Study Guide for

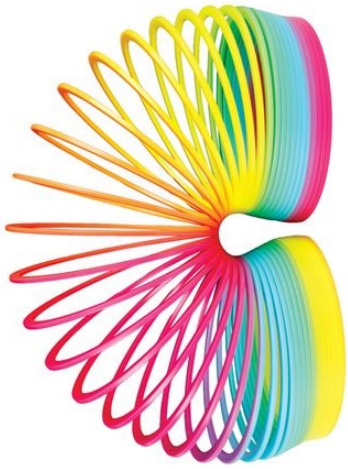
STEAM LAB

STEAM LAB is a live, multi-media, interactive game show that encourages the entire audience to "GET STEAMED."

The infamous Mad Scientist, DR. LOBOTO wants to create the ideal STEAM TEAM. Kenny and Page know just where to find a group of kids with a passion for SCIENCE, TECHNOLOGY, ENGINEERING, ART and MATH…the audience of course! The audience along with several kids and teachers on stage, must answer questions, perform experiments, solve riddles and prove they're ready to be part of Dr. Loboto's STEAM DREAM TEAM.

Wave Warm Up:
At the beginning of the show, Dr. Loboto needs proof that the audience can work together. So Kenny and Page lead everyone in a classic stadium wave.

Waves are the way energy moves from place to place. Sound moves from a mouth to an ear by waves. Light moves from a light bulb to a book page to your eyes by waves. And in the case of the stadium wave, the medium through which the stadium wave travels is the fans that are in the stadium. A **medium** is a substance or material that carries the wave. The wave medium is not the wave and it doesn't make the wave; it merely carries or transports the wave from its source to other locations.



A Slinky Experiment
Materials:
A slinky
Some way to anchor one end of the slinky down
A smooth floor
Tape
1. Put a piece of tape on one slinky wire in the middle or so of the slinky.
2. anchor the slinky to a chair or table.
3. Stretch the slinky out, but not too far.
4. push the slinky toward the table, and then pull it back to its original position. Did you see the wave?
5. Now do it again, back and forth several times and watch where the slinky is bunched up and where it's spread out.
6. Notice the tape. What is it doing?

You made a longitudinal wave. **A longitudinal wave is where the particle moves parallel to the medium.** In a transverse waves the particles vibrate in a different direction (perpendicular) to the wave.

SCIENCE is the method we use to discover answers to questions we have about the world. We figure out those questions by making a guess about what we think will happen then testing that guess with experimentation.

Activity: FOAM Machine
Here is a different version of the demonstration performed during the show.

What You'll Need:
Goggles
2 test tubes (or similar shaped glasses)
Powdered laundry detergent
Teaspoon
Vinegar
2 science stirrers (or coffee stirrers)
Baking soda
Water

How to Create a Foam Machine:

Step 1: label one test tube (or container) with the letter A. Label the other B.
Step 2: Put on goggles.
Step 3: Place 1/2 teaspoon powdered laundry detergent into test tube A.
Step 4: Fill test tube A 1/3 full with vinegar, and then stir gently with a stirrer.
Step 5: Place 1/2 teaspoon baking soda into test tube B.
Step 6: fill it 1/3 full with water, and then stir gently with second stirrer.
Step 7: Pour the contents of test tube B into test tube A.
Watch the foam as it oozes and oozes all over the place.

What happened?
The acidic vinegar and the alkaline baking soda (sodium bicarbonate) produce a **chemical reaction.** Carbon dioxide is produced by the reaction. It combines with the It combines with the soap to produce foam that oozes out of the test tube.

Make it an Experiment:
What happens if you use different proportions of ingredients?
What happens if you use a different size container?

TECHNOLOGY

TECHNOLOGY is any THING, PROCESS, or SYSTEM created by humans to help solve a problem.

Here's a great little animation that explains technology:
https://www.youtube.com/watch?v=Giiz81_uzK8

Technology Scavenger Hunts and Games:

Activity #1: Simple Scavenger Hunt
List 3 pieces of technology in the classroom that don't need to be plugged in.
List 4 pieces of technology around the classroom that do need to be plugged in.
List 2 pieces of technology that help you in school.
List 1 pieces of technology that would make life very difficult if it didn't exist. ETC…

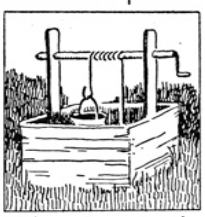
Activity #2:
Write a log of your day and all the technology you use from the second you wake up to the moment you go to sleep.
Bonus: Try to imagine going through your day without using any technology.

Activity #3: Technology Scattergories:
Separate kids into teams of 2-4
Pick a random letter
Try to list as many pieces of technology as you can that start with that letter. Try to come up with something different than the other teams. You get a point for everything you list that the other team did NOT list.

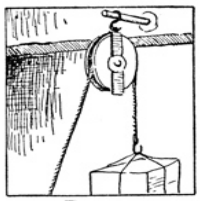
Activity #4: Online technology scavenger hunt games.
http://www.fractuslearning.com/2013/01/23/edtech-scavenger-hunts/

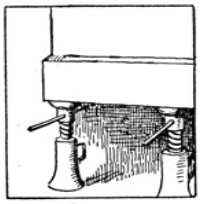

Lever


Inclined plane


Wheel and axle


Wedge


Pulley

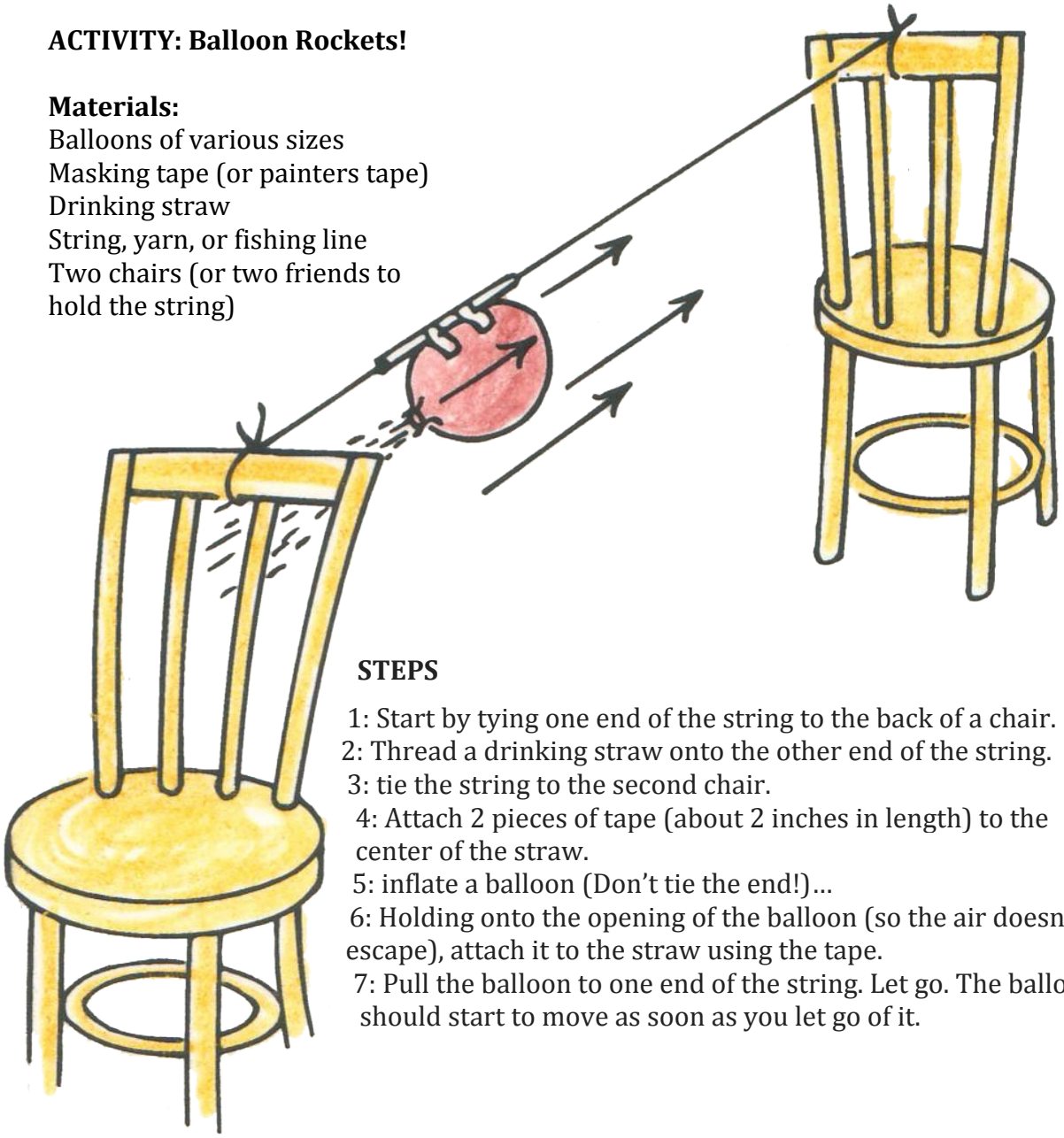

Screw

ENGINEERING

ENGINEERS want to know WHY things work! They are problem solvers. They use science and math and art to design and build things that people need like…technology!

ACTIVITY: Balloon Rockets!

Materials:
Balloons of various sizes
Masking tape (or painters tape)
Drinking straw
String, yarn, or fishing line
Two chairs (or two friends to hold the string)



STEPS

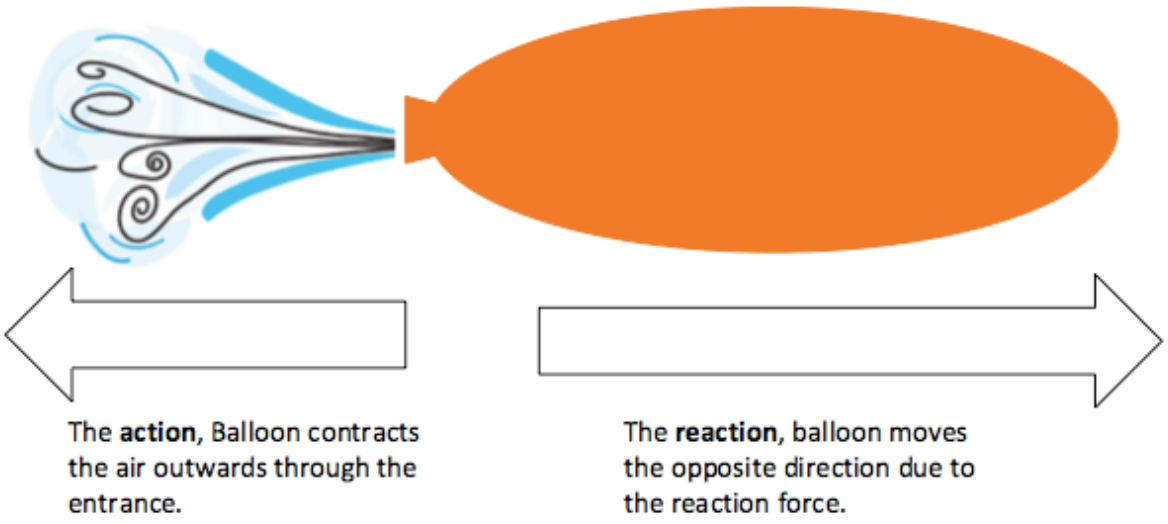
1: Start by tying one end of the string to the back of a chair.
2: Thread a drinking straw onto the other end of the string.
3: tie the string to the second chair.
4: Attach 2 pieces of tape (about 2 inches in length) to the center of the straw.
5: inflate a balloon (Don't tie the end!)…
6: Holding onto the opening of the balloon (so the air doesn't escape), attach it to the straw using the tape.
7: Pull the balloon to one end of the string. Let go. The balloon should start to move as soon as you let go of it.

BALLOON ROCKETS (cont.)

What Happened? Action and reaction.
To make an object move one way, a force has to work in the opposite direction.
In this case, the balloon is full of air. When you let go of the balloon, causing the air to rush out of the opening, it creates a pushing force in the opposite direction. As the air rushes out of the balloon, it creates a forward motion called **THRUST.** Thrust is a pushing force created by energy. In the balloon rocket demonstration, the thrust comes from the energy of the balloon forcing the air out. This makes the balloon move. Real rockets work in a similar way. A rocket engine works by exploding fuel inside a chamber that is open at the bottom. The force of the explosion creates an opposite force that pushes the rocket up and into space.

The project above is a Demonstration. To make it a true experiment, try to answer these questions?

1. Does the shape of the balloon affect how far (or fast) the rocket travels?
2. Does the length of the straw affect how far (or fast) the rocket travels?
3. Does the type of string affect how far (or fast) the rocket travels?



ART

Art us to interpret the world, ask questions, think creatively, use our imaginations and solve problems. Artists are creative problem solvers with great imaginations. Many types of art that use science, technology, engineering and math and many elements of science technology engineering and math use art and design. Art can also helps Scientists, Mathematicians, and engineers communicate their ideas.

Activity: Bubble Art

Materials
Liquid Dish Soap
Straws
Washable Paint
Water
Several Large Containers (disposable aluminum trays work well)
Paper

Steps:
Squirt a small dollop of paint in the container
Add Dish soap.
Add water
Place one end of straw in pan
Blow on the other end to create bubbles
Lay the paper on top of the bubbles to create art.

Note: several containers with different solutions.
Dip the paper in different colors

Make it an experiment:
What happens when you mix colors?
Can you figure out a way to make the bubbles last longer?
What if you use different proportions of water, paint, and dish soap?

MATH

MATH is the study of numbers, equations, functions, geometric shapes and their relationships.

Activity #1: Index Card Trick
Amaze your friends with this trick that comes from a branch of math called topology.
This is a fun exploration of shapes, perimeter, and area.

Can you fit your entire body through an index card?

Check out this video:
https://www.youtube.com/watch?v=71bzxv0032s

Index Card Trick Template:
http://www.kidzone.ws/magic/walkthrough.htm

Activity #2: Fortune Teller
This is a fun way to work on math skills.
http://discoverexplorelearn.com/math-facts-fortune-teller/

Vocabulary:
Science
Technology
Engineering
Art
Math
Catalyst
Molecule
Wave
Medium
Force
Thrust
Perimeter