How will size affect buoyancy?

Testable Question- Will a small plastic bottle submarine, do better with buoyancy then a bigger plastic bottle?

Independent variable - Big plastic bottle (33.8OZ)

Dependant variable - How buoyant a water bottle can stay with more water being added per minute.

Control - Smaller plastic bottle (16OZ)

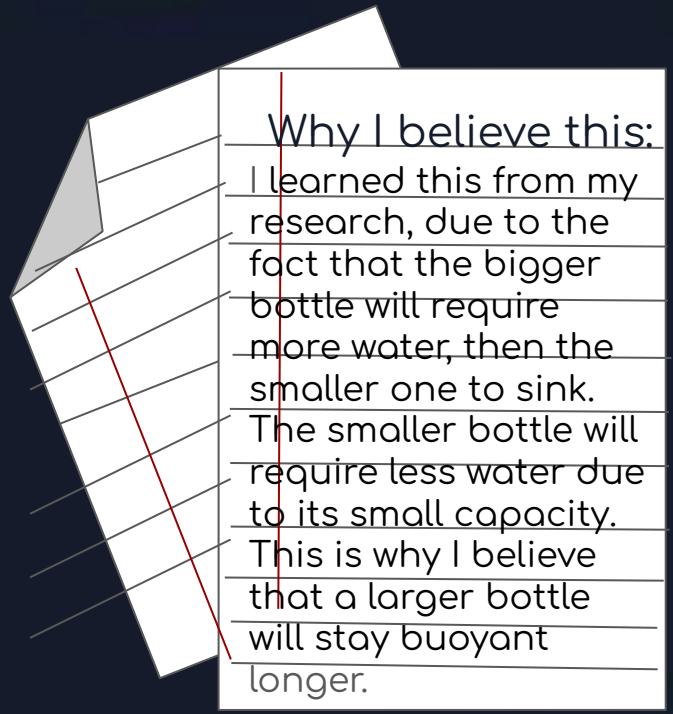
Constants - The environment, amount of water in the models, and the bottles themselves.

My hypothesis

My hypothesis for this experiment is that when I fill the larger bottle with water, it will stay buoyant longer than the smaller bottle filled with the same amount of water

Materials

-Paper and pencil.
-One 16 oz plastic bottle
-One 33.3 oz plastic bottle.
-A tub of pool of water.



Why I believe this:

I learned this from my research, due to the fact that the bigger bottle will require more water, then the smaller one to sink. The smaller bottle will require less water due to its small capacity. This is why I believe that a larger bottle will stay buoyant longer.

Procedure

First, you need to get the following; A piece of college ruled paper, pencil, a small plastic bottle, and a large plastic bottle.

You want to start with the smaller bottle, you'll fill up a sink/tub, or go outside to your pool if you have one.

You're going to place the smaller plastic bottle in the water with 0.5oz of water poured in it, make sure you have a marble in the bottle to represent a person.

You're going to add more water over time till it sinks. For example, you'll start with 0.5oz of water, and if it stays buoyant for more than a minute, add ⅔ water every minute till it sinks.

Than you'll repeat this process with the smaller bottle 4 times.

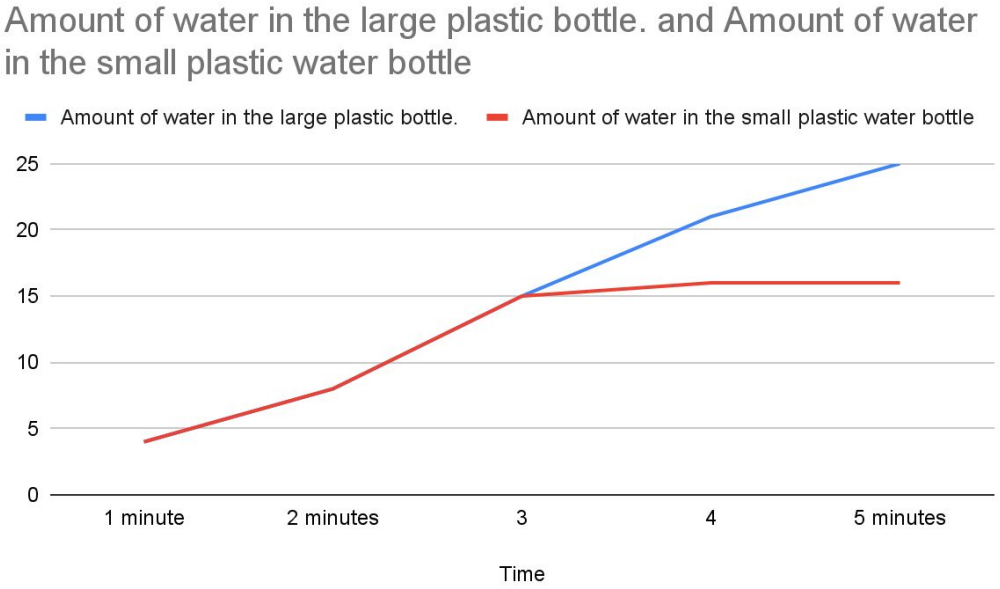
You'll then do this process with the larger bottle, fill it with one cup of water as a starting, and add ⅔ every minute till it sinks

You'll stopwatch both bottles, and then compare the data between the smaller bottle and the larger bottle

Data between the buoyancy of a 33.8 oz bottle compared to 16 oz.

Will a bigger plastic bottle (33.8 oz) submarine, do better with buoyancy then a smaller plastic bottle(16 oz)?		
Time	Amount of water in the large plastic bottle.	Amount of water in the small plastic water bottle
1 minute	4oz	4oz
2 minutes	8oz	8oz
3 minutes	15 oz	2 minutes, 10 seconds, suken; 15 oz.
4 minutes	21 oz	16 oz submerged
5 minutes	25 oz	16 oz submerged

Graph to my data.



Data analysis/results.

The data shows that the average in the bigger bottle is 14.6, while the smaller bottle is 11.8. The difference between the two averages is 2.8. My highest point was (5,25) while my lowest point was (1,4). There were no outliers, and the trend of the line was going up slowly in a slight curve.

Conclusion

My hypothesis was supported by my data. This is because my data shows that a larger bottle will often stay buoyant longer due to its size and capacity. There was a significant difference between how much water the smaller bottle could hold, and the bigger bottle could hold, 9oz difference. I believe I got those results due to the common sense of the situation, bigger bottle has more space, while a smaller bottle has less, so therefore it’s less likely to hold more water. It went with my research rather then going against it. In the future I’d probably test the difference between using hot and cold water, if any.

Limitations

Some limitations for this experiment were probably how I'd write my data, I was unsure on what I was supposed to write, like if I should've put my ounces and time in the same box.And the fact I could've collected more data. I wish I would've planned how I'd measure the data rather than being unprepared. An unexpected problem was how I'd measure it, I got confused cause I was unsure on where to put time and my measurements. I wish I would've known to better plan my data table especially. If I were to do this differently, I'd most likely measure how cold water, and hot water affect buoyancy in big and small water bottles. If I had any resource available I'd most likely choose clay with foil to better simulate an actual submarine.