

**WHEN**

# **SCIENCE**

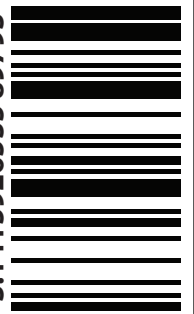
**GOES VIRAL**

**MISTER C LIVE! VOL. 3**



**TEACHER RESOURCE GUIDE**

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Mister C

# 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.

**Mister C 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 a 20+ year education veteran, Mister C has spent time as a classroom 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's DIY Science Time** is a regional Emmy Award winning show and can be found on-air on PBS stations across the country and online everywhere! Mister C also shares his learning adventures online with over 200,000+ subscribers on YouTube.

You can follow along @LearningScienceisFun

Through these platforms, millions of Science Crew members have explored side by side with Mister C, enjoying learning to a different beat with silly songs, exciting experiments and dazzling demonstrations.

And now you will too!


# Welcome to the Crew!



**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 #DIYScienceCrew



@originalmisterc



@learningscienceisfun





Mister C

## Pre-show Conversation Starters

1. What makes a good scientist? Is it okay to fail? Why or why not?
2. Why is working and learning together in a lab an important thing?
3. Why is it important to have a responsible adult help you while doing experiments and activities?

## Lab Safety

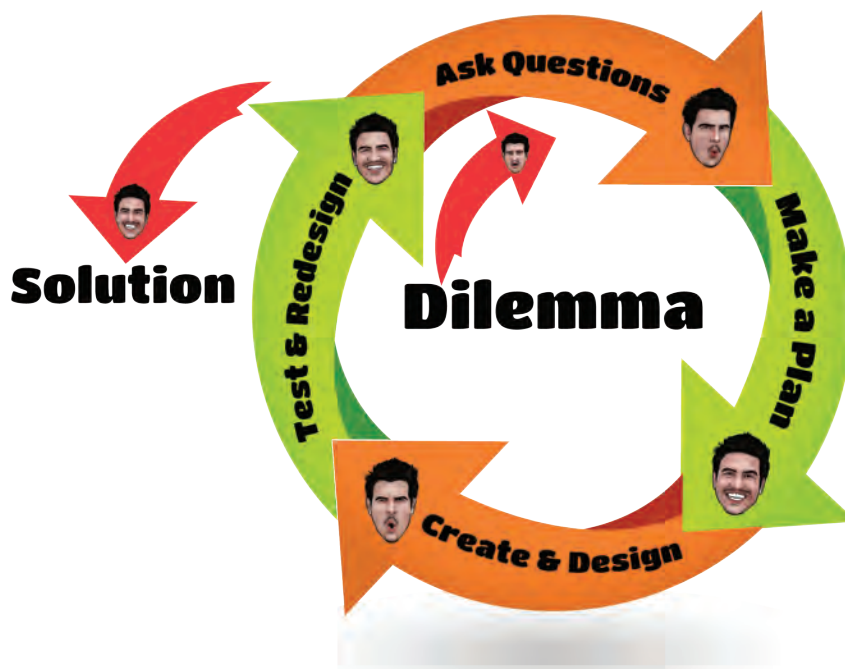
- Anytime you're doing science, it's important to remember Science Safety.
- Report all accidents, injuries, and breakage of glass or equipment to your instructor immediately.
- Keep pathways clear by placing extra items (books, bags, etc.) on the shelves or under the work tables to avoid people tripping 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.



Mister C

# 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.

# DIY Elephant Toothpaste



## FUN FACT

Seaweed is in our toothpaste! Seaweed acts as a thickening agent that allows toothpaste to be squeezed from its tube!

## MATERIALS

- Yeast
- Dish soap
- Measuring spoons
- Empty plastic bottle
- Cup with warm water
- 3% Hydrogen peroxide

## DIFFICULTY



## CHEMICAL REACTIONS

Chemical reactions take place when the molecular or ionic structure of a substance is rearranged. When a chemical reaction occurs, a new substance is created and the process is irreversible. Today you'll make elephant toothpaste with a parent!

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*Why are chemists great at solving problems?*

\*Answer on the next page



“Science is wherever  
YOU are!”



## DIY Elephant Toothpaste

### EXPERIMENT

**Step 1:** Gather materials.

**Step 2:** Place 2 tablespoons of yeast into 3 oz of warm water.

**Step 3:** Mix yeast and warm water, let stand until it gets frothy (about 3 minutes).

**Step 4:** Pour 4 ounces of hydrogen peroxide into an empty bottle.

**Step 5:** Squirt 1 tablespoon of dish soap into the hydrogen peroxide.

**Step 6:** Pour your yeast mixture into the bottle.

**Step 7:** Observe what happens!

### WHY IT WORKS

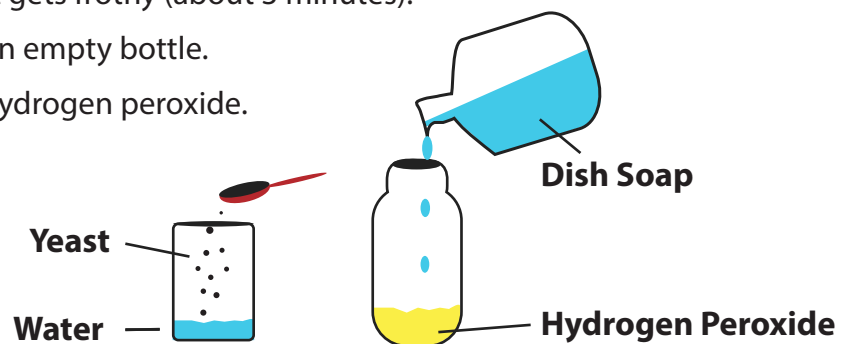
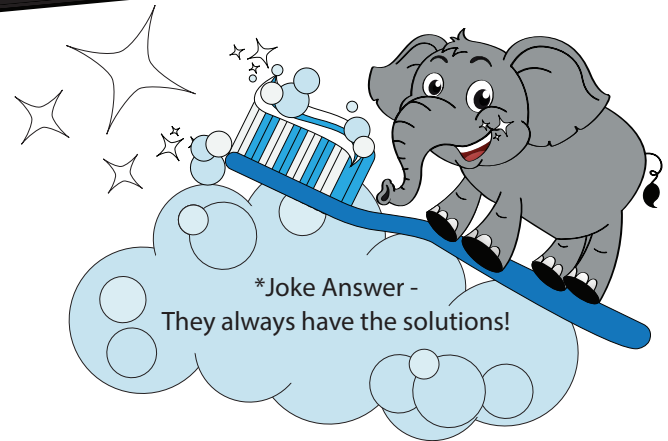
“Elephant toothpaste” is created when a chemical reaction takes place and releases one oxygen atom from the hydrogen peroxide ( $H_2O_2$ ). Hydrogen peroxide decomposes, or breaks down, into water ( $H_2O$ ) and oxygen ( $O$ ) naturally over time, but the yeast causes this to occur faster. The yeast has an enzyme in it called catalase. Catalase is a catalyst, something that increases the speed of the reaction. The catalyst is what causes the oxygen to be released quickly to create our “elephant toothpaste.” So why did we add soap? We wanted to capture all of the released oxygen (gas) from the chemical reaction!

### EXTEND YOUR LEARNING

- Would the experiment still work if you added more yeast?
- What happens if you don't add the soap?
- Does the shape or the size of the bottle change how the elephant toothpaste flows?

### WORKFORCE CONNECTION

Cosmetologists, people who study the application of beauty treatments, work carefully with chemical reactions on a daily basis to help color people's hair. When someone's hair is bleached, a chemical reaction takes place to change the melanin from brown to a colorless (pale yellow) color. This irreversible process (chemical change) then allows the cosmetologist to apply a new color to the hair.



# DIY Bouncy Ball Recipe



## FUN FACT

Bini the Bunny holds the world record for the most basketball slam dunks in one minute by a rabbit. Bini made 7 dunks in just 60 seconds! Now that's one bouncy bunny!

## MATERIALS

### Ball mixture

- Glue
- Cornstarch
- Food coloring
- Mixing bowl
- Measuring spoons

### Borax Bath

- Borax
- Warm water
- Mixing bowl

## DIFFICULTY



## POLYMERS

Polymers are large molecules made from bonded (chemically linked) groups of similar atoms. The word polymer is Greek for "many parts." Polymers are made of many monomers (Greek for "one part"). A polymer is a chain of linked monomers. Polymers can be found all around us: bicycle tires, plastic plates, the soles of our shoes, and even super duper bouncy balls!

**Why did the bucket bounce?**

\*Answer on the next page

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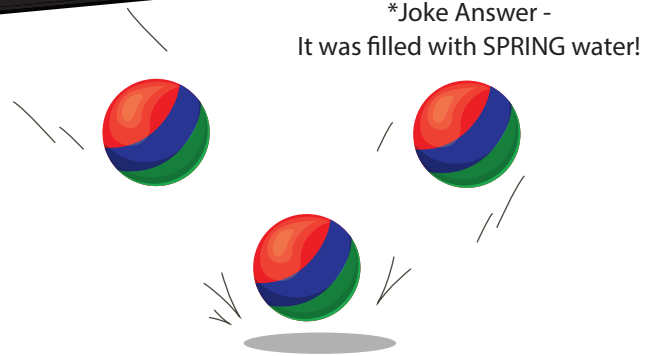
“Science is wherever  
YOU are!”



## DIY Bouncy Ball Recipe

### EXPERIMENT

- Step 1:** Create a Borax bath by mixing together 2 Tbsp Borax into 1 cup of warm water in a mixing bowl.
- Step 2:** Create your ball mixture by mixing together 1 Tbsp cornstarch with 2 Tbsp of glue. If you want your ball to be colored, add food coloring and mix together in another bowl.
- Step 3:** Carefully drizzle your ball mixture into your Borax bath. Allow it to sit in the bath for 15-20 seconds. Stir and make sure that all parts of the mixture have been activated by the Borax bath (should feel firm).
- Step 4:** Remove your ball mixture from the Borax bath and form into a ball shape. A measuring spoon can be used as a guide to help shape your ball. Place your ball back into the Borax bath for 60 seconds.
- Step 5:** Be sure to wash your hands after handling the Borax bath.
- Step 6:** Try bouncing and testing your ball!



### WHY IT WORKS

You are seeing a chemical reaction right before your eyes during this experiment. The glue is a polymer and the Borax links together the molecule chains of the glue. The cornstarch helps to thicken the mixture, allowing it to be formed and hold a ball-like shape. Although you can't see the molecules linking in the chemical reaction, we know a chemical reaction has taken place because our ingredients have combined to create a new item!

### EXTEND YOUR LEARNING

- What happens if you changed the amount of cornstarch or glue used in the recipe? Could you make a larger ball?
- Does your bouncy ball behave differently if chilled in the freezer?
- Could you separate your recipe and use different food coloring to make a multi-colored ball?

### WORKFORCE CONNECTION

A geneticist is a biologist who studies genetics, the science of genes, heredity, and variation of organisms. The genes they study are made of polymers called DNA. Two long strands of these polymers form the familiar double helix shape of DNA. The monomers that make up DNA strands are called nucleotides. Geneticists study the genes of organisms like human beings, animals, crops and bacteria.

# DIY Flip Book



## FUN FACT

You can see one of the biggest optical illusions right from your own backyard! The moon illusion occurs when the moon appears larger in size. This occurs when the moon is low on the horizon. Check out how the moon looks from your backyard tonight!

## MATERIALS

- Colored Pencil
- Index Cards

## DIFFICULTY



## OPTICAL ILLUSIONS

An optical illusion is something that deceives the eye by appearing to be something other than what it really is. We experience optical illusions quite frequently in our daily lives. Cartoons, animations and even movies are examples you may be familiar with!

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FOR MORE SCIENCE FUN!



**Why do optometrists make great magicians?**

\*Answer on the next page



“Science is wherever  
YOU are!”



\*Joke Answer -  
They know all about OPTICAL illusions!

## DIY Flip Book

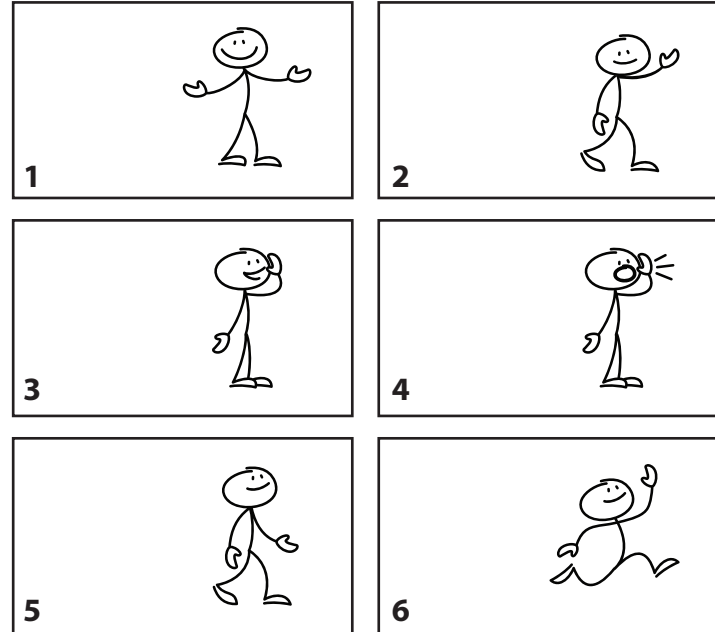
### EXPERIMENT

**Step 1:** Draw your base cartoon figure.

**Step 2:** Repeat this cartoon figure on the right side of each index card, making small changes as you draw a new card.

**Step 3:** Stack your index cards on top of each other. While holding with your left hand, flip through the index cards with your right hand, showing each picture quickly in order.

**Step 4:** Watch as your cartoon figure comes to life and appears to move!



### WHY IT WORKS

A flipbook is an optical illusion and creates the illusion of motion. You perceive that the characters as being in motion, but this effect is created by the sequence of still pictures flashing rapidly before your eyes as you flip pages. Our brains try to make sense of what we are looking at by “smoothing out” the individual images into one continuous scene by filling in what happens between each image. This creates the illusion of movement.

### EXTEND YOUR LEARNING

- Can you incorporate color into your designs?
- Does changing the order of your drawing impact the illusion?
- Is the illusion changed by flipping your cards more quickly or more slowly?

### WORKFORCE CONNECTION

Optometrists are doctors that care for our eyes. Our eyes are organs in our bodies that collect light information. Optometrists perform vision tests and routine eye health services. One tool they use to examine their patients' eyes is an ophthalmoscope. This small hand-held instrument allows optometrists to carefully examine the retina, the part of our eyes where our rods and cones collect light information that is sent through the optic nerve to our brains. Our brains then interpret the information and allow us to see the world.