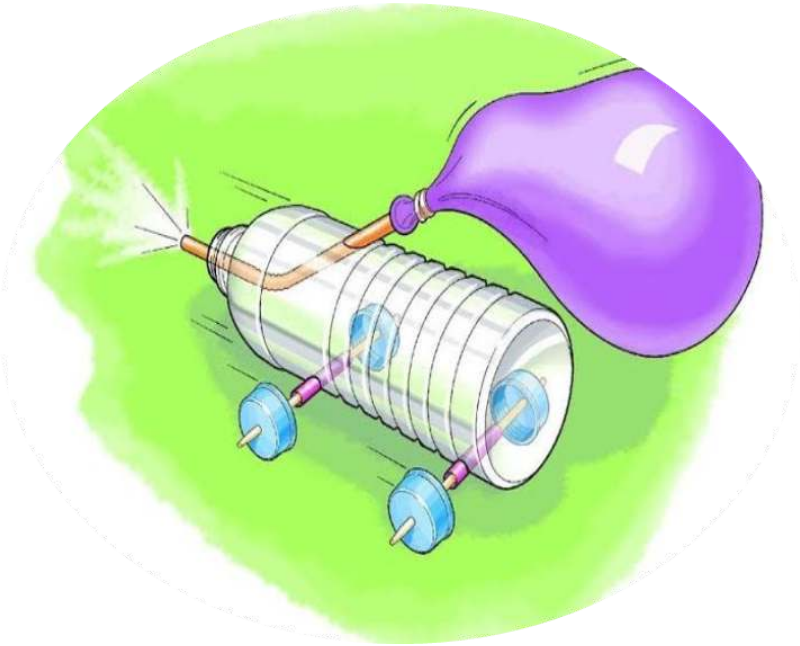
Outreach Playbook

Rocket Balloon Car

(A Science Experiment on Newton's Third Law of Motion)



Metrics

Grade Level:	# of Student Participants:	Duration (hrs):	# of SWE Volunteers:	Partner orgs (if any):
Grade 7-12 students	100	1 hr	12	SWE GWAG and AfriteQ Academy

Img Src: Finio, Ben. (2017). Rocket Balloon Car. *Retrieved October 1, 2021, from* https://scientificamerican.com

Overview of Activity

The Activity

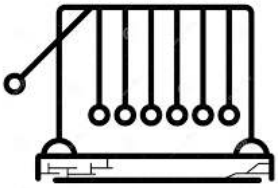
In this experiment, we are going to divide into ten groups of 10 students each and make cars out of plastic bottles, balloons, and other easily-available household items.

These balloon cars will use the pressure released from the balloon to move the car.

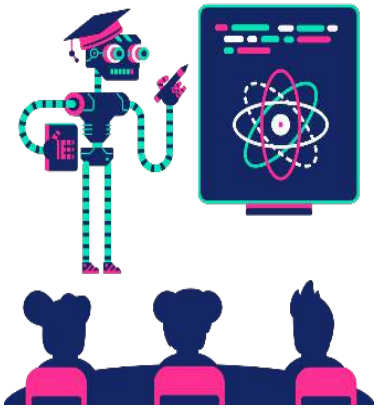
This project demonstrates one of the fundamental laws of motion (Newton's third law). The aim of this activity is to understand the relationship between the motion of an object and the forces which act on it.

Newton's Third Law of Motion

Newton's third law of motion states that "For every action, there is an equal and opposite reaction"



This implies that when two or more bodies interact, they apply forces on one another. These forces are equal in magnitude (amount or size) but opposite in direction. This law is also known as the law of action and reaction.



Why is this experiment important?

The Balloon Car experiment shows Newton's third law, which explains many things we experience in our everyday lives. Things that range from something as simple as walking on the ground to complex motion such as the flight of a bird and the launching of rockets.

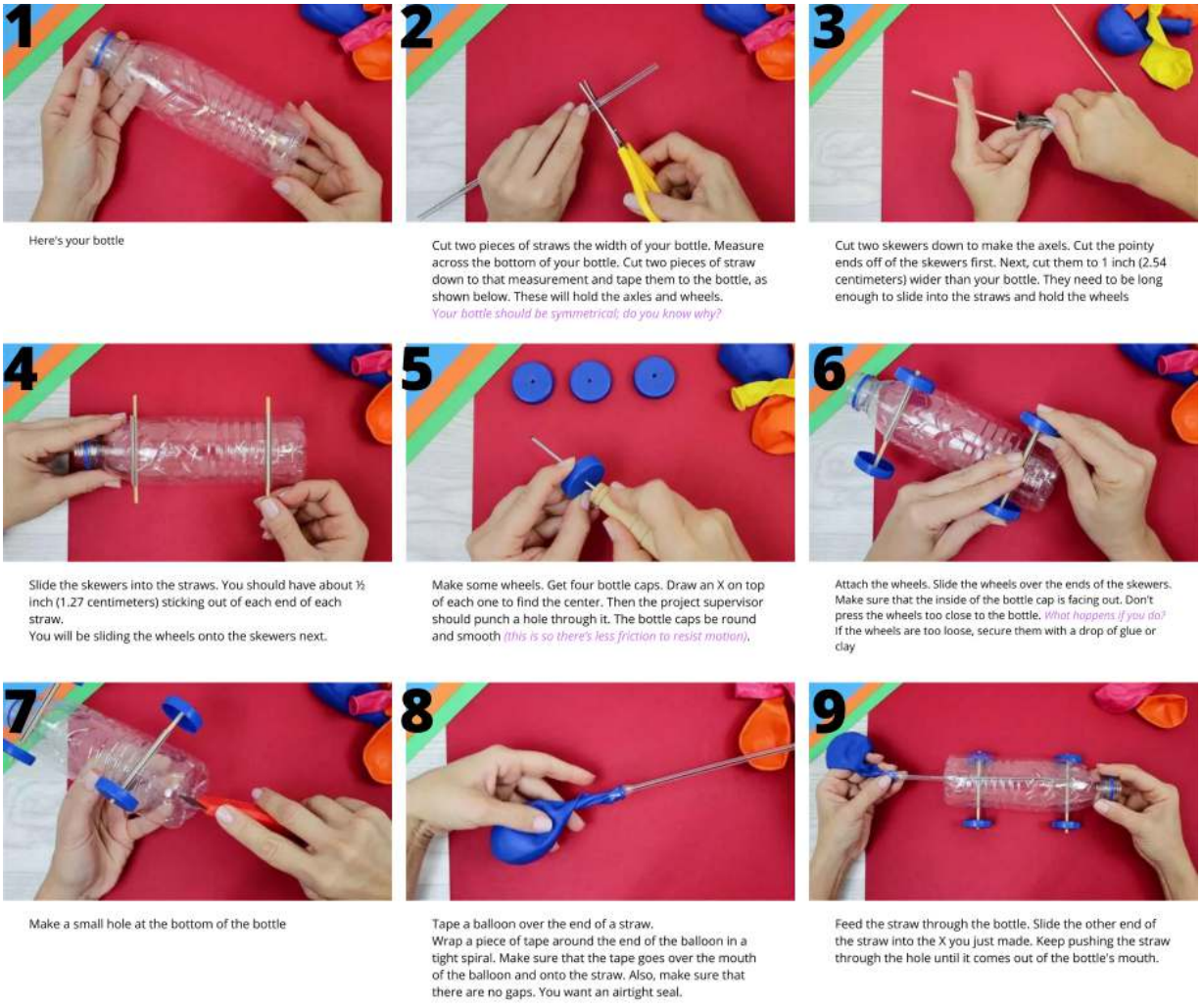
What we learn from this activity gives the foundation of the fundamentals of Science and Engineering Disciplines.

What should you know at the end of the Activity?

After this experiment, all students should have a better understanding of motion (the moving balloon car), the force that drives motion in this experiment (the air leaving the balloon), and how motion works in our everyday life.

Outline and Script

Materials Required and How to perform the experiment



Finally, Blow some air into the balloon through the straw. Pinch the straw so that the air doesn't come out then place the car down on a flat, smooth surface and let go of the straw. Watch the car go!

Illustrations and images are free media from

- icons8.com Pixeltrue from <a
- Dreamstime.com
- wikihow

Bonus exercise: Get the kids to think of what they could do to make their car go faster.

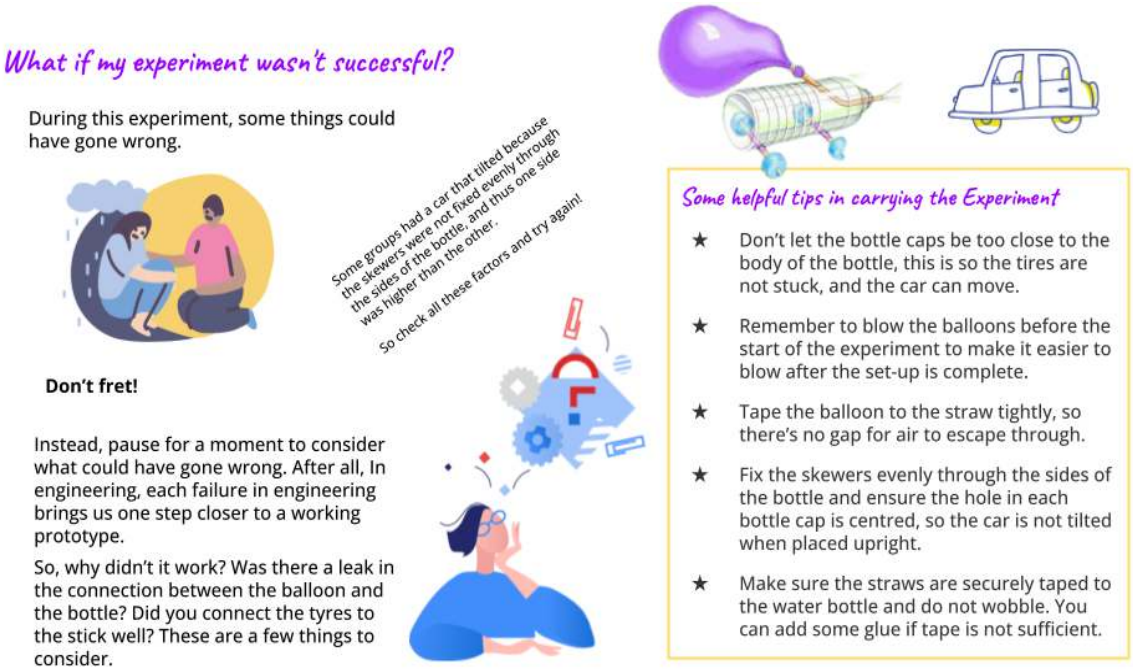
Lessons Learned

Although we had a volunteer at each table and had someone demonstrate the experiment before the students started, many of the cars did not move properly. The good news is that most of the problems we experienced have preventive measures.

Here are two major tips we learned:

- ➔ **Simplify**
  Ensure the instructions are very simple, so the students can easily understand them.
- ➔ **Practice**
  If you're carrying out this experiment, you probably made it only once or twice. However, you should practice as many times as possible to clear all chances of errors when it's time to perform the experiment. Practising also allows you to identify common errors that most students might make during the experiment.

Here is a helpful flyer you can share with the students



What if my experiment wasn't successful?

During this experiment, some things could have gone wrong.

Some groups had a car that tilted because the skewers were not fixed evenly through the sides of the bottle, and thus one side was higher than the other.

So check all these factors and try again!

Don't fret!

Instead, pause for a moment to consider what could have gone wrong. After all, In engineering, each failure in engineering brings us one step closer to a working prototype.

So, why didn't it work? Was there a leak in the connection between the balloon and the bottle? Did you connect the tyres to the stick well? These are a few things to consider.

Some helpful tips in carrying the Experiment

- ★ Don't let the bottle caps be too close to the body of the bottle, this is so the tires are not stuck, and the car can move.
- ★ Remember to blow the balloons before the start of the experiment to make it easier to blow after the set-up is complete.
- ★ Tape the balloon to the straw tightly, so there's no gap for air to escape through.
- ★ Fix the skewers evenly through the sides of the bottle and ensure the hole in each bottle cap is centred, so the car is not tilted when placed upright.
- ★ Make sure the straws are securely taped to the water bottle and do not wobble. You can add some glue if tape is not sufficient.

(A clearer image is also provided)

Accessibility Adaptations

This experiment can be conducted at home because the materials needed are easy to find and are generally cheap household items.

The activity instructions can also be very easily translated into different languages, so the experiment can be done all over the world.

The only concern is that, below a certain age, adult supervision and guidance would be required (particularly in cutting holes into the bottles and bottle caps).

Materials and Costs

Item	**Quantity (for 10 groups of ten)**	**Where to Buy (link if applicable)**	**Total Cost**
Plastic bottle	10	As a household item, it should be available at home (as a bonus, it is excellent recycling)	$0
Bottle caps	40	Should be available in the house. Any plastic bottle cap will do, as long as it's round.	$0
Balloons	10	Please check your nearest local store if you do not have one at home.	$2
Kebab sticks	20	Available at the nearest department store or around the house.	$4
Straws	20	Available at the nearest department store.	$1
Total cost			**$7**