

CHARLES COUNTY PUBLIC SCHOOLS
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ENGINEERING DESIGN

A
SCIENCE @ HOME
ACTIVITY

DENSITY

OVERVIEW FOR PARENTS



The Engineering Design Process...

This lesson introduces the process which engineers use when creating, developing, improving, or implementing an idea. The goal is to help students understand this process when coming up with a solution to a problem. In this experiment:

- A problem has been presented with some questions to think about
- Some ideas have been presented in helping them come up with a solution
- Students should take notes as they work through the process
- Length of time for the project will be different for each individual

We would love to see their creativity so please tag us at James E. Richmond Science Center on Facebook and Twitter.

Thanks for visiting! See you soon!

THE ENGINEERING DESIGN PROCESS

COMMUNICATE
your solution

ITERATE
to improve
your prototype

TEST
and evaluate
your prototype

DEFINE
the problem

IDENTIFY
constraints on your
solution (e.g. time, money,
materials) and criteria
for success

BRAINSTORM
multiple solutions
for the problem

SELECT
the most
promising solution

PROTOTYPE
your solution



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WATER DISPLACEMENT



In the previous lessons we talked about various forces—air resistance, water resistance, gravity, and friction. Let's talk about another force - the force that causes objects to float.

Objects float because they are being pushed on by a force equal to the weight of the water they displaced. Objects sink or float but something also happens to the water. The water and the object cannot share the same space. Instead it pushes the water aside, which is called **displacement**.

Try it at home



Drop something in a full glass of water and see if the cup overflows, or measure whether the height of the liquid increases.

You will observe displacement but make sure to clean up your mess so you don't get displaced!



DENSITY

What is **density**? — *it is the degree of compactness of a substance.*

Dense objects usually have more molecules that are close together. Objects that float are less dense than the water they push aside and objects that sink are more dense.



Try This With An Egg

Take a container and fill it with water, then gently drop the egg in. What does it do?

Sink

Float



Now take the egg out and add a lot of salt to the container (the water should be cloudy). What does it do?

Sink

Float

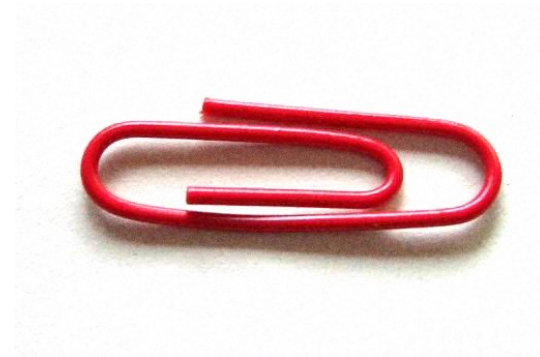
The salt added more molecules to the container which then made the water more dense than the egg.

VOLUME

We know something heavier is likely to sink than something lighter. But then how do those large cruise ships not sink? **Volume** (the amount of space an object fills, or occupies) is different than weight. For example a beach ball and bowling ball take up about the same amount of physical space but the beach ball's inside space is filled with air and, therefore, has less volume than the bowling ball.



Let's test this theory. Take a tub of water and put an apple in and then put a paper clip in. What happens? Why is this happening? (If you're not sure read the information above, again.)



PROBLEM:

I want to find other methods to understand water displacement, density, and volume.



QUESTIONS

How could I test it?

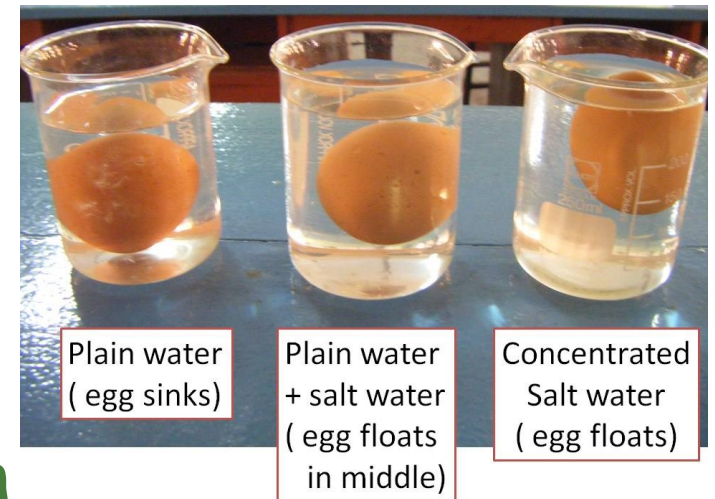
What could I use?

Does using liquids other than water change the outcome?

What resources can I use to help me?

AREA TO WRITE RESEARCH & IDEAS





Videos to Help With Your Design

<https://youtu.be/KgZ7JtmOgHI>

<https://youtu.be/J8ZXDpDh4VY>

Engineering Notebook

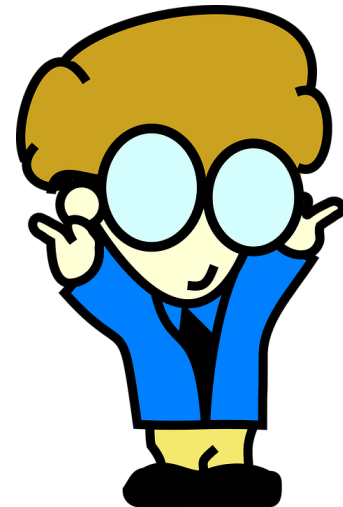
Design: _____

Materials Needed: _____

How To Test: _____

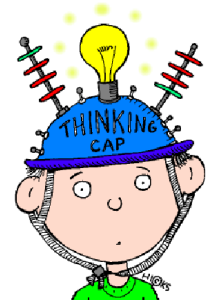


It is important to note the engineering process is a *cycle* and can be started *anywhere* in the process/cycle.



Engineers are always thinking and taking notes so let's put on our thinking cap:

- What other objects can I change in some way to see the effect?
- How do large ships or submarines work?
- How can whales float on the surface for any length of time?
- What would cause me to sink or float if I am in a pool?



NOTES SECTION

We at the Science Center would love to see your finished project, notes you have taken in your engineering notebook, and/or get general feedback.

Tag us on Twitter or Facebook at James E. Richmond Science Center