Conceived & Performed by Kevin Cornell

Mister C

Mister C Live

The World in Motion - 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 as he explores Newton's Laws! Mister C is no stranger to finding exciting and engaging ways to explore STEAM (Science, Technology, Engi-neering, 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 engi-neering design process to make the ordinary extraor-dinary!

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 is an Emmy award winning host and producer for DIY Science Time, which airs on PBS Stations across the US. He is also the creator of the YouTube channel LearningScienceisFun with 106,000 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

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@learningscienceisfun

www.learningscienceisfun.com

Pre-show Conversation Starters

1. Why is it so much harder for vehicles to drive on snow or ice?

2. What type of scientists study motion and Newton's Laws?

3. Could you design and experiment to test how mass impacts the motion of a vehicle?

Motion Vocabulary

Friction - the resistance that one surface or object encounters when moving over another.

Speed - the rate at which someone or something is able to move or operate.

Inertia - a property of matter by which it continues in its existing state of rest or uniform motion in a straight line, unless that state is changed by an external force

Acceleration - the rate of change of velocity per unit of time.

Gravity - the force that attracts a body toward the center of the earth, or toward any other physical body having mass.

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.

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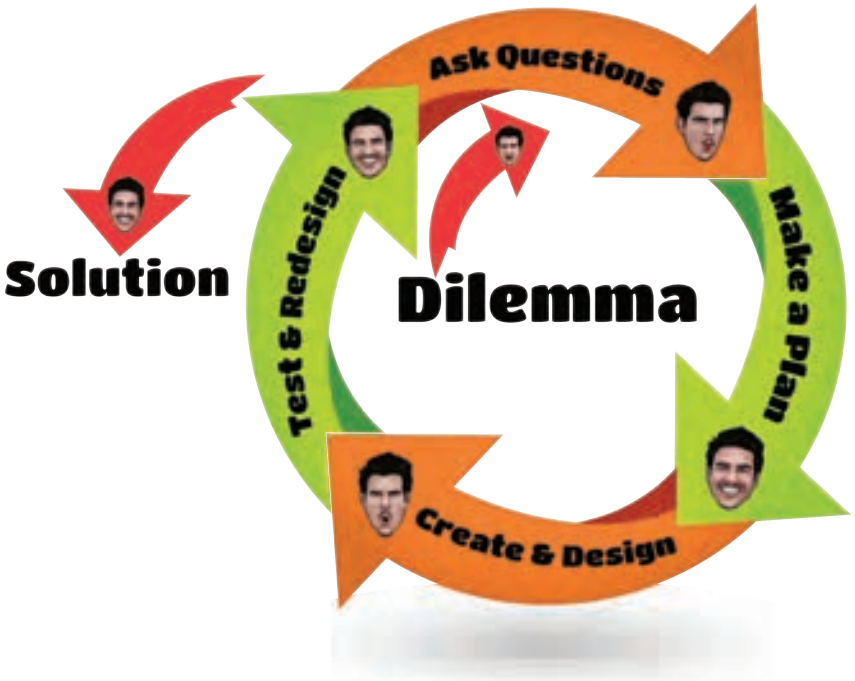
Engineering Design Process

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 HOVER CRAFTS

TOPIC: AIR

Air is EVERYWHERE! Air is the invisible gaseous substance surrounding the earth and can also be used to create a cushion of air to help move your hovercraft across smooth surfaces.

MATERIALS:

- Blank CD
- Water bottle cap (push cap)
- Balloons
- Hot glue gun
- Clean work space and a parent helper

DIFFICULTY:

Lee-on-the-Solent in England, is where you can find the Hovercraft Museum which holds the world's largest collection of hovercraft designs, including some of the earliest and largest.

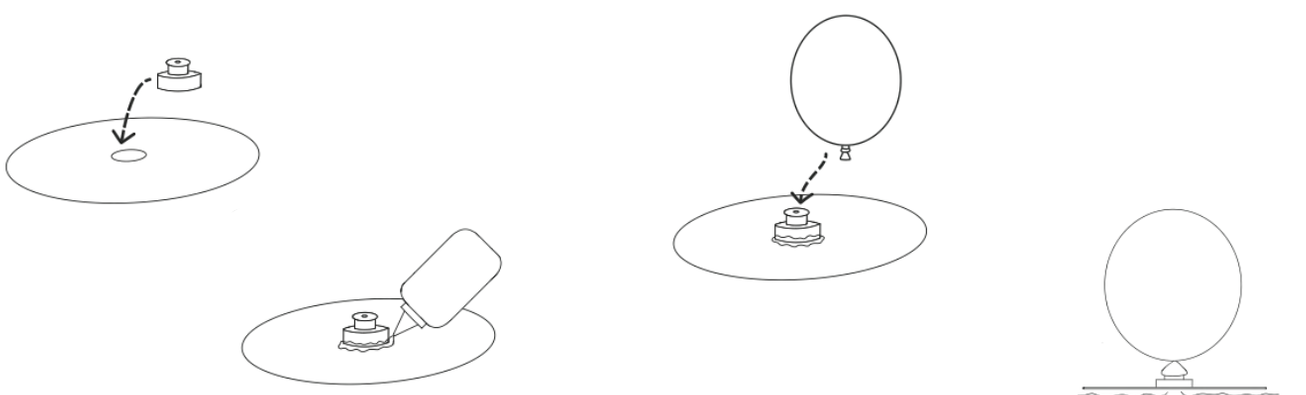
EXPERIMENT:

Step 1: Gather your materials.

Step 2: Glue the water bottle lid to the CD, making sure there are no gaps for air to escape.

Step 3: Blow up a balloon and connect it to your lid.

Step 4: Open the airway of the balloon is open and observe your hovercraft!



WHY IT WORKS:

Hovercrafts work by using air to lift the craft off of the surface. In this activity, as the balloon deflates, the air is pushed out through the bottom of the CD. This is an example of Newton's Third Law that says for every action there is an equal and opposite reaction. Because of the weight, shape and texture of the CD, a thin layer of air is formed between the CD and the smooth table top surface. This layer of air reduces the friction between the CD and the surface allowing the CD to move easily and hover over the table.

EXTEND YOUR LEARNING:

- What would happen if you used a different shaped balloon?
- Will it work with a heavy plastic plate?
- How far can you get your hovercraft to go? What adjustments will make it move faster?
- What type of air nozzle works best? What about the surface?
- How much weight can your hovercraft carry?

WORKFORCE CONNECTION:

Fire-rescue workers use amphibious hovercraft to rescue people in flooded, muddy or icy areas. The hovercraft can easily go up to people's houses to rescue them right at their front door and works much better than a helicopter for this purpose. Fire and rescue workers also need to understand how to operate and maneuver the craft which means part of their job is to practice these rescue scenarios in the event a real situation arises.

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DIY CENTRIPETAL FORCE BOARD

TOPIC SUMMARY:

Objects in motion stay in motion and this centripetal force board defies gravity!

MATERIALS:

- Sturdy cardboard
- Scissors
- String or yarn
- Plastic cup
- Pennies

DIFFICULTY:

A satellite revolves around the earth using the gravitational attraction between the earth and the satellite as the centripetal force.

EXPERIMENT:

Step 1: Gather your materials.

Step 2: Carefully poke holes in all four corners of the cardboard with the scissors.

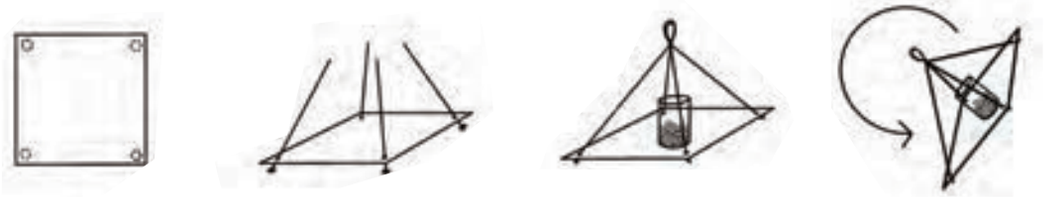
Step 3: Cut four pieces of string and tie one string in each of the corners.

Step 4: Tie the strings together at the top.

Step 5: Place the pennies in the cup and set the cup in the center of the cardboard

Step 6: Practice swing the board while keeping equal tension on the strings.

Step 7: See if you can get the board to spin in a full circle!



WHY IT WORKS:

Newton's First law of Motion states that an object in motion stays in motion unless acted upon by a force. During this experiment, the motion the board is moving in a circular motion because a force is always pushing it toward the circle's center - centripetal force. Even when the cup and pennies are at the top of the circle, the force keeps them going quickly in a circular motion. Centripetal force is center seeking. The board is being pulled towards the center of the axis where your hand is spinning. Although the cup and pennies have inertia, they do not fly off the board because the board is preventing it from flying off in a straight line.

EXTEND YOUR LEARNING:

- What would happen if you shortened the strings? What if you made them longer?
- What if you add water to the cup? Does it matter how much water is in the cup?
- How many cups can you place on the board and still get it to work?
- Try placing a penny on the curved end of a wire hanger. Can you spin it around and keep the penny on the end?
- Does this work with a stack of quarters?
- What happens if you rotate the board more slower?

WORKFORCE CONNECTION:

A satellite launch operations engineer creates procedures to assist launches of satellites into orbit. They help develop and build the satellite so that it can properly orbit in space and complete all of its functions. These engineers also help test the satellite once it is in orbit to ensure everything is working properly. They are also responsible for building facilities on the ground to support further development and testing.
Satellites stay in orbit around the earth because of centripetal force!

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DIY EGG DROP TOWER

TOPIC SUMMARY:

Explore gravity and inertia with this simple egg-speriment! You'll need skills, patience and maybe even a little luck!

MATERIALS:

- Tall glass with water
- Food coloring
- Plastic plate
- Paper towel or toilet paper roll
- Eggs
- An adult helper

DIFFICULTY:

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When you kick a soccer ball into the air, it would fly forever if gravity and air resistance were not acting against it.

EXPERIMENT:

Step 1: Gather Your materials.

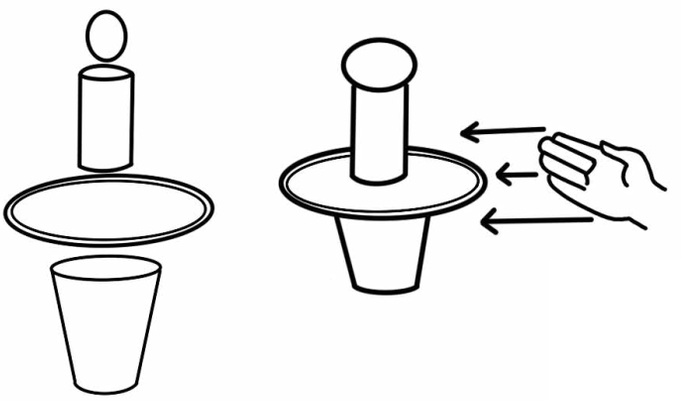
Step 2: Pour water into your glass and add a drop of food coloring to the water.

Step 3: Put the plate in the center of the glass and stack the toilet paper roll in the center of the plate.

Step 4: Carefully place the egg on top of the toilet paper roll.

Step 5: In one fluid motion, carefully hit one side of the plate, knocking it out from under the egg.

Step 6: Observe what happens to the egg.



WHY IT WORKS:

The focus of this demonstration is Newton's first law of motion also known as the Law of Inertia. Newton's first law of motion states that objects in motion want to keep moving at the same speed and in the same direction unless acted upon by an unbalanced force, while objects at rest want to stay at rest unless acted upon by an outside force. Since the egg is sitting on the tube not moving, it wants to stay there. Mister C applied enough force to knock the tube and plate away. Therefore, the egg had no more support. Because of this, the force of gravity is able pulls the egg down toward the Earth. After the egg began to move, it didn't want to stop, and the container of water blocked the egg's fall. Maybe Humpty Dumpty would be okay if only he had a little swimming pool to fall into!

EXTEND YOUR LEARNING:

- What would happen if you used something besides an egg? Would a lemon or ping pong ball work?
- Could you try it with a smoothie straw and a marble?
- What if you try a taller tube?
- Have you seen the magic trick where someone pulls the tablecloth out from under some dishes?

WORKFORCE CONNECTION:

A race car driver has to understand how to drive the car in such a way that inertia doesn't cause her to have an accident. She needs to understand how much inertia the car has and how to manipulate the inertia using the brakes as well as using advanced steering techniques. The race car drivers also has to understand acceleration and friction to ensure she is able to manage the car on slippery surfaces and sliding towards the outside of a curve.