shark float! Use cardboard or any other craft supplies to design fins and attach them to the toilet roll.

2) Test out your shark fins by putting the toilet paper roll in the basin. Does it float? If not, what could you improve about the fins? Do you need to make the fins bigger, add more fins, or make them lighter? Does it float without the oil too?

How Do Sharks Float?

Debrief

- Did your shark float? Why or why not? If your shark didn't float the first time, what did you have to change about it to make it float?

- Try seeing how many pennies/rocks/objects you can add to your shark before it sinks again.
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- If you use a different size tube for your shark, does this change how fast it will sink? What does this tell you about how sharks of different sizes float?
    - Bigger sharks are heavier, but they usually also have bigger livers that can store more oil and also bigger fins that can provide more lift.

- Try filling a ziplock bag or balloon with air and replacing it with the oil-filled bag to see if you can recreate a fish's swim bladder.

#SVatHome

Want to share your project or results with us?

Email or tag us @ScienceVenture

Have a question?

Reach us at svcamp@engr.uvic.ca