

<BUILD. LEARN. TEACH. INSPIRE>

THE TINKER SERIES

Projects For Young Inventors

Balloon Rockets

REVISION HISTORY

Revision: 1.02
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Author: Edward Li
Contributors: Victoria Lin

Revision History

- 1.00: First revision
- 1.01: Removed 2nd Law, added content regarding pressure, adding resources section
- 1.02: Updated formatting

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ACTIVITY MATERIALS LIST

Below is a list of all materials required for this activity along with sources to purchase and estimated costs *per student*:

ITEM	QTY	COST PER UNIT	SUBTOTAL COST	NOTES	HOW TO PURCHASE
Small Balloon	1				Dollar Store
Large Balloon	1				Dollar Store
Yarn	1			15 ft per kid	
Clothes Pin	1				
Regular Sized Straw	1				
Weights	1			See what happens if you add coins, paper clips, etc. Instructor to provide themselves.	
Balloon Pump	1				
Standard Craft Materials					
Washable Markers				For decoration	
Masking Tape				To tape bottle cap to plate	
Scissors					
Construction Paper					
TOTAL PER STUDENT					



Balloon Rockets

Lesson Plan

Introductions (5 min)

If this is the first day of class, tell the kids about the culture of the class. Talk about tinkering = inventing, and that we are learning how to experiment. We also focus on helping each other, so if you finish the step first, see if your neighbor needs help.

Air, Energy, Rockets (5 min)

In that past we have made a robot that uses a battery to provide energy to the system. We even used rubber bands to create energy. Today, we will use air to create energy into our system!

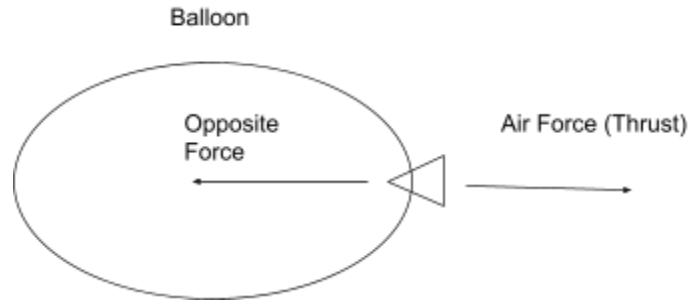
Demo - Newton's 3rd Law (5 min)

Blow up a little balloon and ask the kids what they think will happen once you let go. The balloon will fly through the air! This is because of Newton's 3rd law of physics. Have the kids write this onto their worksheet.

Newton's 3rd Law = If you push something one direction, it will push back at you with the same amount.

In our case, there is air that is put into the balloon. Once we blow it up, the air comes up with an amount of force. The force pushes the balloon the other way and then it goes through the air! This special force is called thrust.

Draw a diagram to illustrate.



When air is used to move an object, it is also called propulsion. This this concept is used to move airplanes and rockets through the air. Have you ever heard of jet propulsion? There is a company called Jet Propulsion Labs in Pasadena. They work on a lot of NASA projects to get things into outer space.

Fun with Propulsion! (5 min)

Hand out the small balloons and have the kids write their name on it. Have them experiment with propulsion by blowing in air and letting go. You can have them all launch at the same time by saying, propel!

Creating A Path (10 min)

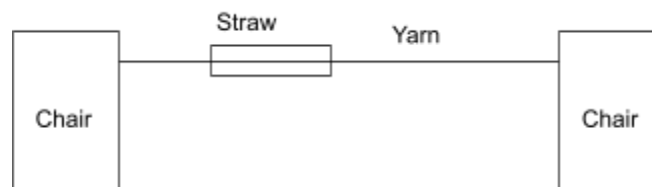
Now, we have a very simple rocket, however, the issue is that we can't control it.

Talk about why the balloon doesn't go straight when you let go. A few ideas:

- It starts out straight, but once it goes crooked, it kind of goes crazy
- It doesn't have any wings to navigate it through the air

One thing that we can try is to create a path for it.

This will easily be done with yarn and a straw. Hand out the yarn to each child and have them tie it to two chairs that our far apart in order to make a path. Before they tie both sides of the yarn, make sure that they put the straw through.

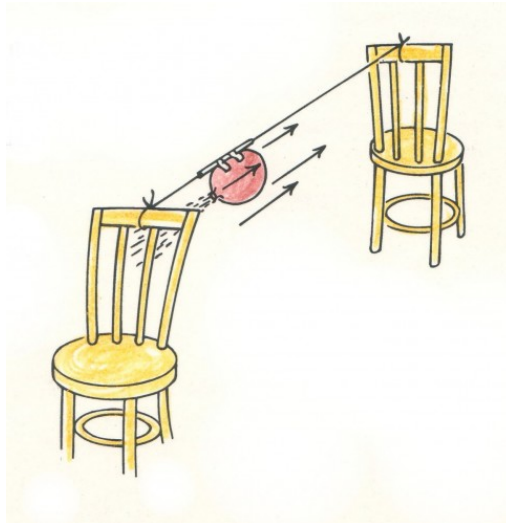


tie it to two chairs that our far apart in order to make a path. Before they tie both sides of the yarn, make sure that they put the straw through.

Experimenting With Our Path (5 min)

Hand out the clothes pin.

Have the kids blow up their balloon (or blow it up for them using the balloon pump) and lock the air in by pinching the opening with the clothes pin. While the balloon is tight, tape the straw onto the balloon and launch!



Source: <http://scienceprojectideasforkids.com/2010/balloon-rocket-projects/>

Reviewing the 3rd Law (5 min)

Now that we've had fun experimenting with propulsion, have the kids sit back down and review why the balloon is shooting through the air. Review Newton's 3rd Law. Ask the following questions:

1. What is Newton's 3rd law?
2. What force is coming out of the balloon? And what direction is it traveling? (Air. It is going in the direction out of the balloon).
3. What direction is the balloon traveling? (The key here is that it is going opposite from the force coming out of the balloon).
4. What is the name of the force that pushes the balloon? (Thrust)
5. What is called when you use air to move something? (Propulsion)

Why Does Air Try To Escape The Balloon? (5 min)

When you blow up your balloon, air goes inside, which actually starts bouncing around and hitting each other. This creates the force that becomes the thrust.

Pressure is the amount of force that is on a certain area. Now here is the thing about pressure. If you have a lot of pressure on one area, it automatically tries to get out.

Show the balloon blown up and show the pressure on the balloon. When you press it on the outside, it bounces back. This is because there is pressure trying to get out. So what happens when you open the balloon? The pressure tries to escape... and your balloon goes!

Rocket Fuel (5 min)

Now that we know about pressure, thrust and newton's 3rd law, let's see what happens when use a bigger balloon.

Well one way we can think about this is that the balloon can handle more air. The more air, the more force is created, which is the same as more pressure inside the balloon. So in a sense, your bigger rocket will have more "fuel" for it's journey. So we could probably say that your rocket will go further!

Hand out the large balloon. Have kids blow it up and see if their rocket goes further.

Decorate and Race! (10 min)

Let's decorate our large balloon and race!



Additional Challenges

- What will happen if we add weight to our balloon?

Resources

- <http://pagingfunmums.com/>
- <https://www.education.com/science-fair/article/volume-air-far-balloon-rocket-travels/>
- <http://scienceprojectideasforkids.com/2010/balloon-rocket-projects/>
- <https://www.sciencefriday.com/educational-resources/balloon-rockets/>