Mister C

Mister C Live

Air is Everwhere - Resource Guide

- Online media to support each activity sheet
- Engage, Embrace and Extend STEAM Learning
- Easy to complete activities for everyone to enjoy

ABOUT THE SHOW

Are you ready for some hair-raising science, toe-tapping music and mind-blowing media? Join Mister C for another fun day of learning together in the lab! Mister C is no stranger to finding exciting and engaging ways to explore STEAM (Science, Technology, Engineering, Art, and Math) in our everyday lives. Full STEAM Ahead Live will have everyone singing, dancing and learning to the tune of science. Students and teachers will be amazed with this fun and educational series as Mister C uses humor, media and the engineering design process to make the ordinary extraordinary!

WHO IS MISTER C?

Mister C is not your ordinary educator! As an 20+ year education veteran, Mister C has spent time as a class-room teacher, principal, curriculum specialist and district administrator. His specialty is knowing how to inspire and engage learners of all ages using video, music and live presentations.

Mister C is the Emmy nominated producer and Emmy nominated host of Full STEAM Ahead, which airs on PBS Stations across the US. He is also the creator of the YouTube channel LearningScienceisFun with 15K subscribers. Through these platforms, millions of learners have had the opportunity to enjoy learning to a different beat with silly songs, exciting experiments and dazzling demonstrations.

Whether online, on-air or live on-stage, Mister C's high energy and infectious attitude will have you out of your seats, having fun learning together!

TEACHER FOCUSED

Activities designed to kickstart critical thinking and minds-on learning.

STUDENT-DRIVEN

Fun activities to introduce students to STEAM Learning.

EDUCATOR CREATED

Mister C created these learning experiences to foster critical thinking and a love for learning.

SHARE YOUR LEARNING

Snap a photo and share it online.
Use #MisterCFullSTEAMAhead

@originalmisterc

@learningscienceisfun

www.learningscienceisfun.com

Pre-show Conversation Starters

1. Air is all around us! What evidence is there that air is actually something that surrounds us?

2. What type of scientists study the weather?

3. Could you design an experiment that allows you to measure weather over time?

AIR-cabulary

Atmosphere - the envelope of gases surrounding the earth or another planet. Earth's atmosphere has 5 layers which are the troposphere, stratosphere, mesosphere, thermosphere and exosphere.

Air pressure - the force exerted onto a surface by the weight of the air. There is approximately 14.7 pounds of pressure per square inch at sea level.

Density - Density commonly is expressed in units of grams per milliliter and kilograms per liter and is defined as mass per unit volume. D = M/V

Mass - is the measurement of the amount of matter there is in an object. Mass of an object remains constant in all circumstances while weight varies due to gravity. Mass and is measured in grams (g) or kilograms (kg). Your mass on the earth and the moon are identical.

Lab Safety

Scan me to hear the song!

- Anytime you're doing science, it's important to remember Science Safety.

- Report all accidents, and breakage of glass or equipment to your instructor.
- Keep pathways clear by placing extra items (books, bags, etc.) on the shelves or under the work tables to avoid people tripping and falling or spilling materials.

- Long hair (chin-length or longer) must be tied back to avoid catching fire or dipping in chemicals.

- Leave your work-station clean and in good order before leaving the laboratory.

- Learn the location of the fire extinguisher, eye wash station, first aid kit, and safety shower.

- Walk calmly in the lab without running to avoid bumping into materials or one another.

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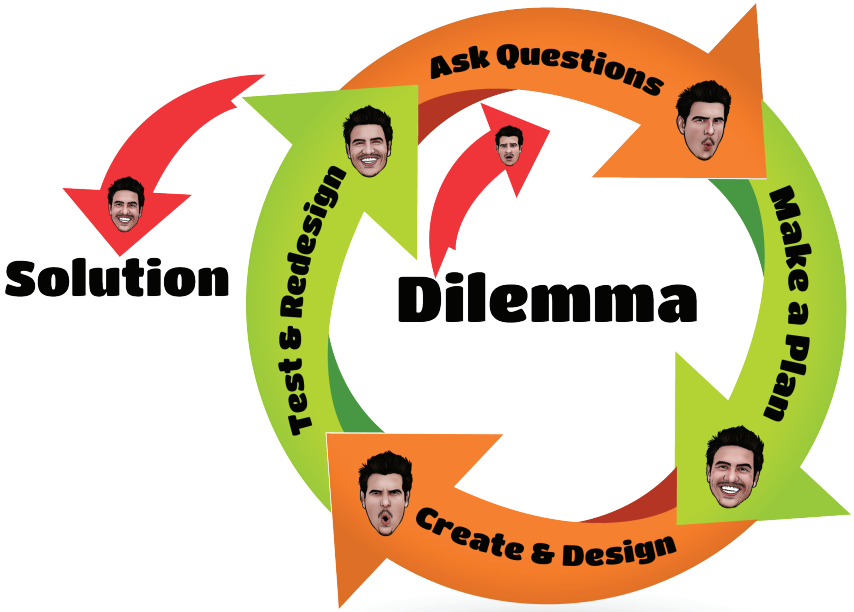
Engineering Design Process

THE ENGINEERING DESIGN PROCESS (EDP) is a flexible process that can include many variations. What makes the EDP unique is that engineers, and students, can begin anywhere in the process because the EDP is a cycle without a start and end point.



DILEMMA:
What is the identified problem? Have others approached it? How? What are your constraints?

ASK QUESTIONS:
What could be possible solution? Brainstorm ideas individually or with your team.
Select one of your ideas.

MAKE A PLAN:
Draw your design and determine what materials will be needed to build your design.

CREATE & DESIGN:
Work to make your plan come to life.

TEST & REDESIGN:
What works? What doesn't? How can you improve your design. Make adjustments to your design and make it better. Then test it again.

FIND A SOLUTION:
Test, redesign and continue planning if needed until you find a solution.

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DIY AIR CANNON

TOPIC: AIR

Air is EVERYWHERE! Air is the invisible gaseous substance surrounding the earth. Build an air cannon to experience the movement of air through a space.

MATERIALS

- Plastic or styrofoam cups
- Scissors
- Balloon
- Various items to knock over
- Clean work space and a parent helper

DIFFICULTY:

SCAN ME TO WATCH A VIDEO

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@ORIGINALMISTERC

WWW.LEARNINGSCIENCEISFUN.COM

EXPERIMENT:

Step 1: Gather materials.

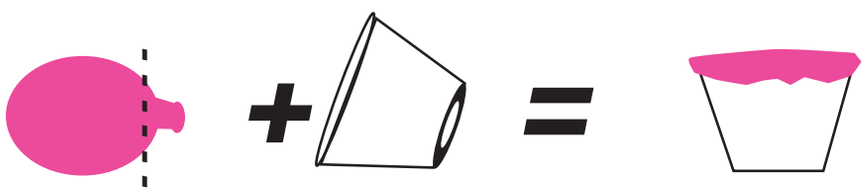
Step 2: Cut the neck off of the balloon and keep the large part.

Step 3: Carefully cut a hole in the bottom of the cup about the size of a dime with your scissors. You may need an adult to help for this step.

Step 4: Attach the cut balloon to the mouth of the cup. Be sure to stretch it tightly and reinforce by wrapping a rubber band around the lip of the cup.

Step 5: Pull back the balloon and let it go to force the air out of your cannon. You can also tap the balloon to fire the cannon.

Step 6: You can hang a strip of toilet paper from a door frame and test how far back you can stand and still hit the toilet paper with the air cannon.



WHY IT WORKS:

Although you can't see it, your cup is filled with air. When you apply a force to the air molecules by pulling back the balloon and letting it snapback, the air molecules are pushed toward the opening. This movement sets off a quick chain reaction of collisions with other air molecules and the sides of the cup. The only way for the air molecules to escape is through the opening at the bottom of the cup. The quick escape of these air molecules forms a stream of air that flows straight out of the cannon.

EXTEND YOUR LEARNING:

To make this a true experiment, try changing a variable?
What might happen if you used a different sized cup? Could you cut a 2 liter bottle to make a larger cannon?
Could you try another stretchy material to take the place of the balloon?
Does it change the experiment if you make the hole a different shape? What if you place it in a different spot?
Experiment with your air cannon to see what changes allow you to shoot air the furthest.
Have a target competition with a friend

WORKFORCE CONNECTION

A meteorologist studies interactions between temperature, humidity, air pressure, precipitation and vortices in the atmosphere. They develop an understanding of how vortices such as tornadoes, waterspouts and hurricanes form so they can predict the weather to keep people informed and safe. They also study and learn about the polar vortex and how it affects the weather during winter

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DIY CAN CRUSH

TOPIC: AIR

Air is EVERYWHERE! Air is the invisible gaseous substance surrounding the earth. there are five layers to Earth's atmosphere and gravity is pulling down on the air molecules in each layer. That pulling creates atmospheric pressure.

MATERIALS

- Stove top or burner
- Water
- Empty soda cans
- Tongs
- Large bowl with ice
- Clean work space and a parent helper

DIFFICULTY:

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EXPERIMENT:

Step 1: You'll need parent help for this since you'll be using a stove top burner to heat water.

Step 2: Gather materials.

Step 3: Fill a large bowl ½ way with cold water. Add several ice cubes.

Step 4: Add a quarter cup of water to the bottom of the can (just enough to cover the bottom).

Step 5: Place the can on the center of the burner. Once it's stable, turn the burner on high.

Step 6: Once you see steam coming out of the can, wait one additional minute.

Step 7: Use your tongs and grasp the bottom of the can (Make sure your palm is facing up. This will allow you to quickly flip the can into the ice water).

Step 8: Quickly flip the can over placing the opening into the ice water.

WHY IT WORKS:

So how'd that happen? The can was filled with water AND air! As the water in the can heats up, it changes from a liquid to a gas. We call this gas water vapor. The moving water vapor pushes the air out of the can. After you turn the can over into the water, it seals the can and traps the water vapor inside. The water vapor quickly cools and condenses. As the water vapor condenses back into water, it leaves empty space in the can. This empty space allows the air around the outside of the can push on the can and crushes it. The outside air is always there and exerts 14.7 pounds of pressure per square inch. But, it's not able to crush the can when there is air inside of the can. Once that air inside the can is removed, the outside air easily crushes the can. You may have noticed that the can started to fill up with water. This is a result of the low pressure inside the can and the air pushing down on the water in the bowl. The water gets pushed by the air into the can to fill the empty space.

EXTEND YOUR LEARNING:

You just completed the can crusher activity. To make this a true experiment, try changing a variable?
-What might happen if you add more water to the can?
-What if you don't add ice to the water?
-Does it change the experiment if we use a different kind of can or a water bottle?
-What if we change the water temperature in the bowl?
-Does the ice make a difference?

WORKFORCE CONNECTION

Aerospace engineers have to understand how pressure and a lack of pressure (vacuum) affect the performance of aircraft and spacecraft inside and outside of the earth's atmosphere. Aerospace engineers design and test aircraft and spacecraft as well as missiles and satellites to learn how air impacts flight.

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DIY SOLAR BALLOON

TOPIC: AIR

Air is EVERYWHERE! Air is the invisible gaseous substance surrounding the earth. Build a Solar Balloon Kite to learn how heat energy changes how air behaves.

MATERIALS

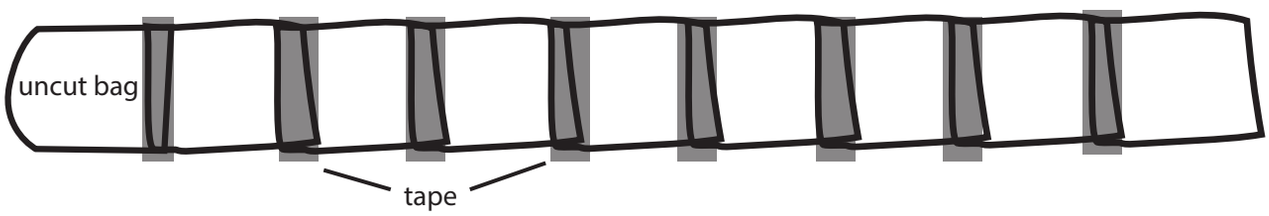
- Cellophane packing tape
- Seven (7) 30 gallon thin, black trash bags
- Scissors
- String
- Clean work space and a parent helper

DIFFICULTY:

Make sure you don't fly your solar balloon kite near any airports and be sure to let your neighbors know what you are doing! We don't want any UFO calls being made to the authorities!

EXPERIMENT:

Step 1: Gather materials.
Step 2: Cut the bottoms off of 6 trash bags.
Step 3: Lay the uncut bag out first. Then lay 6 cut bags end-to-end starting at the top of the uncut bag. Be sure to tuck the bags into each other at least 1 inch so no air will be able to escape when you tape them together. This overlap prevents air from escaping.
Step 4: Connect the bags together by taping them to each other with tape. Carefully cover the seams all the way around the bag so no air can enter or escape.
Step 5: Repeat step 4 with the remaining bags and then connect them together in the middle. Make sure you are careful to tuck them in the same direction as the other segment so the air will flow in easily. Your kite should look like a giant segmented earthworm with one open side.



Step 6: Carefully inflate your balloon. Have a helper hold the closed end while you hold the open end to allow air to fill your balloon.
Step 7: Once inflated, tie a kite string to your DIY Solar Ballon Kite and allow it to be in direct sunlight.

WHY IT WORKS:

The black color of the trash bags absorbs heat energy from the sun and the air inside the bags to heat up. As air molecules fain more energy, they spread out quickly and create more space between them. Because the air molecules inside are spreading out, they become less dense than the cooler air around the solar balloon kite. This allows the solar balloon kite to rise and float in the air. This is similar to a beach ball rising to the top of the pool water because the air inside is less dense than the surrounding water.

EXTEND YOUR LEARNING:

- Would the solar balloon kite work if you used white trash bags?
- Would it work with one trash bag?
- Does the solar balloon kite work better in the morning, in the middle of the day, or in the evening?
- Does it work on a cloudy day?

WORKFORCE CONNECTION

An airship pilot flies giant airships. The airships only fly about 30 miles per hour, but are extremely sensitive to the wind just like the solar balloon. Pilots need strong flying skills to respond to the slightest changes in the weather. In addition, Airships have to land into a group of people who rush to secure them to the ground, so expert piloting skills are necessary for safety. Even professional pilots need at least a year of additional training to fly a helium filled airship.