UNIVERSE SIMPLIFIED FOUNDATION

Empowering For Innovation

Balloon Car

Conventions used in this document:

Blue: Questions from facilitator to children
Maroon: Children's anticipated response
Black: Comments, notes and plan for facilitator

Session flow

Sr. No.	Activity	Talking points	Time allotted
1	Introduction	• We are going to make a balloon car today • How do you think the balloon car will work? • What will happen if you will fill a balloon with air and then leave it?	15 mins
2	Group formation and worksheet distribution	Assuming you have already explained to them how to use the worksheet. If not please refer 'General instructions for the facilitator'	15 mins
3	Ideation and Material gathering	Students will come up with the design of the project and list of the material required for the completion of the challenge. Here children should have filled the worksheet till the material list.	15 mins
4	Project making	During this time, children will build the project.	45 mins
5	Worksheet completion	It will be difficult for children to complete the worksheet while making the project. So give them extra time to complete the worksheet once the project is completed.	15 mins
6	Final Discussion	Ask the children what they have observed. How do they think the car is moving? At this point, you can discuss the working in detail and mention Newton's 3rd law of motion.	15 mins

The above mentioned is the minimum time you need to give children. Feel free to change the time allotted as per the requirement of the class. This is typically a 2 hr project. You can extend it up to 3 hrs.

Introduction

You can give them the instruction sheet and tell them to read the challenge for the day. You can then open with the following question.

What are we going to make today?
Balloon powered car

What do you know about a balloon powered car?
Car that works on balloon

(Children may not be able to directly come to this so you can ask them about how they think that car/ bike/ truck or any form of the vehicle works? -- by petrol diesel, or natural gas.
Great, now how do you think that the bicycle works? -- we fill air in tyres.)

What happens to the balloon when you fill air and leave it?
It will fly.

What will happen if you attach something to the balloon and then you will leave it?
That thing will fly with the balloon.

So now let us make a car which moves with the help of a balloon.

Why the project may not work

1. Make sure that the air is coming out of straw and there is no other leakage
   Air leakage can be checked simply by closing the open end of the straw and observing if the air is leaking out or not from elsewhere
2. Check the connection between the balloon and straw, make sure it is not too tight
3. If the balloon is touching the floor, it will cause friction, this will stop the car from moving

4. Make sure that the car isn't too heavy
5. Check the contact points between tire and chassis (Cardboard frame). Make sure that the wheel is free to move and not get stuck on the cardboard. You can check this by trying to move the wheels with your hands. If you have to apply an excessive force that means that something is stopping the wheels from moving freely
6. If using multiple balloons and straws make sure the air is released in the same direction

How to help children when they are stuck using Inquiry driven approach

1. Attaching balloon to Straw

A balloon can be attached to straw in multiple ways, the simplest being using rubber bands and straw. Another simple way is to use tape.

How are you going to attach the balloon to the straw?
We can tape it/ Use a rubber band.

Ask them to test if the air is being released properly through the straw. If not there can be mainly two reasons:

- Balloon is too tightly attached to the straw
- There is air leakage

2. Attaching the wheels to the car

Generally, children find it difficult to do this part for the first time.
They will start by sticking the axle directly to the cardboard but then they will realize that it will not work. Wheels are stuck to the axle and since the axle is fixed on the cardboard, wheels won't be able to move. Due to this the car will not move forward.

At this point, students will understand that the axel has to be free to move for the wheels to move. Ask them how can they do it? How can you give the axel enough space to rotate by itself?

Working

Working of Balloon Car

Balloon Car is one of the simplest projects to learn and explain Newton's law of motion.

Newton's law of motions talks about the forces acting on the body and the motion of the body.

First law of motion:

Newton's first law of motion or the law of inertia states that every object will remain at rest or in uniform motion in a straight line unless made to change its state by the action of an external force.
This means that any object which is in some kind of motion will continue to be in motion unless some external force is applied to it.

In context of balloon car:

There are various forces acting on the balloon car.

1. When the car is sliding on the floor it is met with frictional force. You can test this by trying to slide the car on different surfaces. More the friction, the slower the car will move.Friction is the force generated by two objects, sliding or trying to slide across each other. Rough surface causes more friction.
2. If it is windy the car will slow down due to the resistance offered by the wind
3. When you keep the car on the flop it moves for a longer period even when there is no force exerted by the air coming out of the balloon. This is due to gravity.

Second law of motion:

Force is equal to the change in momentum (mass x velocity) per change in time. For a constant mass, Force = mass x acceleration.
This means that acceleration of an object depends on two things, Mass and Force.
Acceleration is directly proportional to force, ie. if force increases then the acceleration will also increase. And acceleration is inversely proportional to mass, ie. if mass is increased then the acceleration will go down.

In context of balloon car:

1. If you increase the mass of the car, the car will move slowly and if you reduce the weight the car will move faster. Make sure no other changes are made to the car or the surface through which it is moving.
2. If you add two balloons to the car, it will move fast since the force is increased.

Third law of Motion:

For every action, there is an equal and opposite reaction". Putting it simply, consider you have two interacting objects, Object A and Object B. If Object A exerts the force on Object B, then Object B will exert an equal and opposite force on Object A as well.

In the context of the balloon car:
The air stored in the balloon is let out of the staw with a force thus moving the car in the opposite direction to the direction of air release.

Final Discussion

What did you observe?
When the straw was released, the car started moving forward.

What happened when you released the straw?
Air from the balloon got pushed out.

Which direction did the air was pushed out of the balloon and which direction did the car move?
They will point out the direction and you can inform them about Newton's third law of motion.

What will happen if you add more weight to the car?
The car will become slow.

What happens if you add more balloons to the car?
The car will move fast. Why? Because more force.

Good! so if more weight means the car will slow down and more force means the car will speed up. This is Newton's second law of motion.

Here you can state Newton's second law and explain it to them.

What will happen if you put your hand in front of the car?

It will stop moving. Why? Because my hand will stop it. We are applying force with the hands.

So if you apply the external force the car will stop moving. Let us look at what Newton's first law says.

Here you can state Newton's first law and explain it to them.