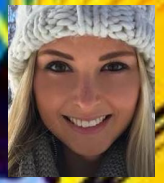
# Whatever Floats Your Boat!
# A Lesson in Buoyancy

Presentation by:
Julia Davis, Chris Kim, Christina Lacuesta,
Andrew Perry, William Pratt, and Rami Switzer

Presenter: William Pratt

# Learn About Today's Presenters

CHRISTINA (Senior)
Major: Elementary Education



JULIA(Senior)
Major:Elementary Education

WILLIAM (Senior)
Major: Mechanical Engineering Technology

RAMI (Junior)
Major: Mechanical Engineering Technology

ANDREW (Senior)
Major: Mechanical Engineering Tech.

CHRIS(Senior)
Major: Mechanical Engineering Tech.

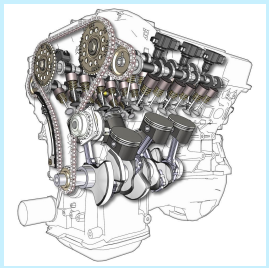
# What is Engineering?

Engineering combines practices of math and science to design and build machines and structures that are put into play to promote the betterment of society.
A look at what engineers build

## Bridges

Bridges were built to create a safe passageway over bodies of water, railroads and roadways. Engineers create bridges to withstand much weight and forces.

## Combustion Engines



Combustion engines provide a more time and fuel efficient travel. Engineers determine the amount of power created by different motors.

## Water vessel

Ships allow for safe water travel. Engineers are responsible for finding proper buoyancy

Presenter: Rami Switzer

# Raye Montague

Marine Engineer Raye Montague broke down barriers in the Navy by overcoming gender and racial discrimination to revolutionize the way naval ships were built.

Raye become the first women to design a ship using a computer system. Her contribution directly changed how ships are designed and manufactured today.

She is credited for working on some of the U.S Navy's biggest shipbuilding projects such as the *SeaWolf*-class Submarines (top right) and the *Nimitz*-class aircraft carrier, the *Dwight D. Eisenhower* (bottom right).

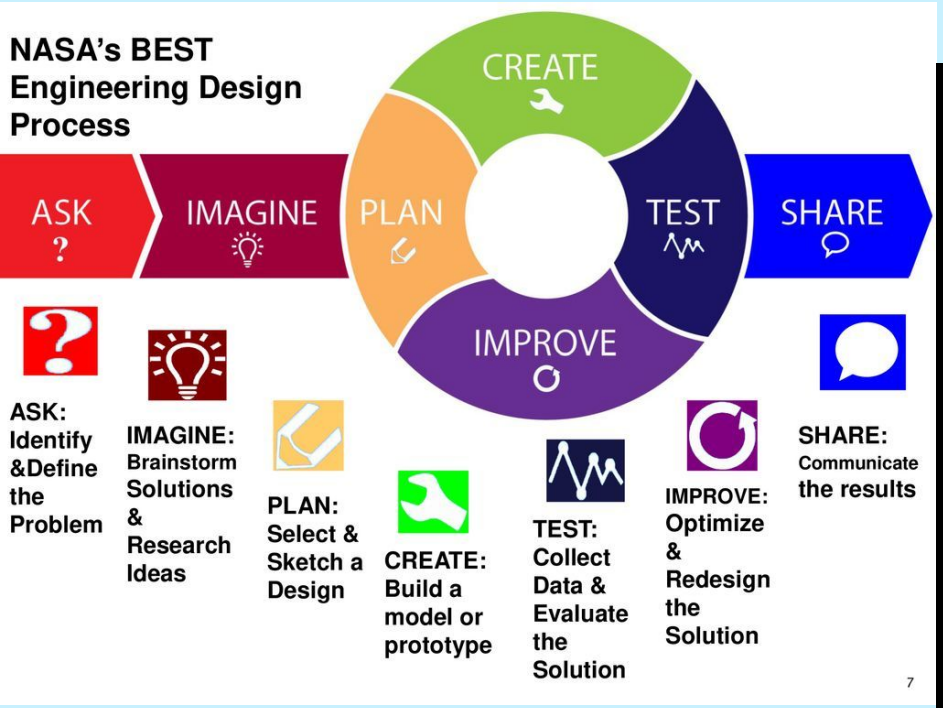
She was appointed to the Director level role for the Naval Sea Systems Command (NAVSEA) Integrated Design, Manufacturing, and Maintenance Program.

**Did you know?**

A **Marine Engineer** is someone who designs, builds, tests and repairs ships, boats, underwater craft, offshore platforms, and drilling equipment.

Presenter: Christina Lacuesta

# The Engineering Design Process (EDP)



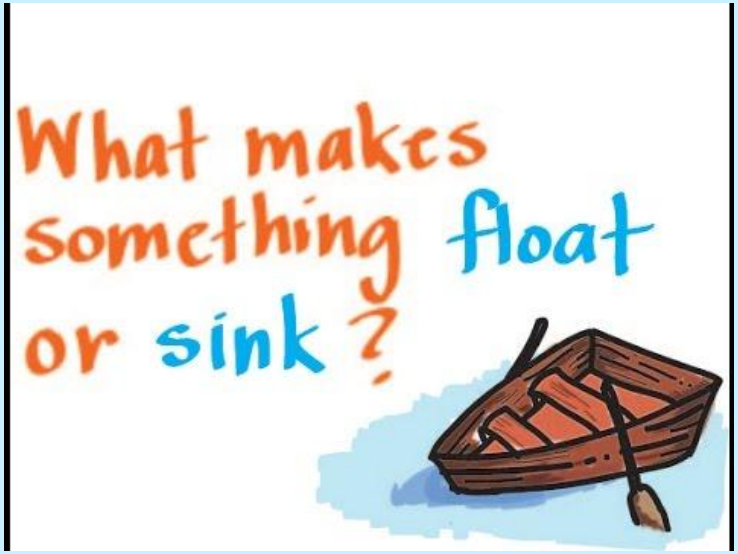

Presenter: William Pratt

# Sink? or Float? Buoyancy!

- In the YouTube video attached, you will see a brief explanation on why things sink or float. This is due to a force called ***Buoyancy.***

- Buoyancy is dependent on a property called ***Density.*** At the end of the video, you will see a comparison of sand in a bucket. This will explain density better. In our experiment, we will have you put various objects of different masses inside a container. This is comparable to the sand in the bucket concept.

- What do you think will happen if we continue to fill our volume up with heavy objects (mass)?




Presenter: Andrew Perry

# How Does Buoyancy Actually Work?

Buoyancy is the concept that we will explore in our experiment today. Buoyancy is essentially the ability of an object to float.

By placing heavy objects in our “submarine” later, we will show how the concept of density affects buoyancy.

Presenter: Andrew Perry

# Today's Engineering Design Challenge... (Create your own submarine)

- The challenge today is to create your own submarine that will stay submerged under water.

- The concept is simple. We will take a "vessel" such as a Gatorade bottle or a Tupperware container and add mass to it until it submerges itself.

- The goal today is to keep it from sinking all together. Don't worry if your submarine sinks, that's part of the Engineering Design Process.

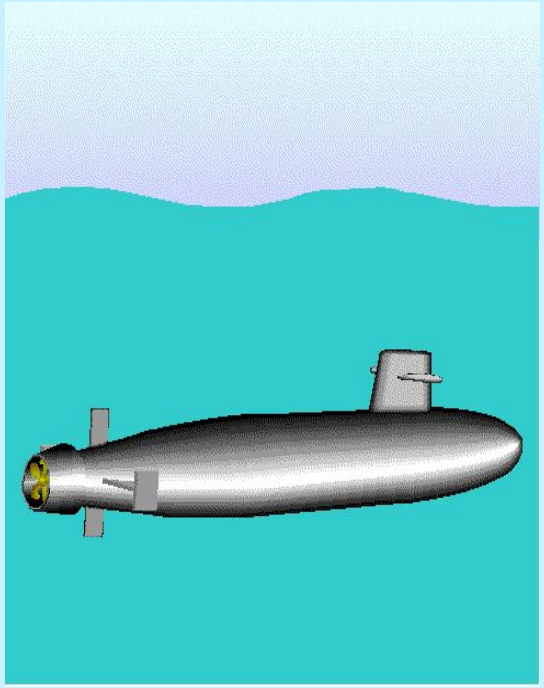
- What are some design ideas you have come up with? (What kind of vessels float better than others?)

Presenter: Andrew Perry

# Step One: IMAGINE Your Perfect Submarine!

Think of a few ideas for your Submarine

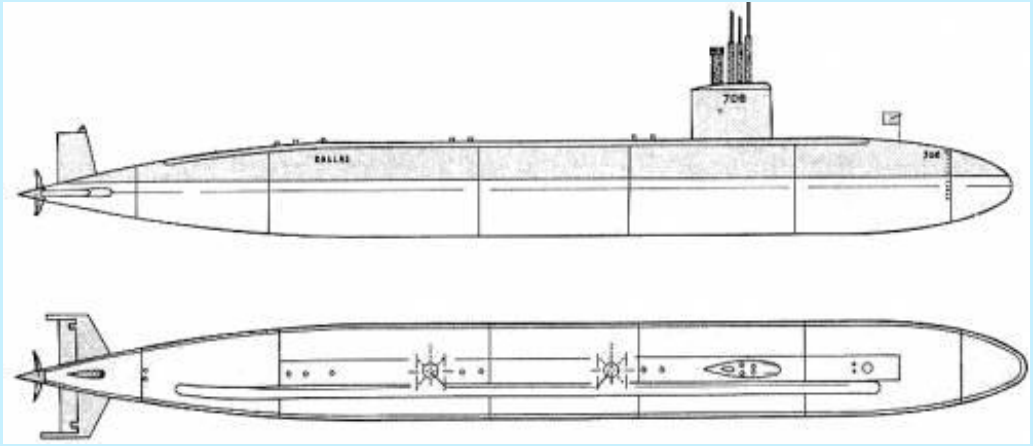
- Do you want to use a bottle or another type of container?
- What kind of weights do you want to use? Something that you can easily take out or add more of to the container is a good idea!
- Do you have a tub of water big enough to suspend your bottle or container without it touching the bottom?
- If not, try finding a smaller bottle or container, or a bigger item to hold the water.
- Your submarine doesn't have to look perfect - it can be long, short, deep, shallow, funny-shaped, clear, or colorful - as long as it can close, float, and hold weight, you're on the right track!

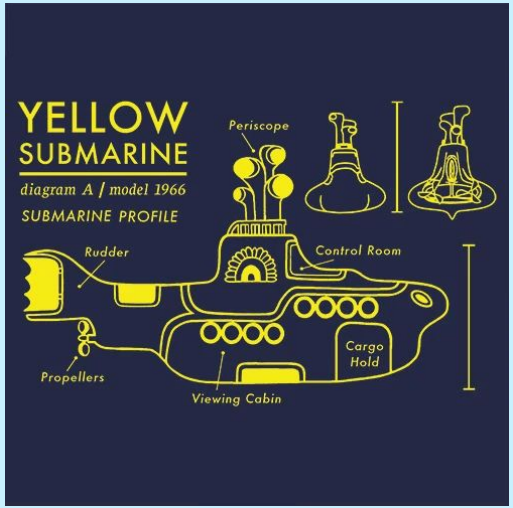


Presenter: Julia Davis

# Step Two: Choose a PLAN!

- Choose ONE of your ideas from Step One
- Draw out your submarine design on a piece of paper
- Make sure to include your weights and where you want the submarine to be suspended in the water in your drawing






Presenter: Rami Switzer

# Step Three: Get your SUPPLIES

Think creatively and experiment with items around the house

We suggest gathering the following:

- An empty plastic bottle (water bottle, Gatorade bottle, or soda bottle), or a plastic container with a lid
- A tub or large container to fill with water
- Something to be used as a weight for your submarine
- Get creative around your house as well! Rice, goldfish crackers, small rocks or pebbles, coins, marbles, etc. are good items if you have them


Presenter: Julia Davis

# Step Four: CREATE it!

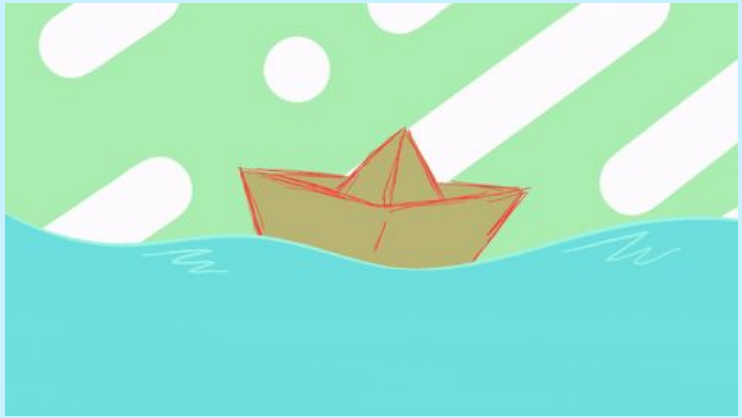
- Take about 5 minutes to build your submarine!
- Make sure to put your weights into your bottle until you think it is heavy enough to be suspended in the water.
- Don’t forget: too much weight and the submarine will sink to the bottom, but too little weight and it won’t go below the surface.

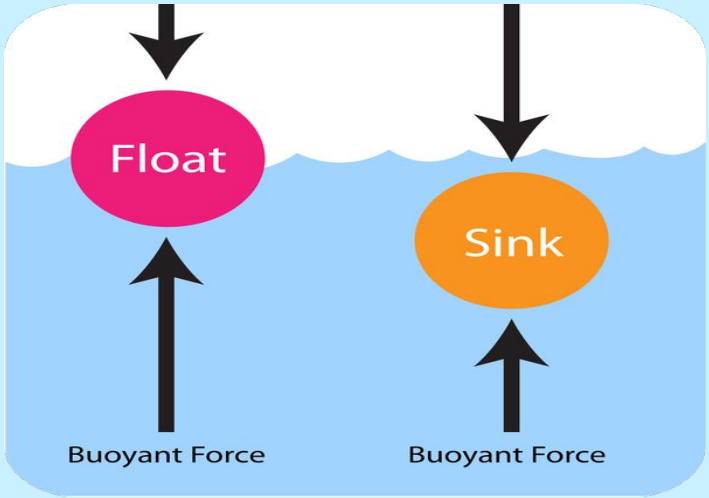

Press the arrow to start the timer

Presenter: Julia Davis

# Step Five: TEST Your Submarine

- Place your submarine in your container of water.
- Did it work? Yes? Great! No?
- That's okay, try adding or taking out some weight and seeing how it affects the buoyancy of your submarine. Keep trying until you can see it suspended in the water.
- What will happen if the container is
- increased/decreased in size?






Presenter: William Pratt

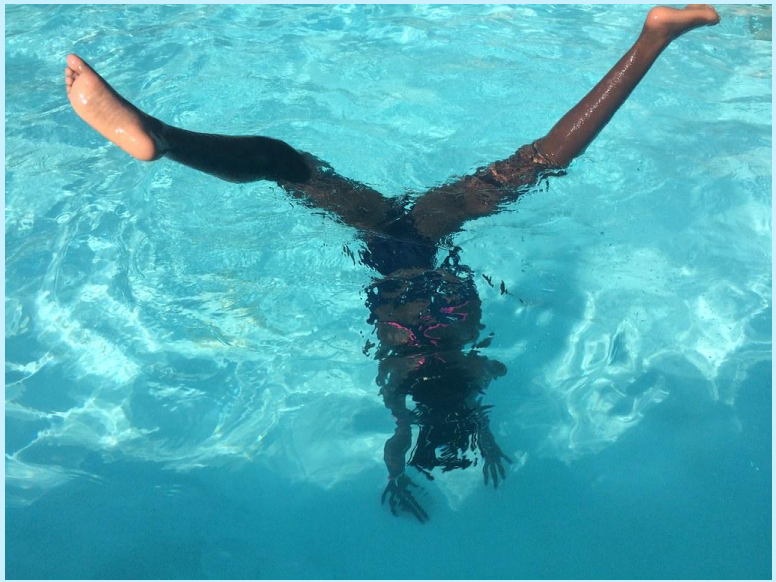
# How did it go? Let us know!


Show us your submarine! Click the image to visit our padlet board that will be full of your experiments. To add yours, just press the “PINK +” in the bottom right corner.

Presenter: Christina Lacuesta

# Engineering/Science Concept Revisited

- Remember, buoyancy is what gives objects the ability to float!
- The buoyant force is what makes it easier to do flips and jumps when you're in the pool compared to when you're on land. It is the upward force on an object in a fluid.



Presenter: Christina Lacuesta

# IMPROVE your design! (6th step in the EDP, Extend Phase!)

- How could the design of this makeshift submarine be improved?
- Did you have any water leaking into your submarine? If so, what could be done to fix that?

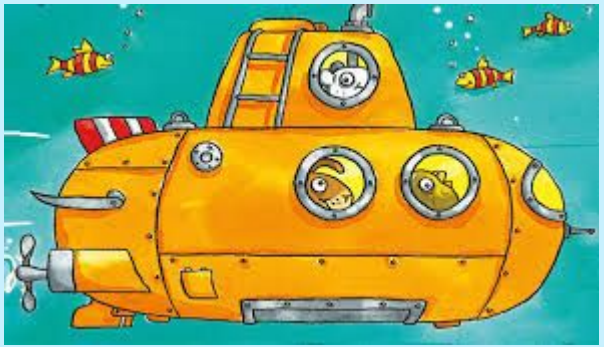
- In the real world, why would we need the submarine to not leak?
- What would be different in the real world compared to this activity?

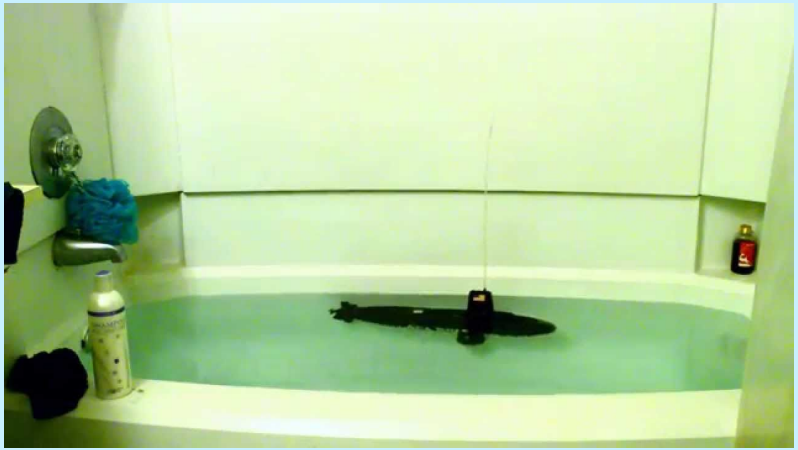
- In real world applications, we won't be able to open up a submarine and add/subtract more weight to sink or float. What could we do different to make it float and sink without having to open it up everytime?

Presenter: Chris Kim

# What did you learn? (Evaluate Phase!)

Submarine Quiz





Presenter: Chris Kim

# Document Your Work!

- Take a picture of your submarine
- Take a video of your submarine floating under the water surface but not touching the bottom

Presenter: Chris Kim