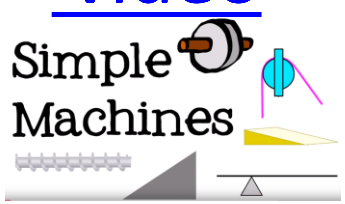
Robots

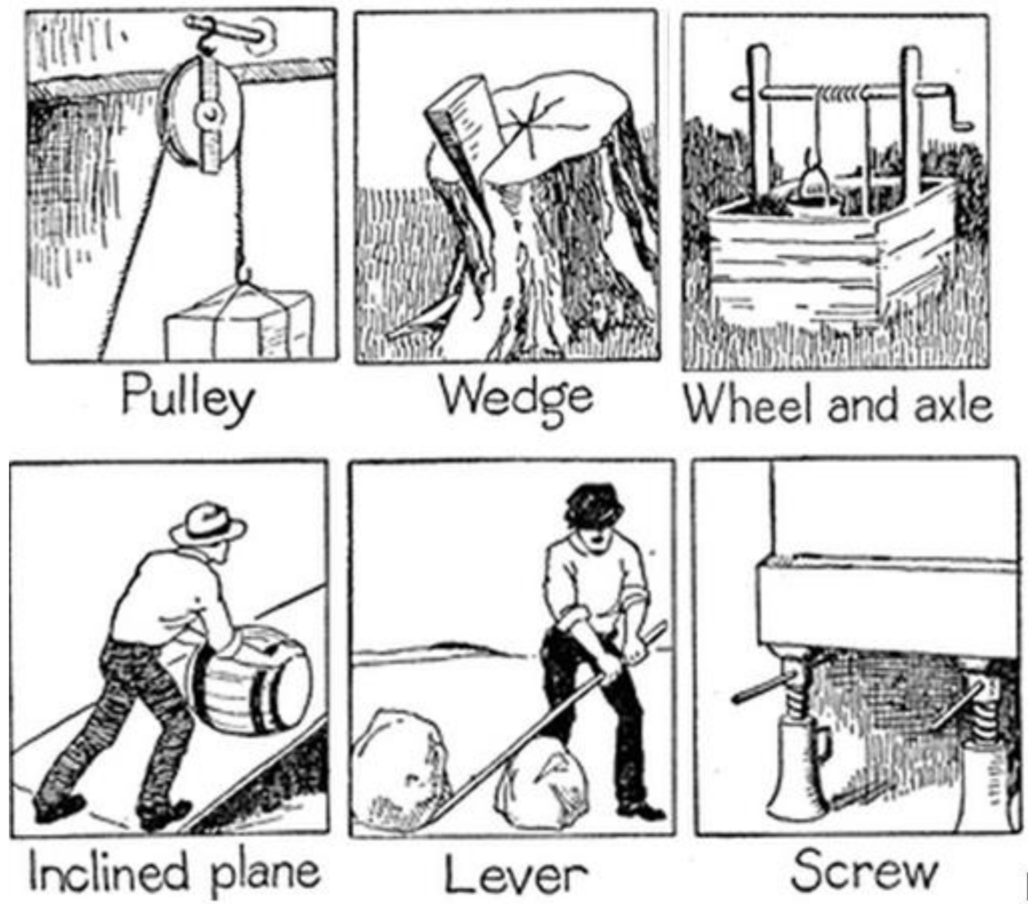
Creativity in Motion

Six Machines to Do It All, Six Machines to Bind Them

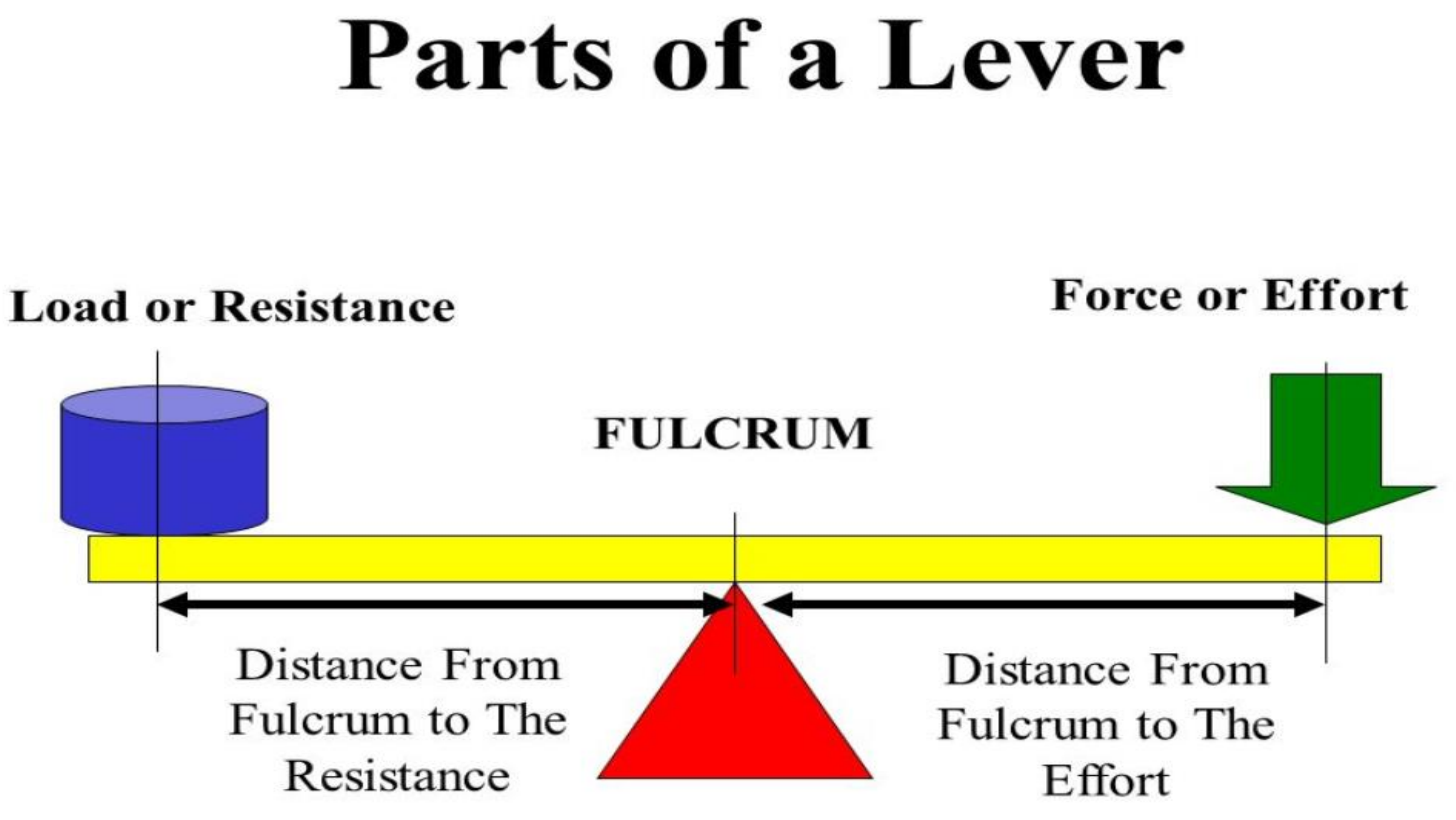
Explore the six simple machines, how they work, and make sample models of them.

Sample video





Understanding the Lever and Load



Understanding the Lever

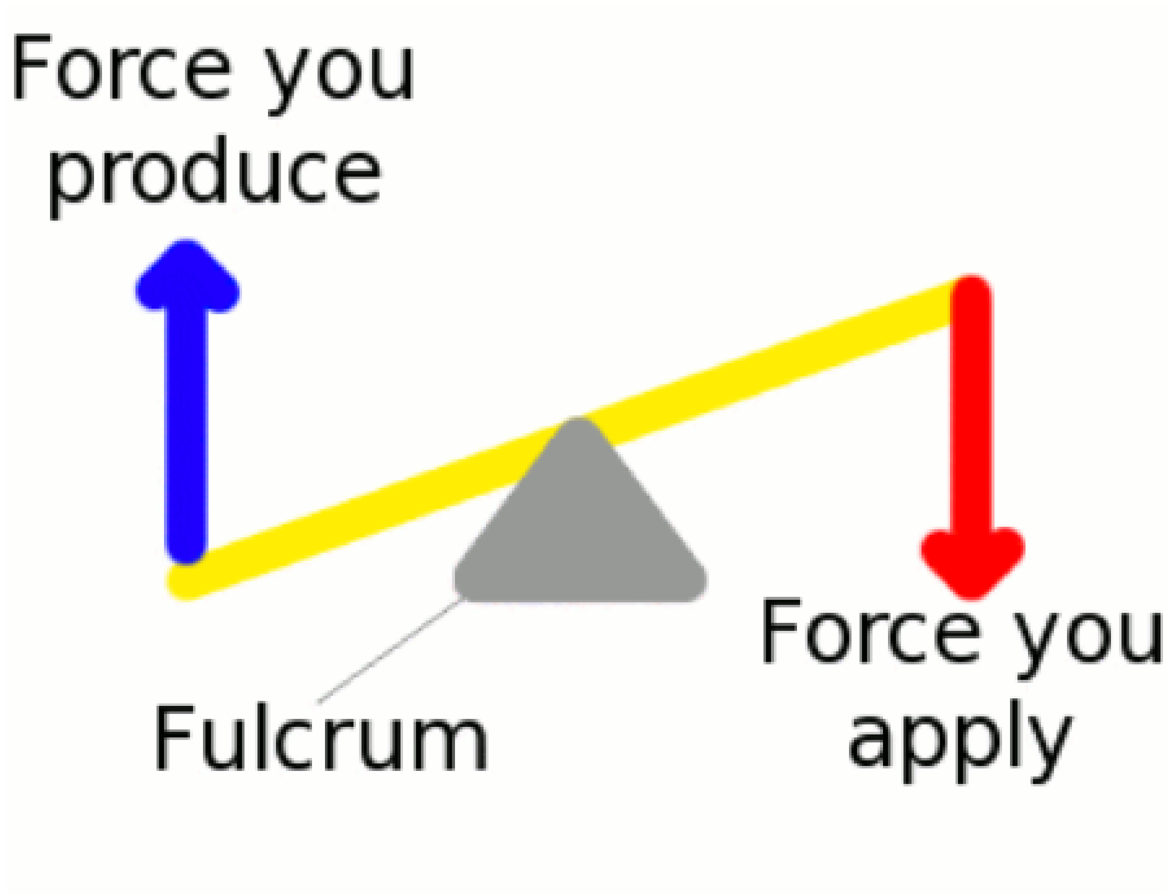
For the experiment hands may not be used to move the ball. Nothing may be used to secure the ball to the lever.

This configuration shows what is needed for students to explore the best lever design.

Understanding the Lever

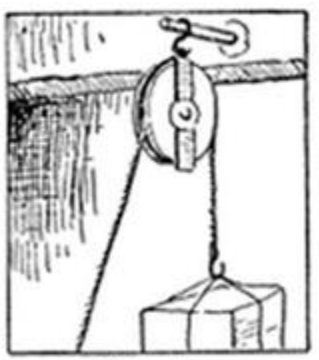
For the experiment hands may not be used to move the ball. Nothing may be used to secure the ball to the lever.

Students need to determine how to use the lever to get the ball where they need it.



Pulley

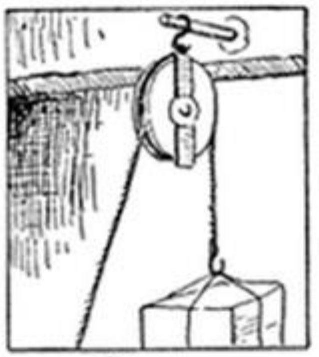
Picking up the milk jug. Which way is easier?



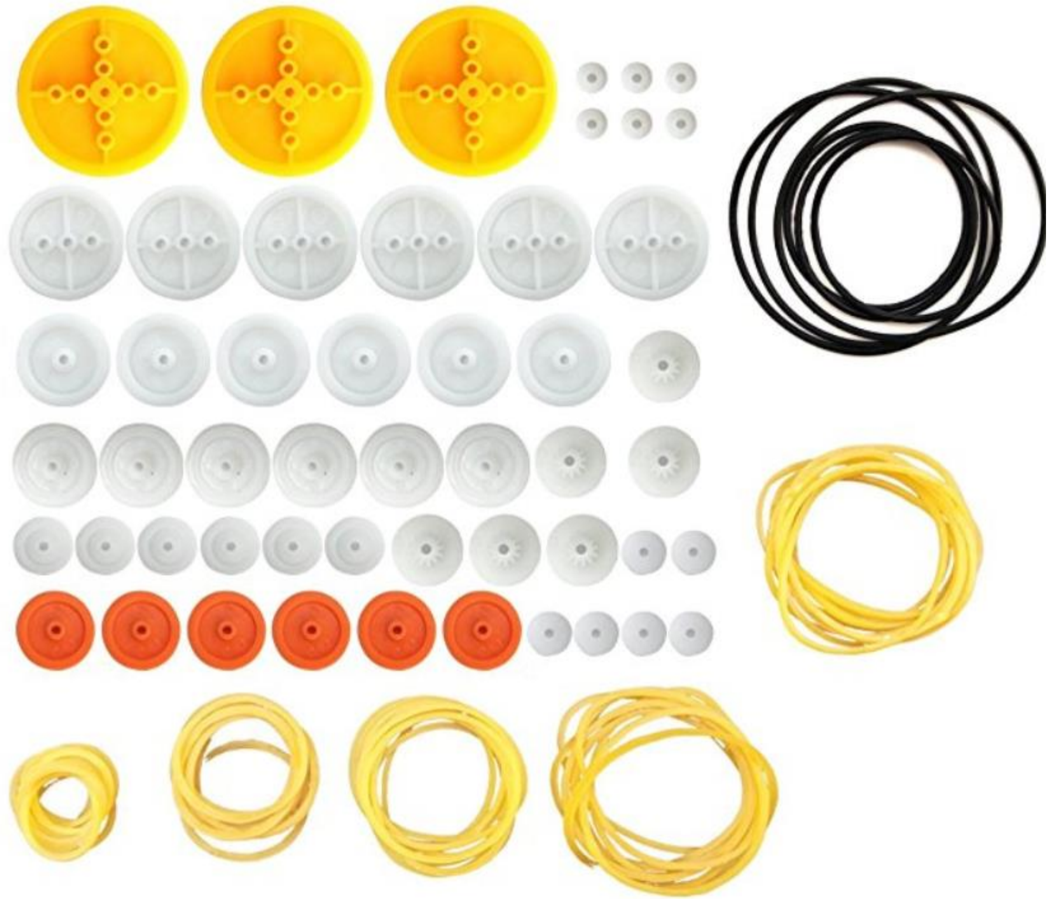
Pulley

Pulley

Picking up the milk jug. Which way is easier?

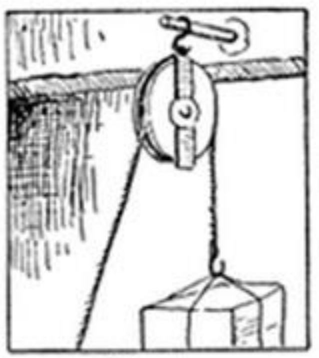


Pulley



Pulley Challenge

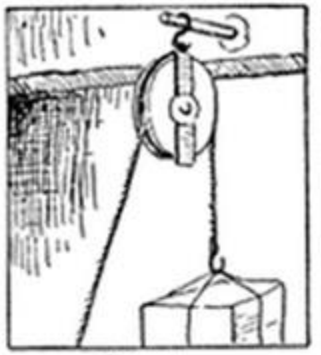
Good video
Understanding pulleys



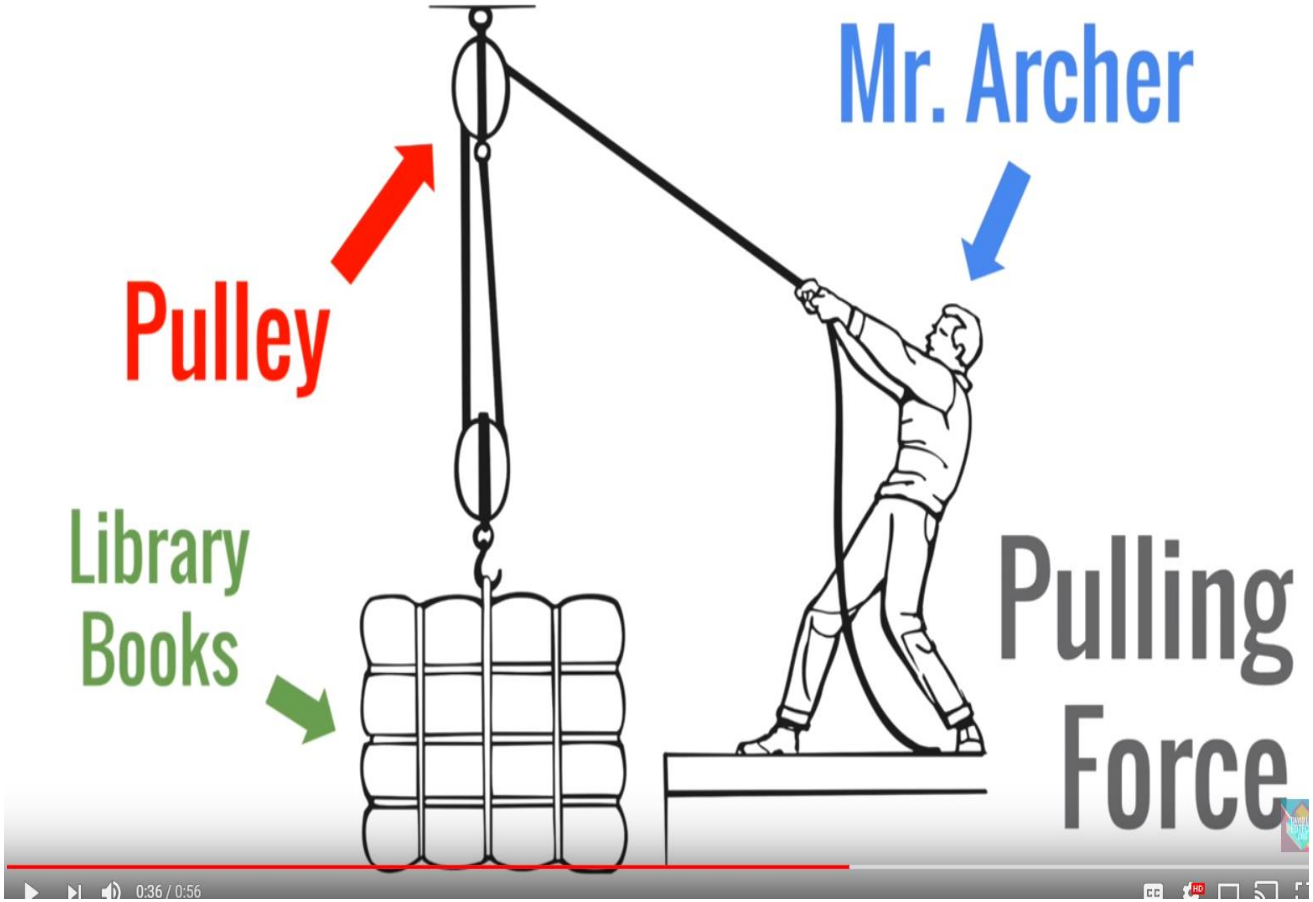
Pulley

Pulley Challenge

Modify your challenge



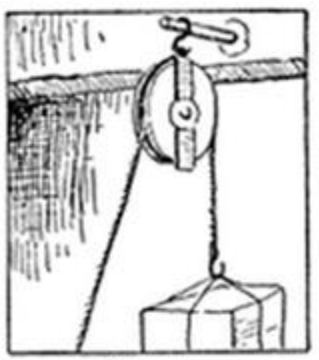
Pulley



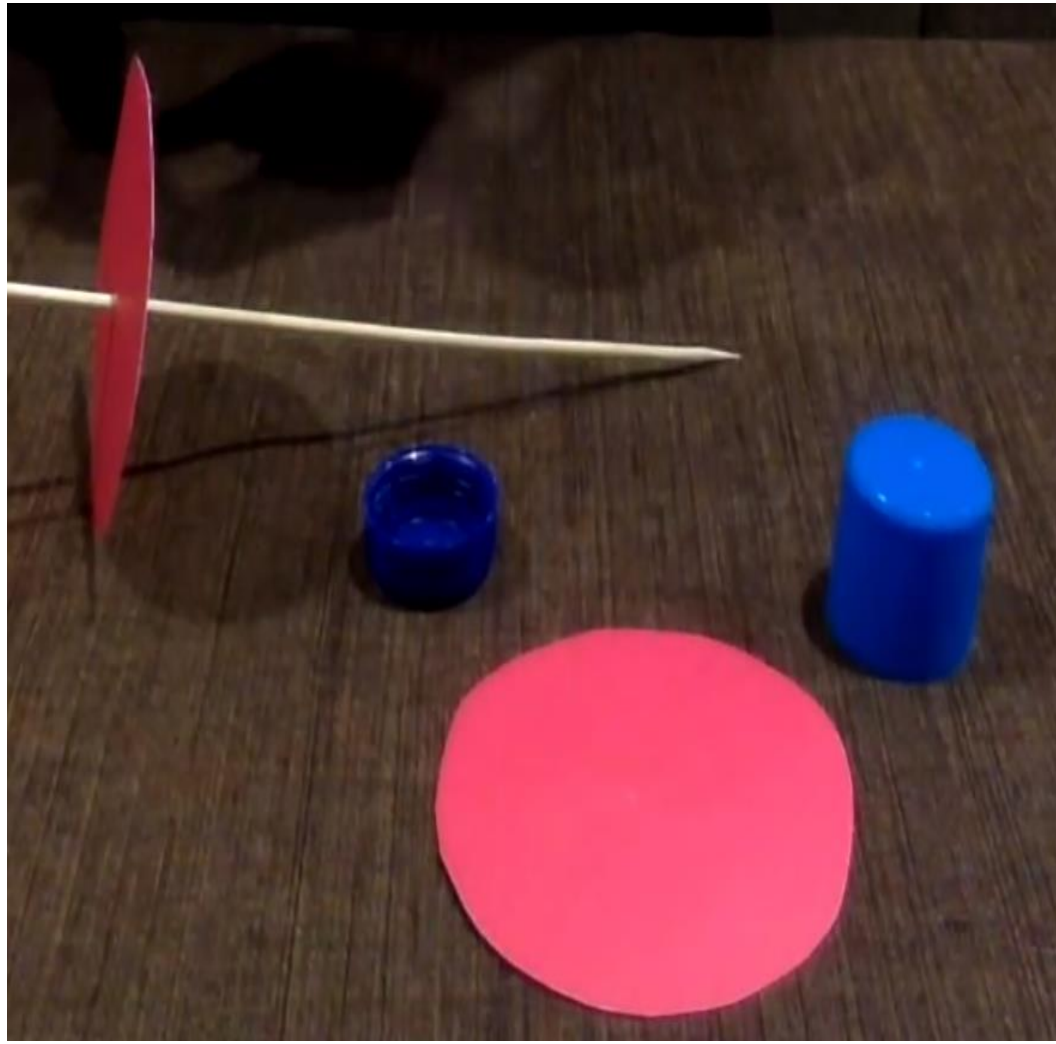
Pulley Challenge

Cups, marbles, pulley tools, thread spools, paper clips, skewers, tape, string

How to make a simple pulley?



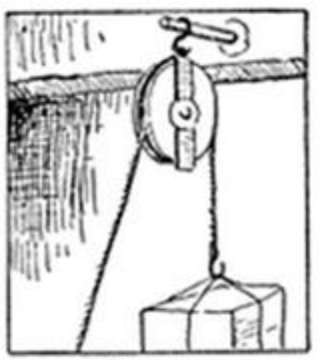
Pulley



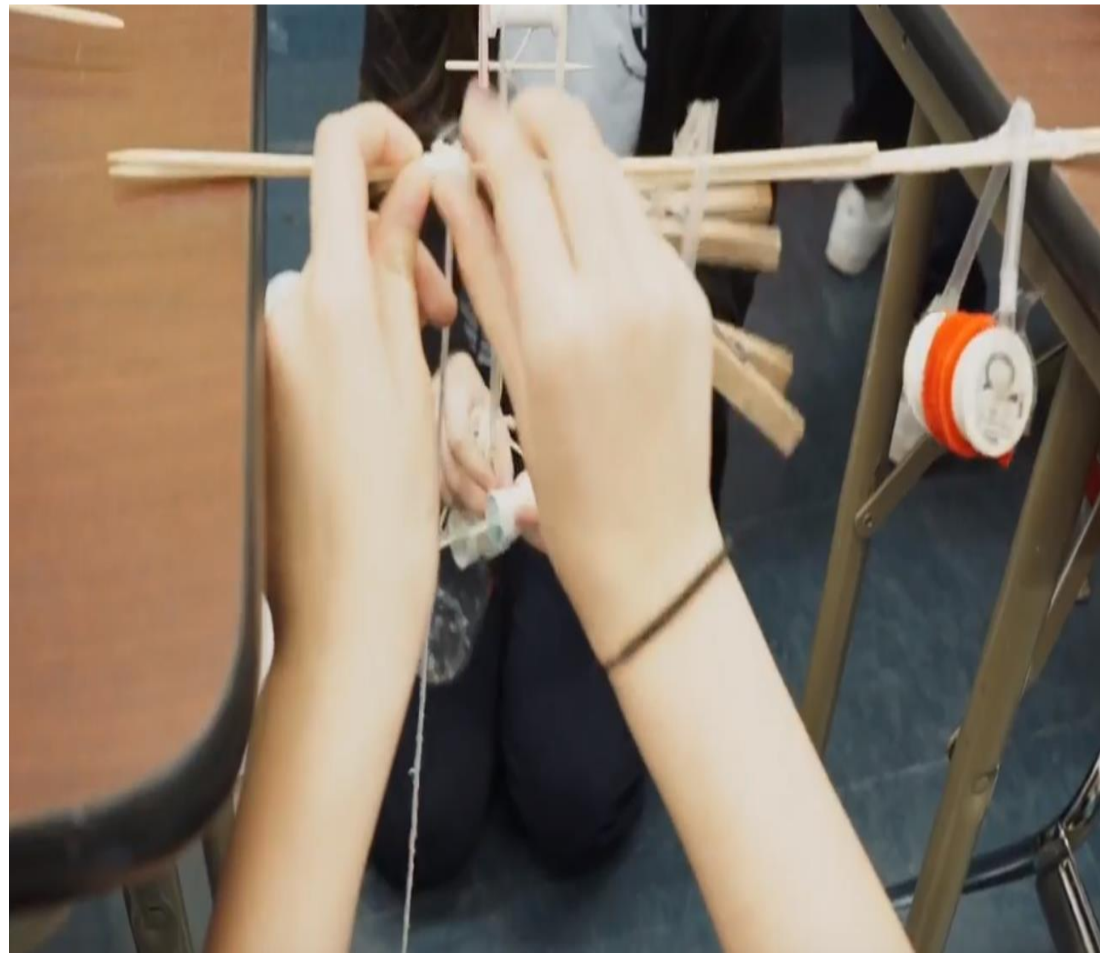
Pulley Challenge

Cups, marbles, pulley tools, thread spools, paper clips, skewers, tape, string

Who can lift the most marbles?



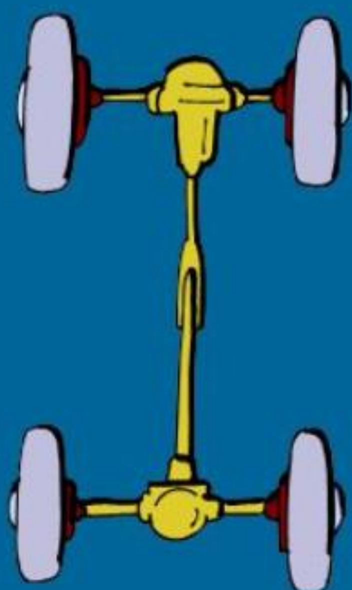
Pulley

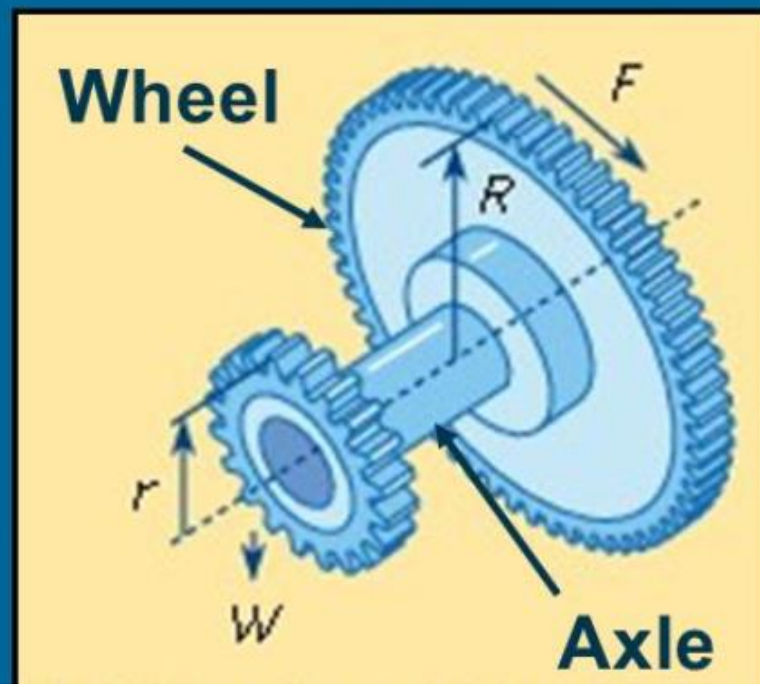


$W = Fd$

Wheel and Axle

- **Wheel and Axle**
  - two wheels of different sizes that **rotate** together
  - the wheel is always larger than the axle
  - a pair of **"rotating levers"**
- Examples: door knob, gears, car axle, pencil sharpener, screw driver, faucet handles





Wheel and Axle Group Challenge

Everyone gets the same materials and the challenge begins-

Who can move the tennis ball the greatest distance.

Wheel and Axle

Wheel and axles- expanded

Wheel and axle

Mousetrap Car

Instructables
667.5k followers

Follow

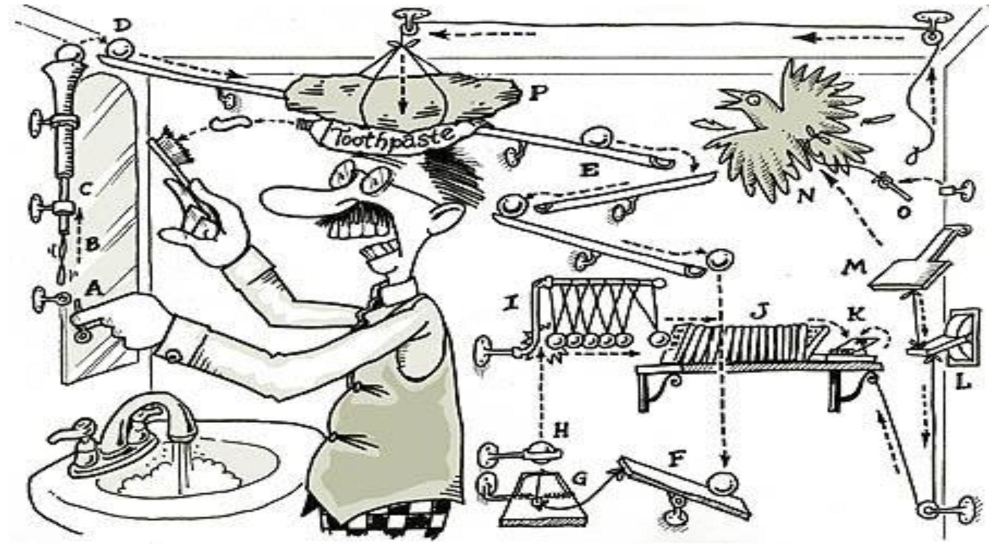
Mousetrap Car: This instructable will help you build a self-propulsion mousetrap car. The car uses physics and engineering concepts such as pulleys, levers, and springs to convert potential energy to kinetic energy which moves the car along. **Less**

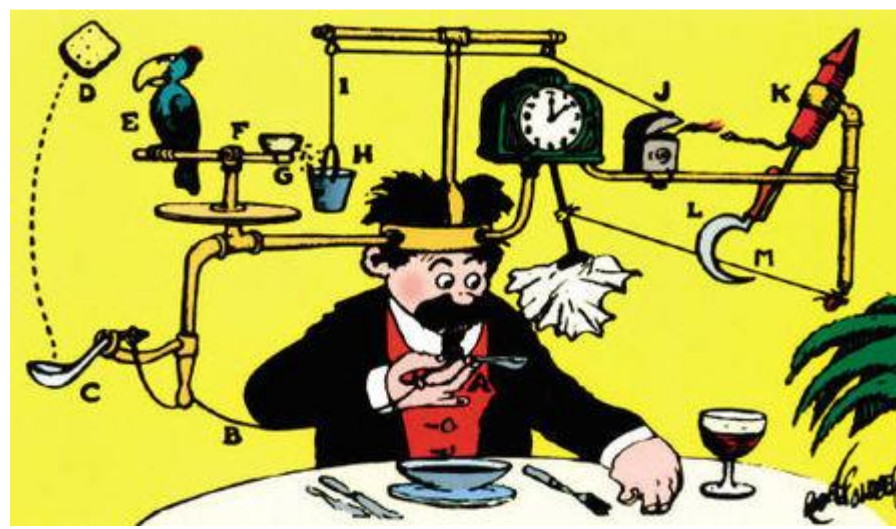
↗ instructables.com

Students Brainstorm how simple machines are used in Robots

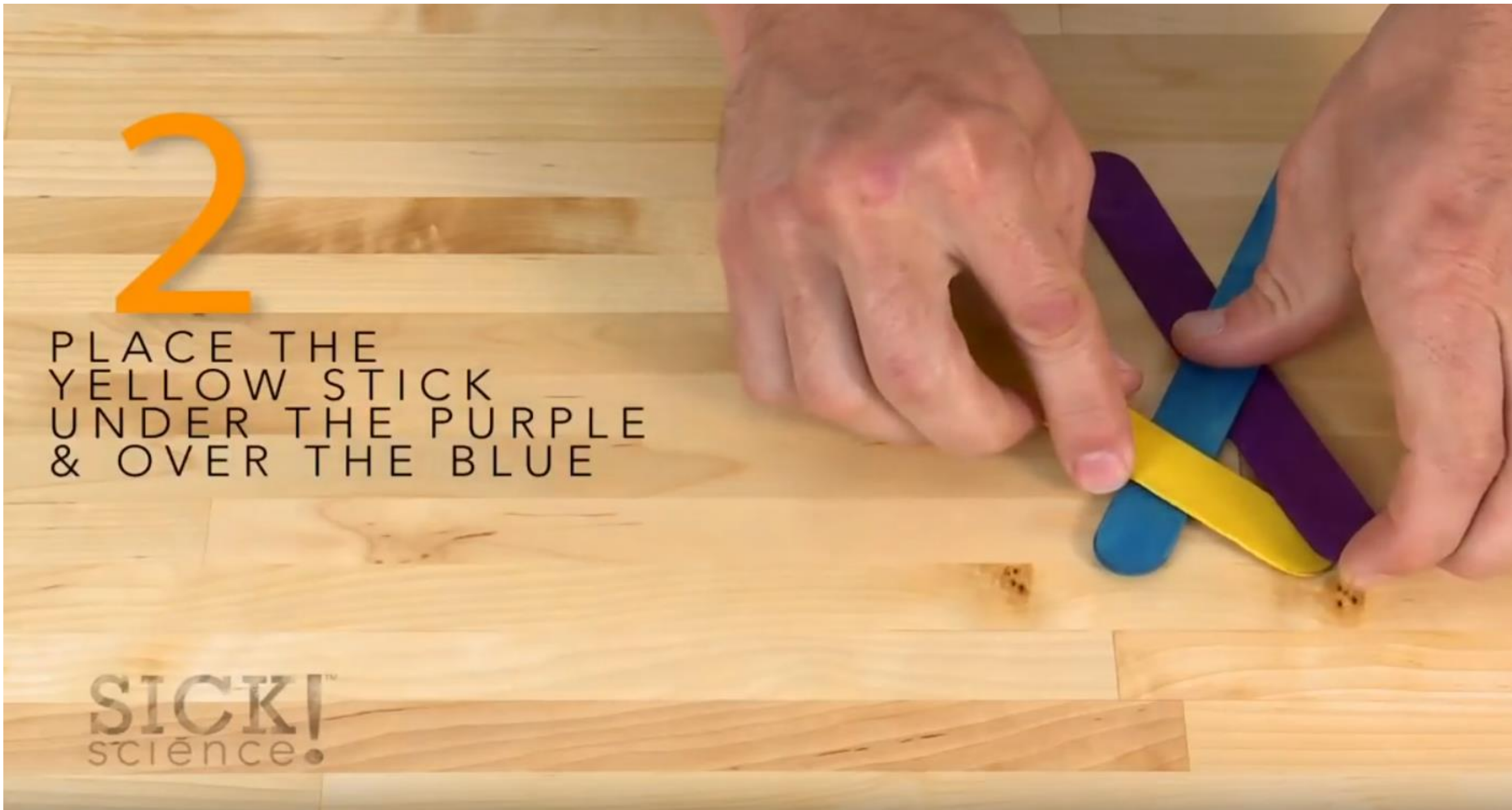
Chain Reaction: Rube Goldberg Project—Creativity in Motion

- Learn about who Rube Goldberg was
- Explore his cartoons and ideas



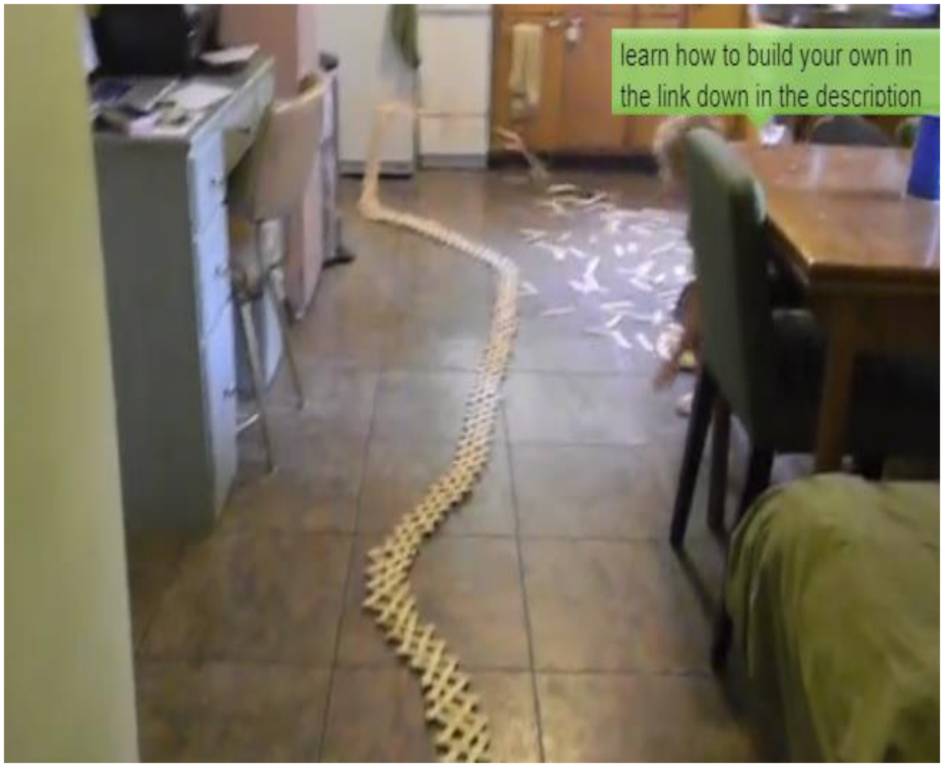


Chain Reaction: Rube Goldberg Project—Creativity in Motion

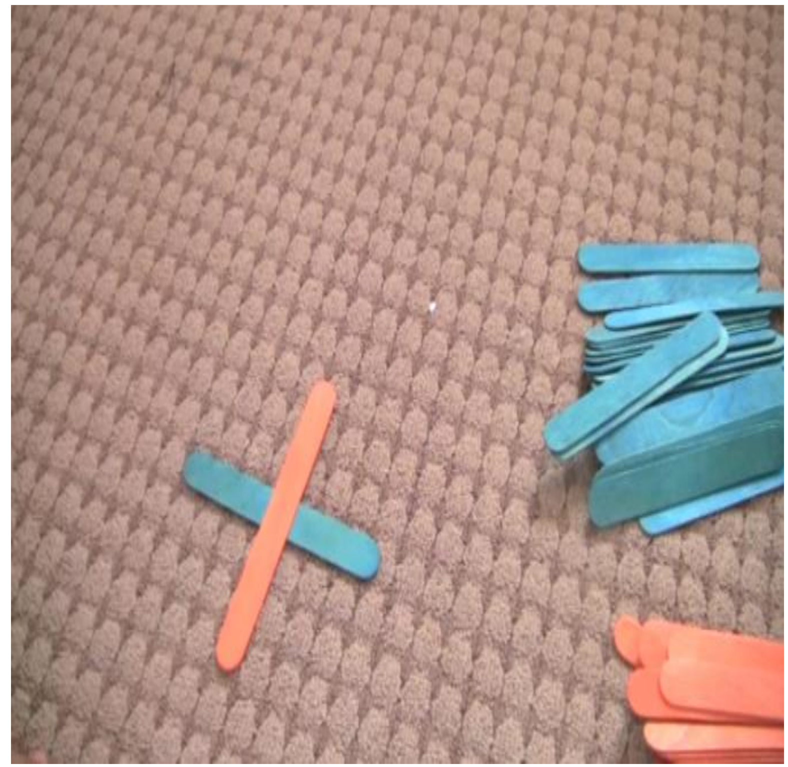


Chain Reaction: Helpful videos

Over 1000 used!

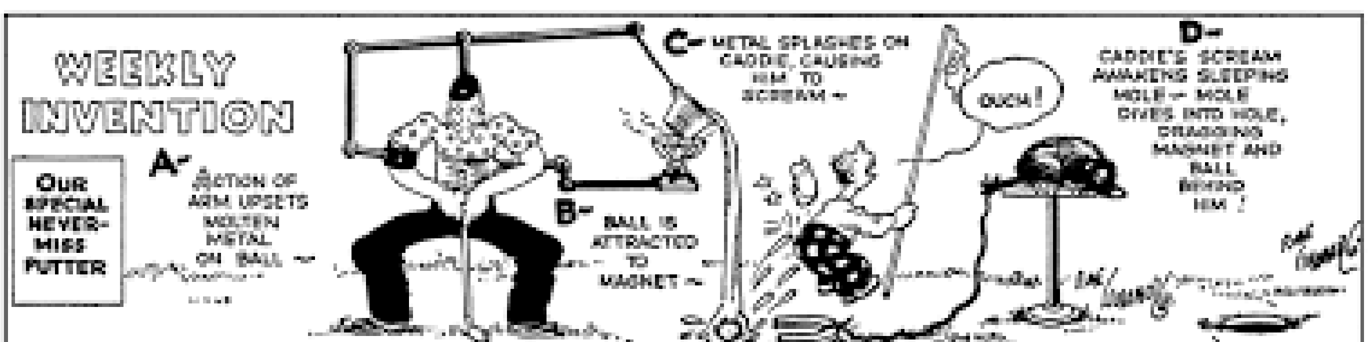


How to do the weave



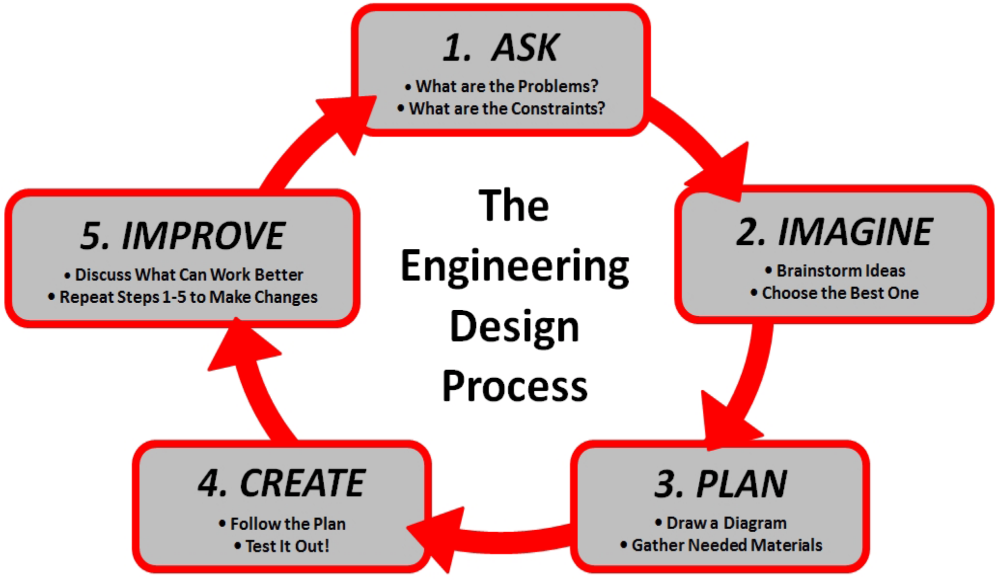
That's So Rube of You!

- Now that we know about simple machines, let's combine a few into something new, a complex machine (several simple machines working together)!
- Get inspiration from videos and Rube Goldberg's illustrations



That's So Rube of You!

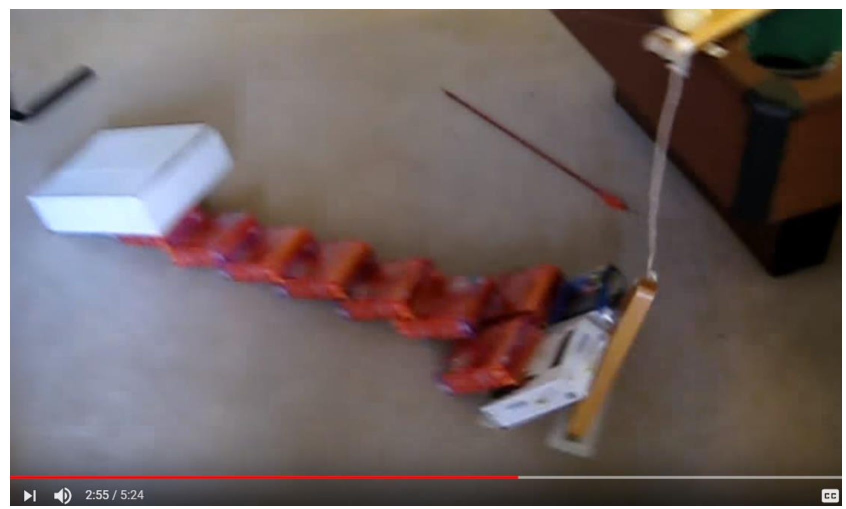
And then students work (individually or in teams) to follow the engineering design process create their own Rube Goldberg style machine to solve a specified problem.



That's So Rube of You!

And then students work (individually or in teams) to follow the engineering design process create their own Rube Goldberg style machine to solve a specified problem.

Students make mashed potatoes through a very complicated machine!



That's So Rube of You!

And then students work (individually or in teams) to follow the engineering design process create their own Rube Goldberg style machine to solve a specified problem.

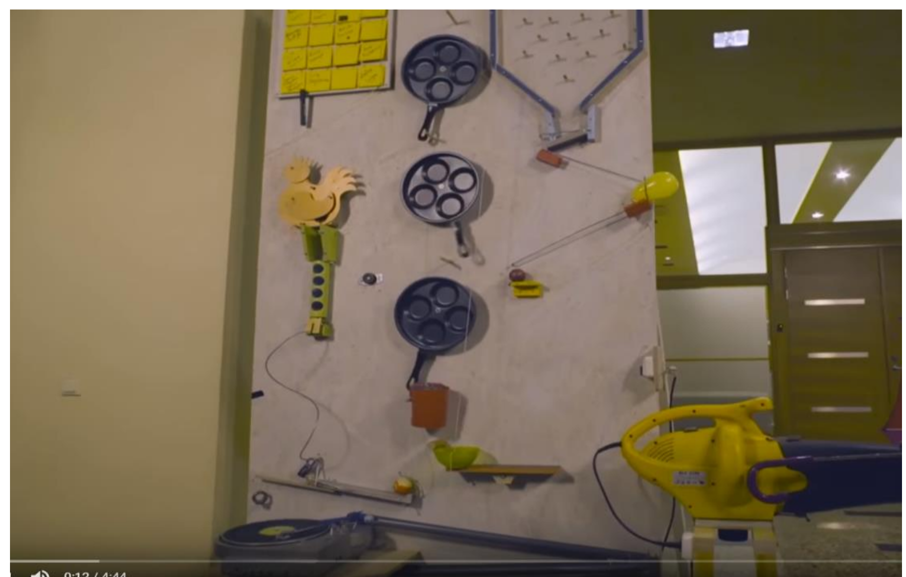
Students using simple machines for the rube Goldberg machine

ın with Rube Goldberg Machines 2018

That s So Rube of You!

And then students work (individually or in teams) to follow the engineering design process create their own Rube Goldberg style machine to solve a specified problem.

In this video the World's Greatest Rube Goldberg Machine lights up a Christmas tree



Robots

Small and simple things!

Tools of Mass construction!

Introduction

- Learn about simple tools that can be used to have robotic type capabilities
- Such as
- Walking
- Gripping
- Move

Introduction

Build the Hand

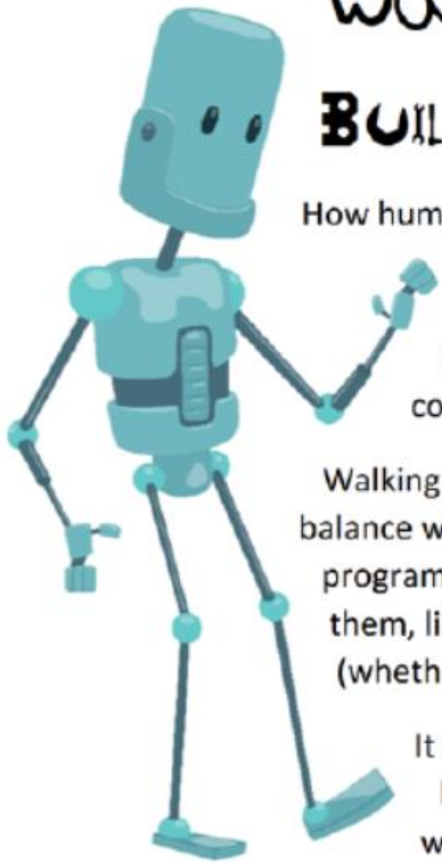
We're using this process to make an amorphous robot gripper. A balloon filled with coffee is attached to an air hose; when balloon is slightly pressurized the grounds are loose and easily rearranged. By pressing the balloon against an object, the grounds will move around it and take its shape. But when the air is sucked out of the balloon, the grounds are compressed and grip the object. The rubber surface of the balloon also helps to keep a hold on the object.

Materials:

Introduction

Universal Robot Gripper

Walk Like a human



Walk Like a Hu-uman?

Building a Leg to Stand On

How humans walk with their top-heavy, upright trunk atop two relatively spindly leg understood. While some scientists believe that the human nervous syst coordinates balance and locomotion, our research further suggests that t interaction of gravity, inertia and ground contact may also be very importa coordinating our locomotion.

Walking on two legs may be easy for some humans, but not for robots. To get a rob balance while standing, walking, running, or going up stairs takes a lot of complicate programming. That's why some robots are built to stay in place and have work bro them, like those in factories, and the most common way for robots to get around i (whether it's one, two, three, four, or even more), and others have treads, just lik

It doesn't have a brain or a heart, and its walk is a little like the scarecrow's, b headless, armless, trunkless two-legged robot, developed at Cornell Univer walk, wobble, hobble, limp, stride and stagger. But it can't stand still in any p without falling over.

Walk Like a human Cornell U

Andy Ruina Cornell Walker

20,182 views

27 0 SHARE

Walk Like a human another sample

assive Walking Robot Propelled By Its Own Weight #DigInfo

Walk Like a human another sample

Passive Dynamic Robotic Walker trial_2 - 7cm popsicle stick legs

2.836 views 24 0 SHARE

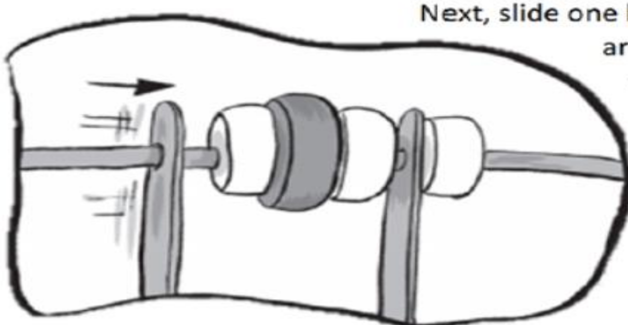
Walk Like a human   real life use

Paraplegics - Active walking

42,087 views

91   16   SHARE

Walk Like a Human Design

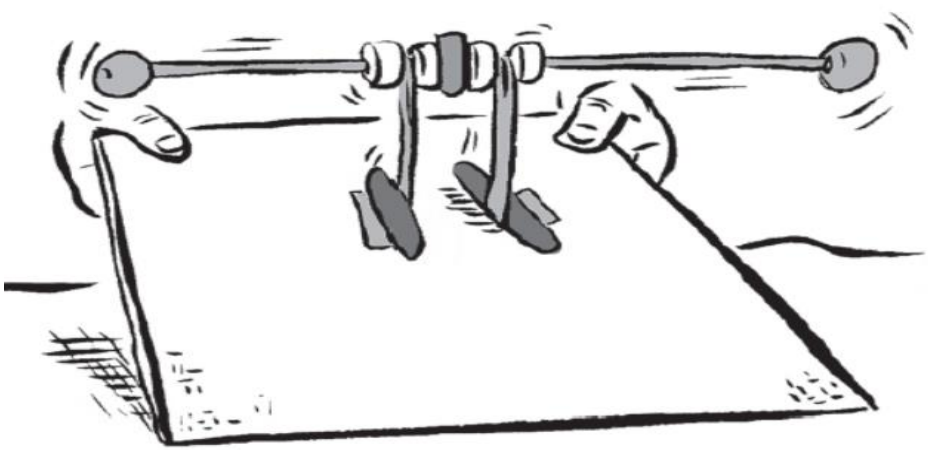


Next, slide one big bead or several small beads onto the skewer so that they are just touching the inside of the first leg. The bead(s) should cover about ½ inch of the skewer (1cm).

Now, slide on the second leg so that the front of the food is pointing in the same direction as the first foot. Slip another bead onto the the skewer to thold the legs in place, making sure there is just enough space for the legs to swing back and for the easily. If the outside beads are not staying in place, wrap a rubber band or a little piece of tape around the skewer to keep them from sliding around.

Stick a bead on each end of the skewer. It should be tight enough to stay on. If not, attach with tape. You can glue the beads on, but first make sure the legs are in the center of the skewer and your mini-walker is balanced. Avoid getting any glue on the legs.

Stand the walker on its feet. Glue a mini craft stick onto each foot, right next to the leg.



Make a test ramp with a long flat surface that you can tilt slightly, like a big book or a sheet of stiff cardboard or foam board. Foam core makes a nice walking surface.

For added traction put some strips of masking tape down the length of the ramp. To test each walker, set it at the top of the ramp and gently tap one end of the skewer. The walker should tip from side to side as it makes its way downhill.

Now, try other designs! Start with a robust, simple structure and expand! Can they lengthen the design? Add knees?

Soft Robots

Meet the Inflatable Robots of Pneubotics!

60,552 views

1.2K 13 SHARE

Soft Robots

Soft Robots

279,132 views

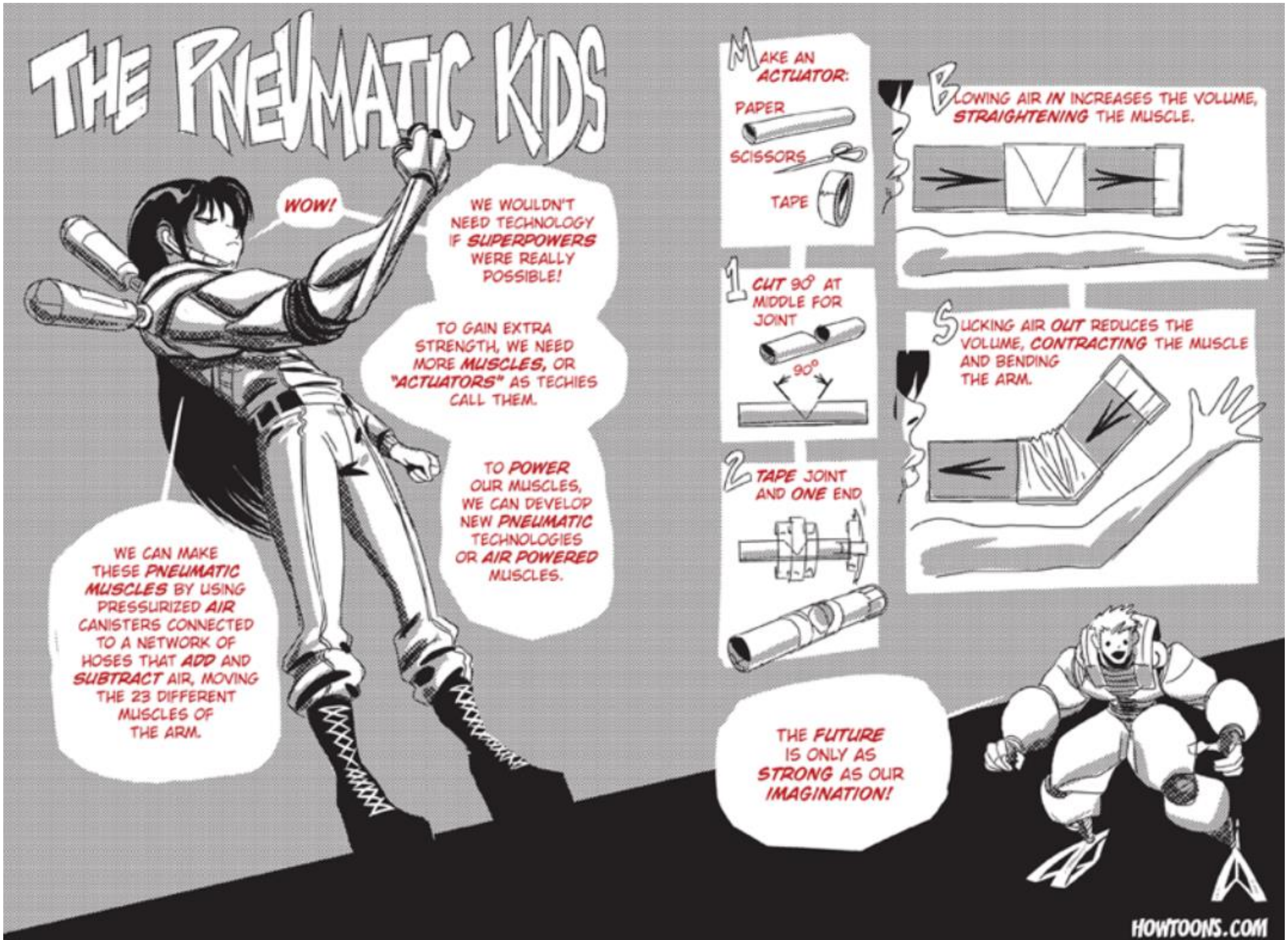
2.2K 72 SHARE

Soft Robots

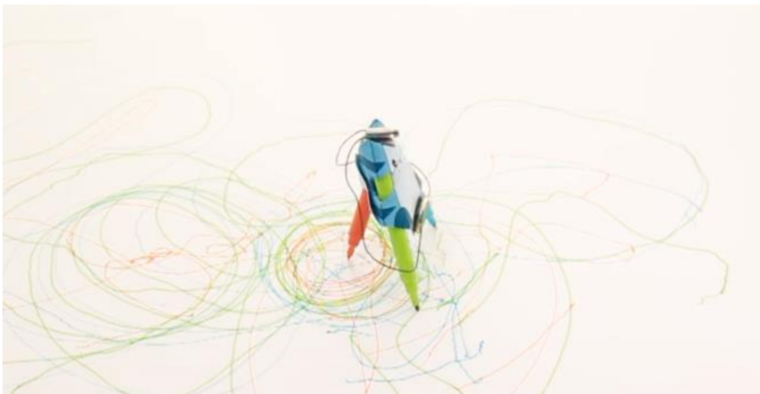
Stanford researchers develop vine-like, growing robot

648,077 views 5.8K 590 SHARE

ACTUATORS

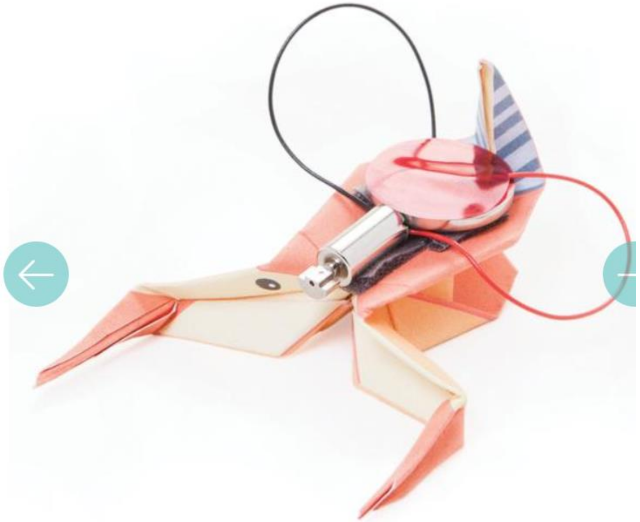

THE PNEUMATIC KIDS
WOW!
WE WOULDN'T NEED TECHNOLOGY IF SUPERPOWERS WERE REALLY POSSIBLE!
TO GAIN EXTRA STRENGTH, WE NEED MORE MUSCLES, OR "ACTUATORS" AS TECHIES CALL THEM.
TO POWER OUR MUSCLES, WE CAN DEVELOP NEW PNEUMATIC TECHNOLOGIES OR AIR POWERED MUSCLES.
WE CAN MAKE THESE PNEUMATIC MUSCLES BY USING PRESSURIZED AIR CANISTERS CONNECTED TO A NETWORK OF HOSES THAT ADD AND SUBTRACT AIR, MOVING THE 23 DIFFERENT MUSCLES OF THE ARM.
MAKE AN ACTUATOR:
PAPER
SCISSORS
TAPE
1 CUT 90° AT MIDDLE FOR JOINT
90°
2 TAPE JOINT AND ONE END
BLOWING AIR IN INCREASES THE VOLUME, STRAIGHTENING THE MUSCLE.
SUCKING AIR OUT REDUCES THE VOLUME, CONTRACTING THE MUSCLE AND BENDING THE ARM.
THE FUTURE IS ONLY AS STRONG AS OUR IMAGINATION!
HOWTOONS.COM

GAMIBOTS

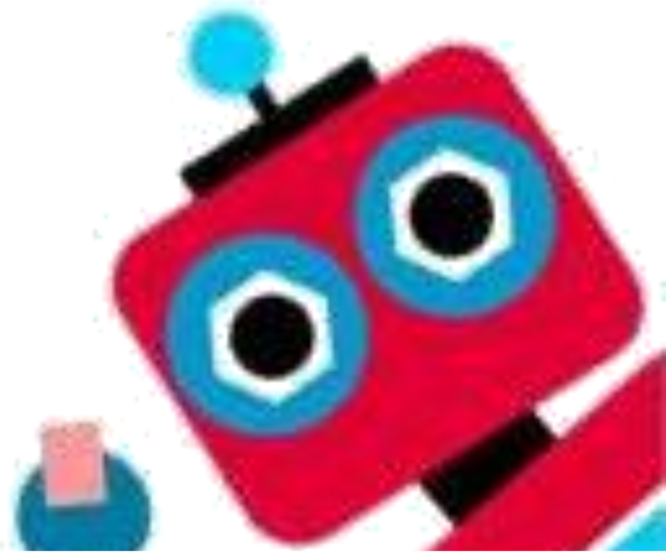



HOWTOONS
BUILT FOR BATTLE | GAMI-BOTS
INTERVIEW WITH
ROBOTICIST
KEVIN ALBERT
HT

GAMIBOTS



ROBOTS



PAGING DR. NAN O. BOT!

ROBOTS TO THE RESCUE?

Nanotechnology

Nanotechnology

YOUR A-MAZE-ING BODY!

In this activity we'll use play materials you already have like Lego bricks, Magna-Tiles®, and even old wrapping paper and paper towel tubes or straws to create mazes and obstacles for the Hexbug Nano.

This activity is an absolute hit with kids and promotes all kinds of learning: planning, problem solving, engineering and building, creativity and more!

Nanotechnology

SAMPLE GOAL LEVELS:

Level One: Can students build a maze that their hexbug can successfully travel from one end to the other in order to 'apply its medicine' to the target?

Level Two: Can students build a/expand on/modify their maze and make sure that that their hexbug can successfully travel from one end to the other in order to successfully 'apply its medicine' without getting stuck a single time? If it gets stuck 'tissue' could be damaged by the medicine being delivered to the wrong spot!

Level Three: Can students build a maze that demonstrates a special skill that their hexbug nanobot has?

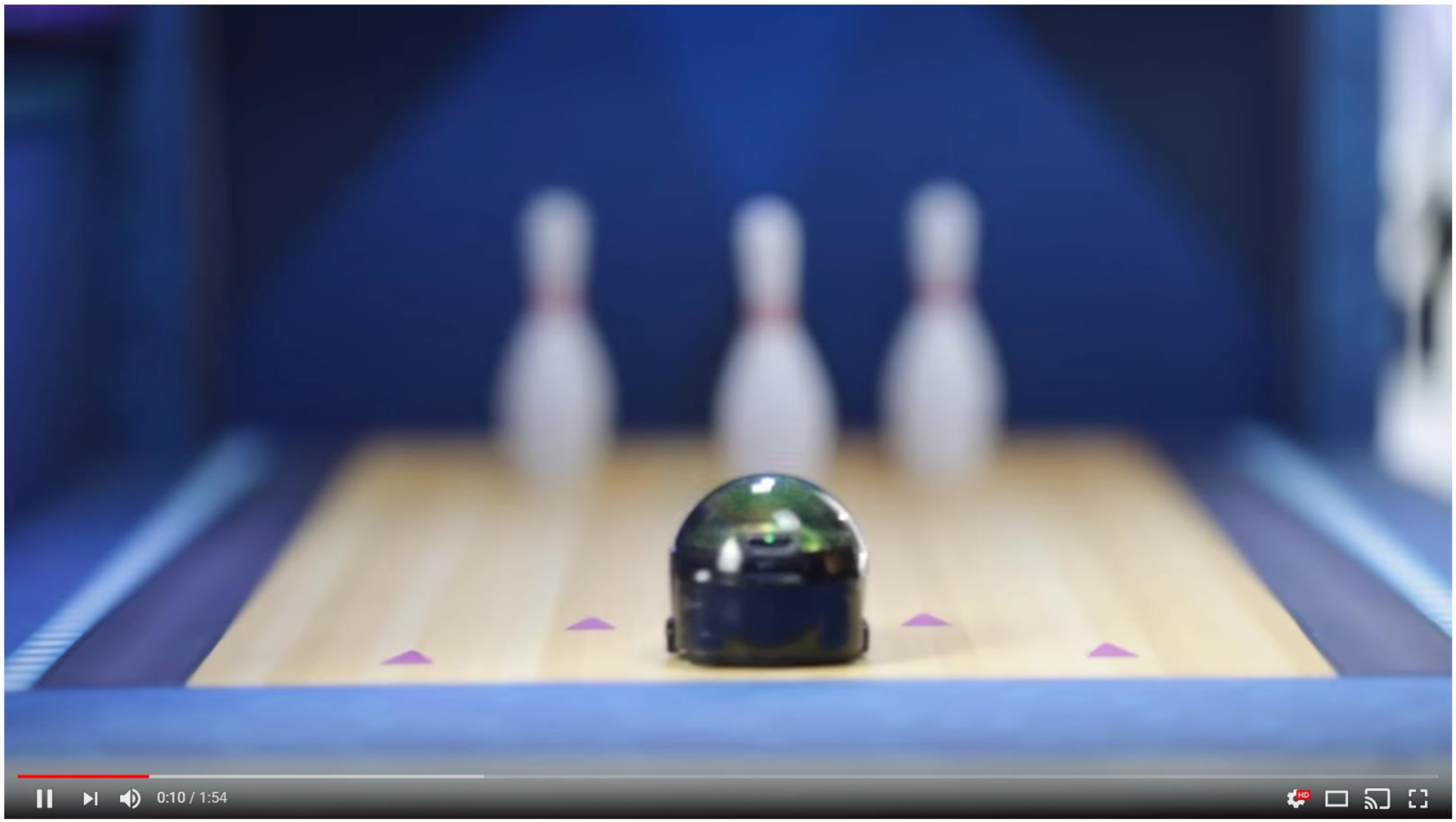
OZOBOT

CURING CARDIO KID WITH DR. OZOBOT!

COLOR CODED CURES!

Ozobot reads lines and color combinations on a page, following them almost like a road or a path. Certain color combinations make the Ozobot do tricks, speed up, slow down, among other things. You can see all of the different color codes the Ozobot knows HERE. It also works as a great reference guide.

OZOBOT

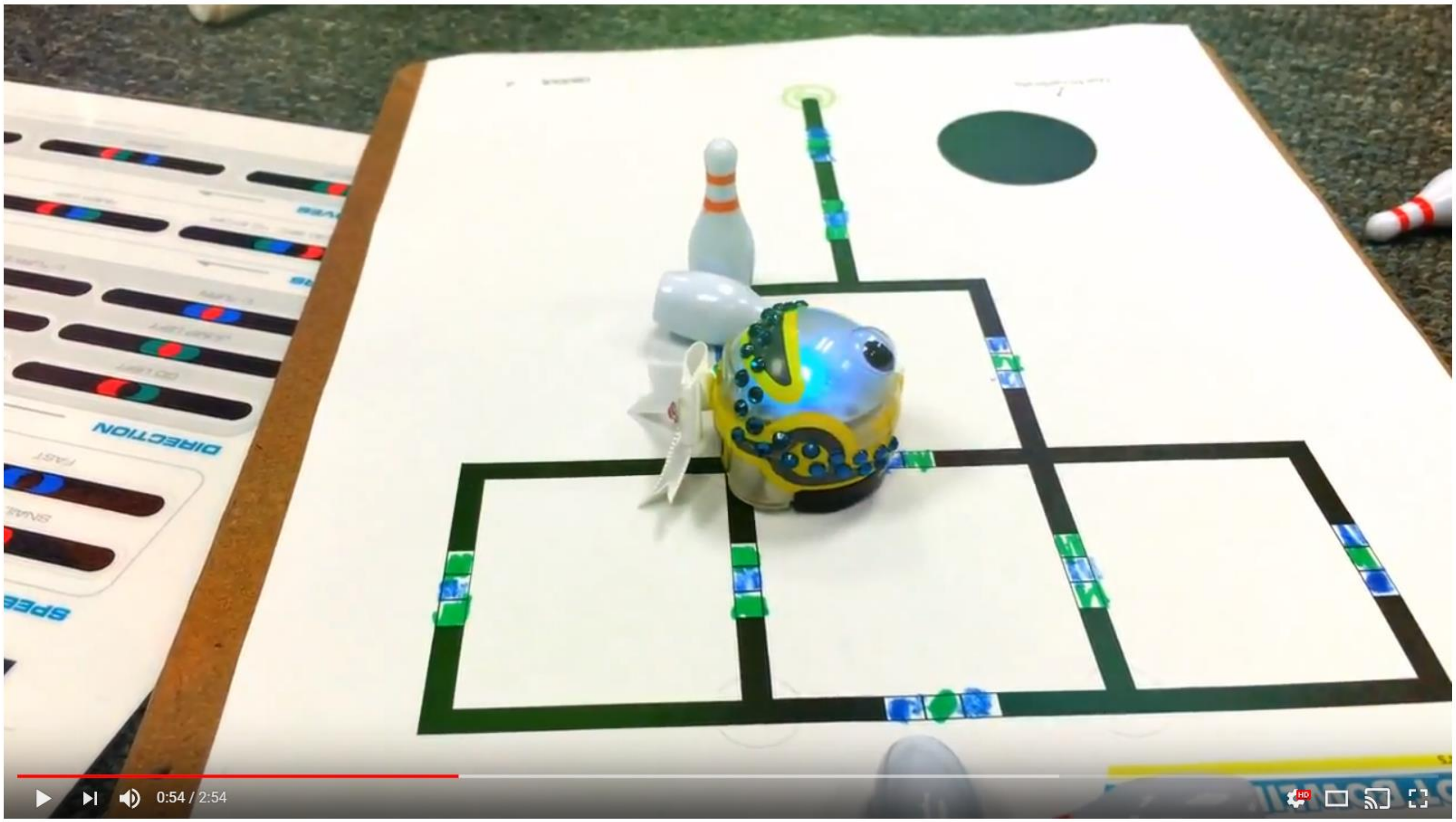


OZOBOT BIT ADVENTURES

199,236 views

236 11 SHARE

OZOBOT DROPPING THE PINS



Ozobot Bowling Challenge

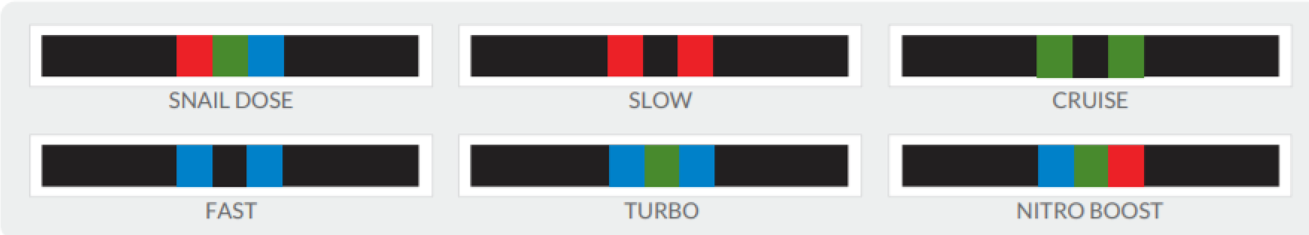
22,344 views

28 8 SHARE

COLOR CODES

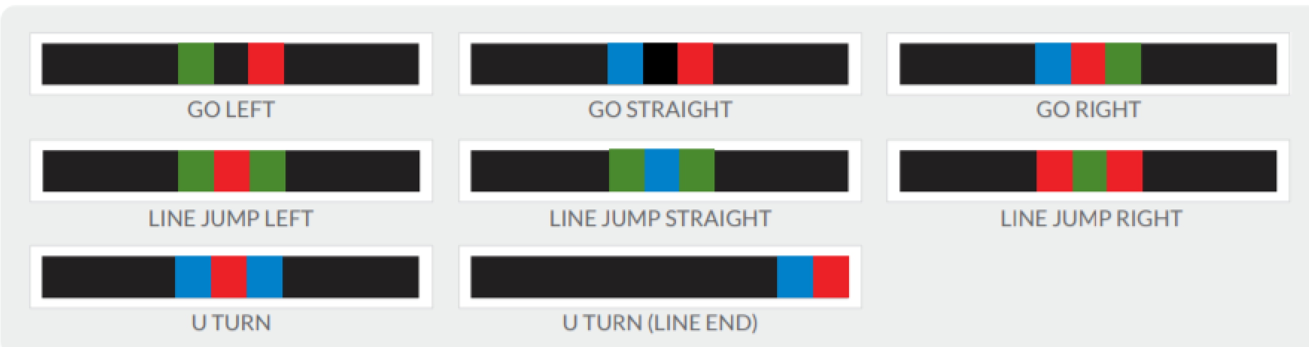
bit evo by ozobot

SPEED



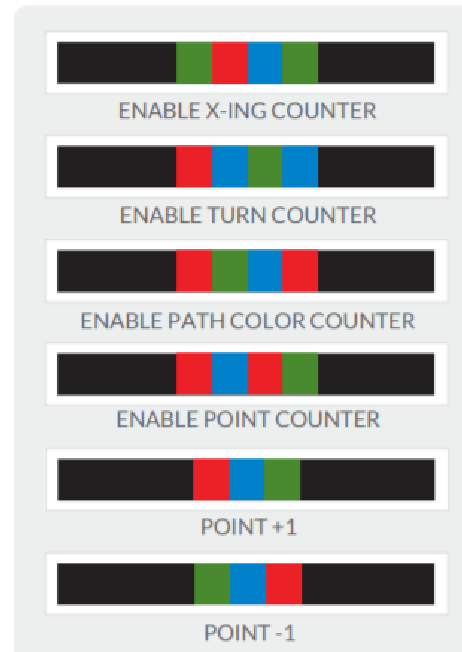
WIN/EXITS

DIRECTION

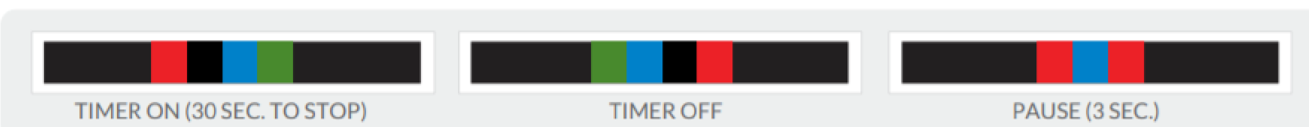


COUNTERS

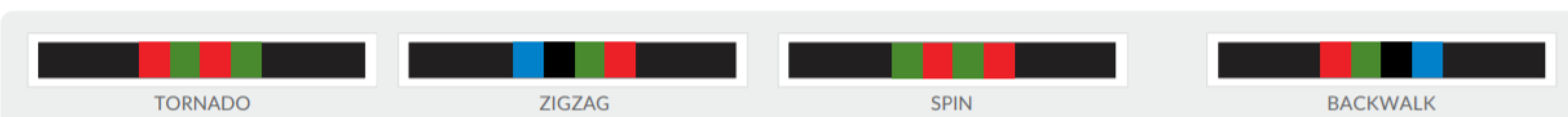
FIVE DOWN TO STOP



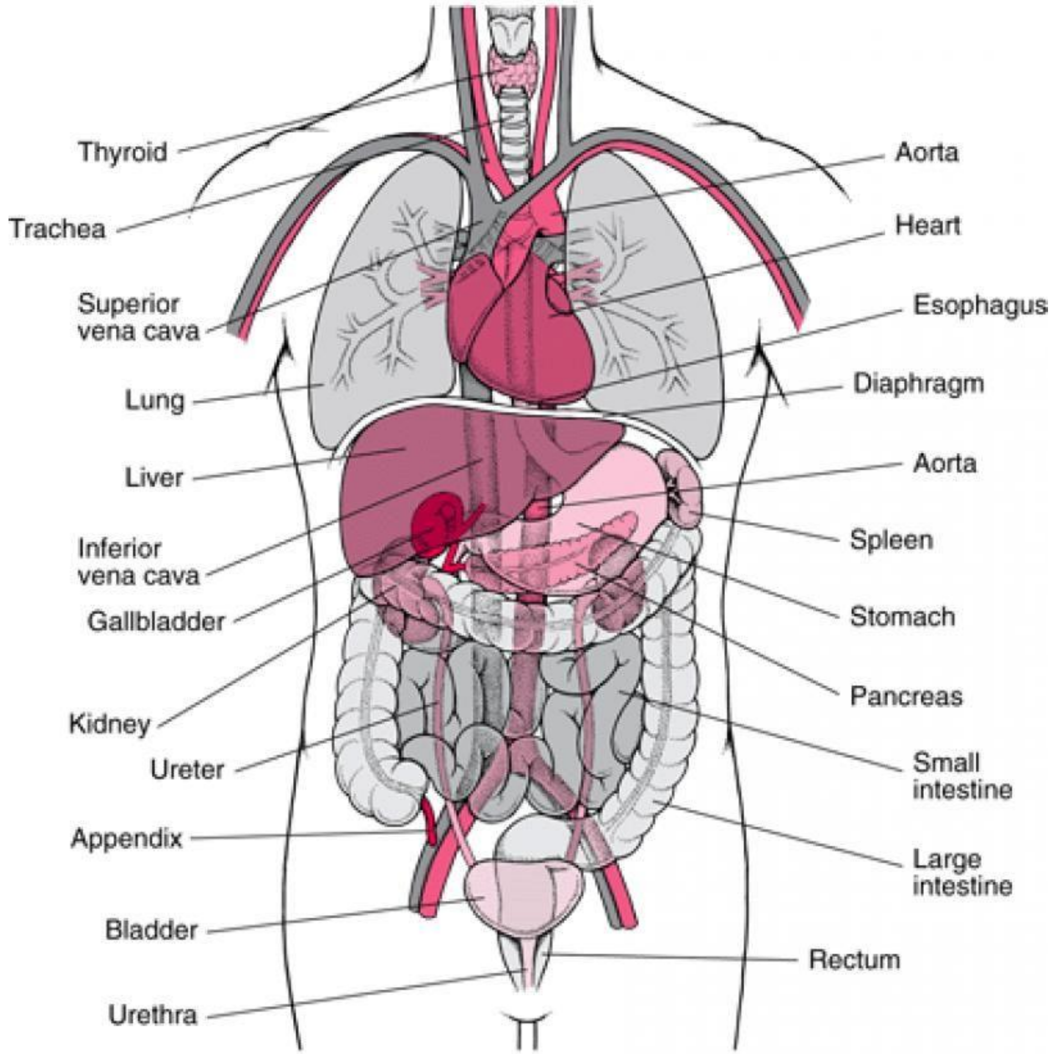
TIMERS



COOL MOVES



Cardio Kid



Thyroid
Trachea
Superior vena cava
Lung
Liver
Inferior vena cava
Gallbladder
Kidney
Ureter
Appendix
Bladder
Urethra
Aorta
Heart
Esophagus
Diaphragm
Aorta
Spleen
Stomach
Pancreas
Small intestine
Large intestine
Rectum

OZOBOT

LEVEL ONE: CODING COLORFUL CURES

1. The Ozobot needs to start at 'Injection Site' and go to a specified organ or 'tumor' on your Cardio Kid.
2. There should be at least three working codes
3. There should be at least one cool move among those codes.

LEVEL TWO: HUMAN TRIALS

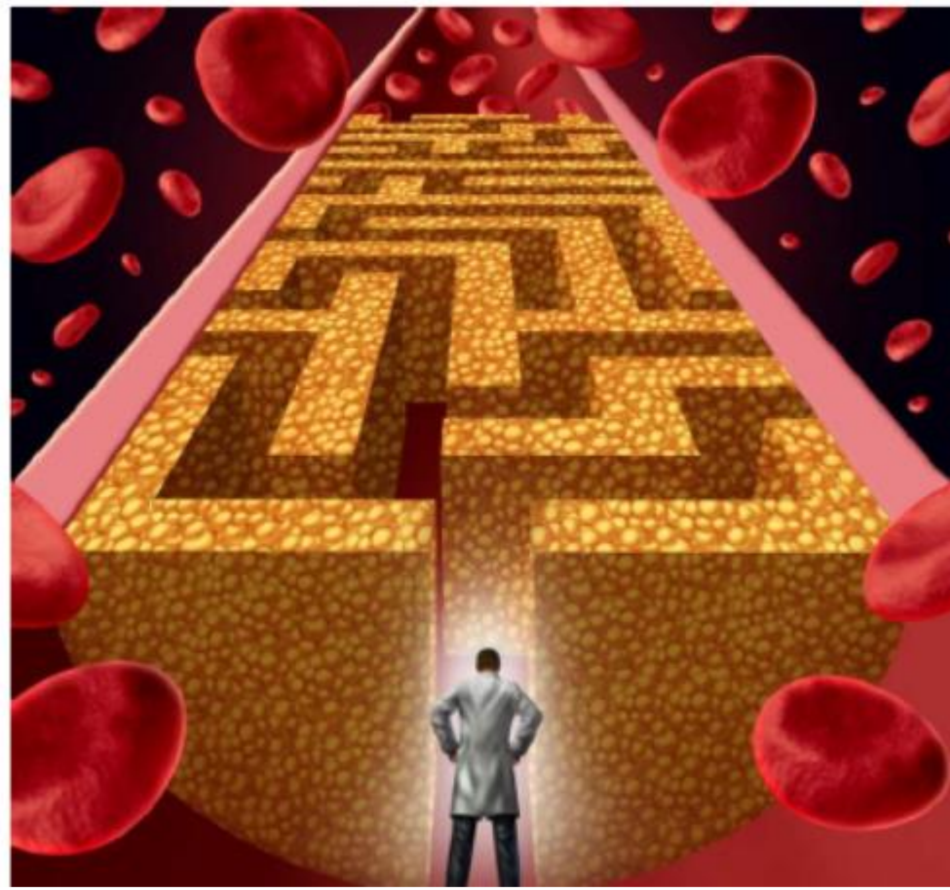
At this stage Lab Assistants are ready to incorporate more engineering design thinking. We will still keep all the challenges from the first level, but you'll add in more challenges:

4. The bot must spin to deliver its medicine once it reaches its destination.
5. Build an arterial bypass a.k.a. a bridge or ramp the Ozobot can travel over on your Cardio Kid's circulatory system, preferably near the heart. (Note: the Ozobot is not very powerful so the incline must be very smooth and low. Watch to see if students deduce that if Ozobot has enough momentum, it can navigate the bridge better. They might add a "turbo boost" code just before the ramp.)
6. Create a tunnel tall and wide enough for the Ozobot to pass through somewhere on the body.

OZOBOT

LEVEL THREE: GOING WITH THE FLOW

7. Challenge students to create a route that has the bot follow the circulatory system flow in the correct order and direction from the injection site, to the heart, through the body, and/or around the circulatory system.
8. Have the bot 'apply medicine' at multiple spots in the body along the route.



Tip: Demonstrate that to edit codes students can use pieces of white paper to stick over any errors or areas they want to debug or improve. If you use sentence strips in writing, you could compare these to them and perhaps call them "debugging strips" or "gauze strips".

ROBOTS

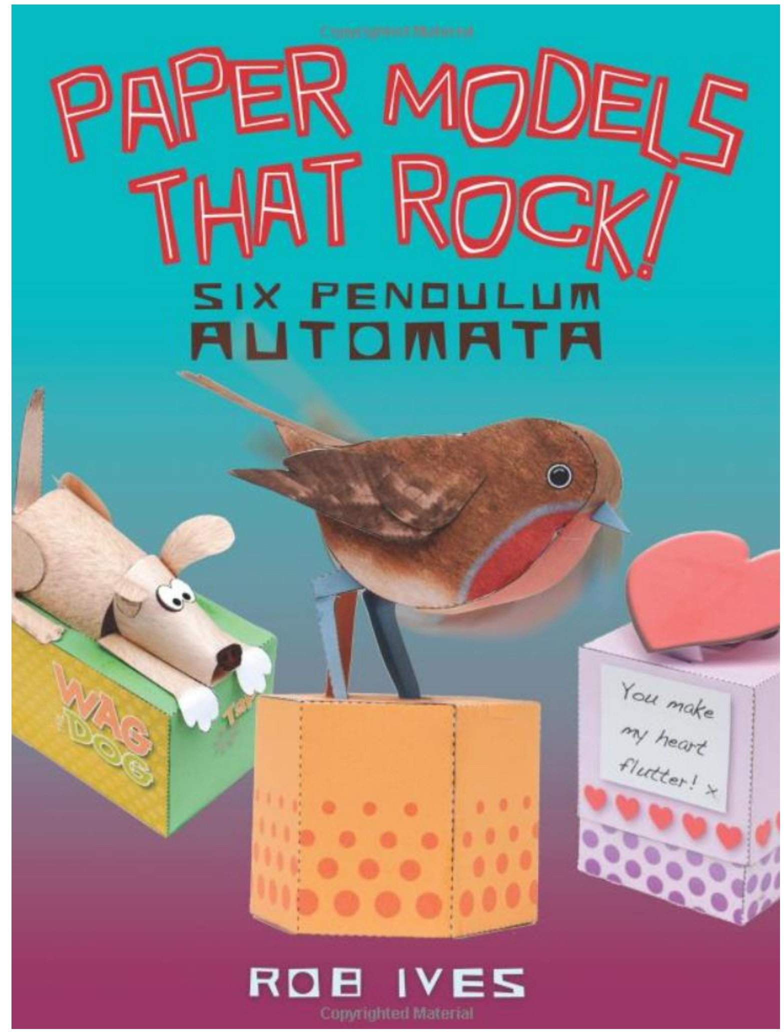
The Illusion of Life

Automatons

The oldest working automaton known today is the rooster atop the cathedral clock tower in Strasbourg, France. Built in 1352, the rooster flaps its wings, thrusts out its tongue and crows. Like the Strasbourg rooster, glockenspiels, German for “players of the bells”, are run by the clockwork and move atop clock towers, chiming the hours. Glockenspiels can be quite elaborate and are often life-sized figures moving to the clock chimes in a choreographed dance.

AUTOMATONS

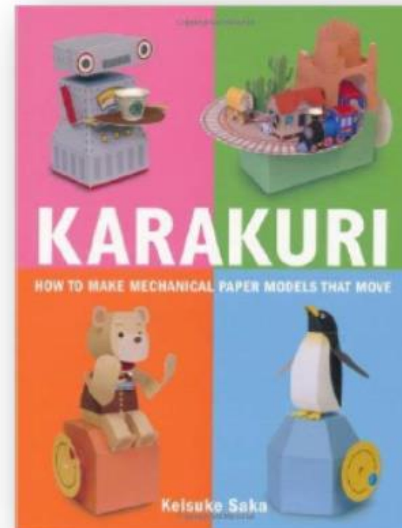
Dog´s Dinner, paper model



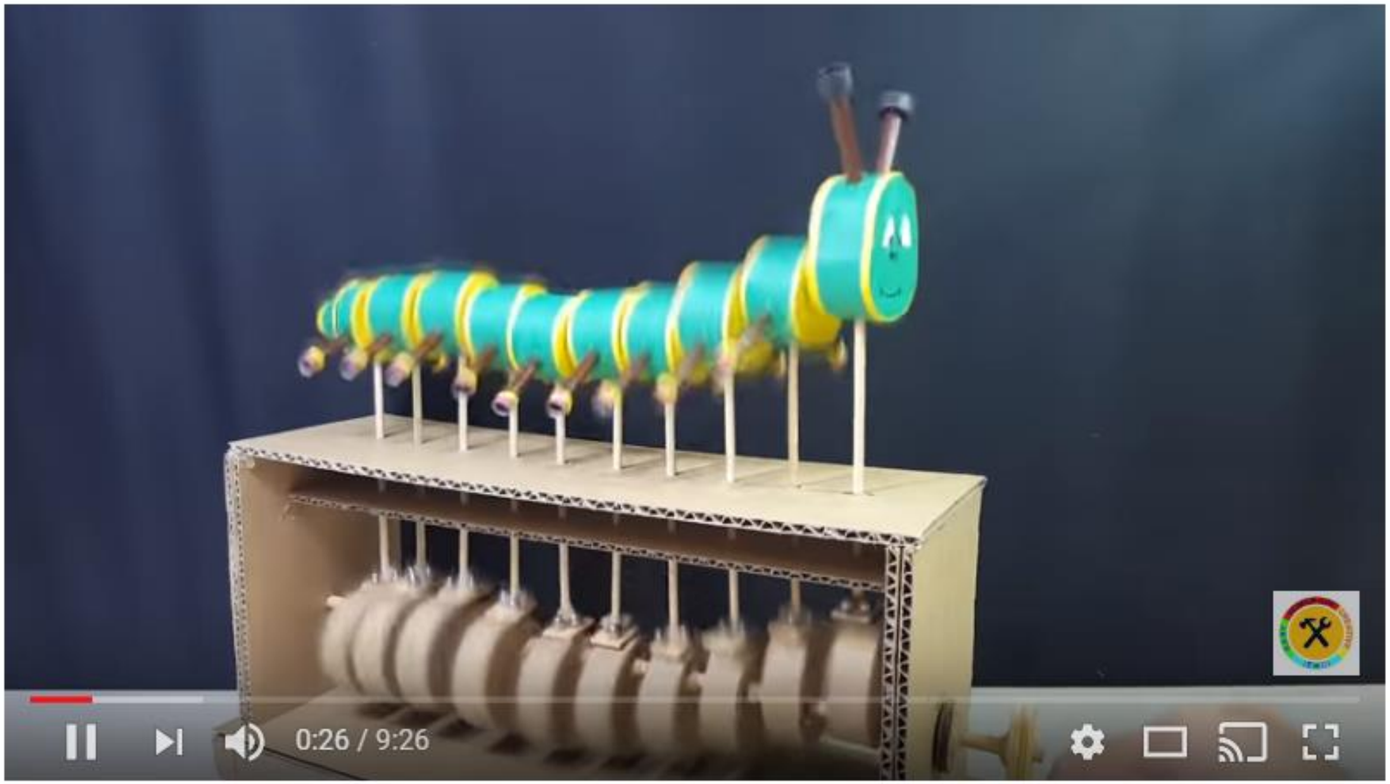
Automatons

Resources and Materials:

- RobIves.com
- Printer Paper
- White Cardstock
- Books such as *Karakuri*
- Scissors
- Tape
- Craft/Tacky Glue



AUTOMATONS



Wow! Amazing DIY Cardboard Caterpillar Automata Toy

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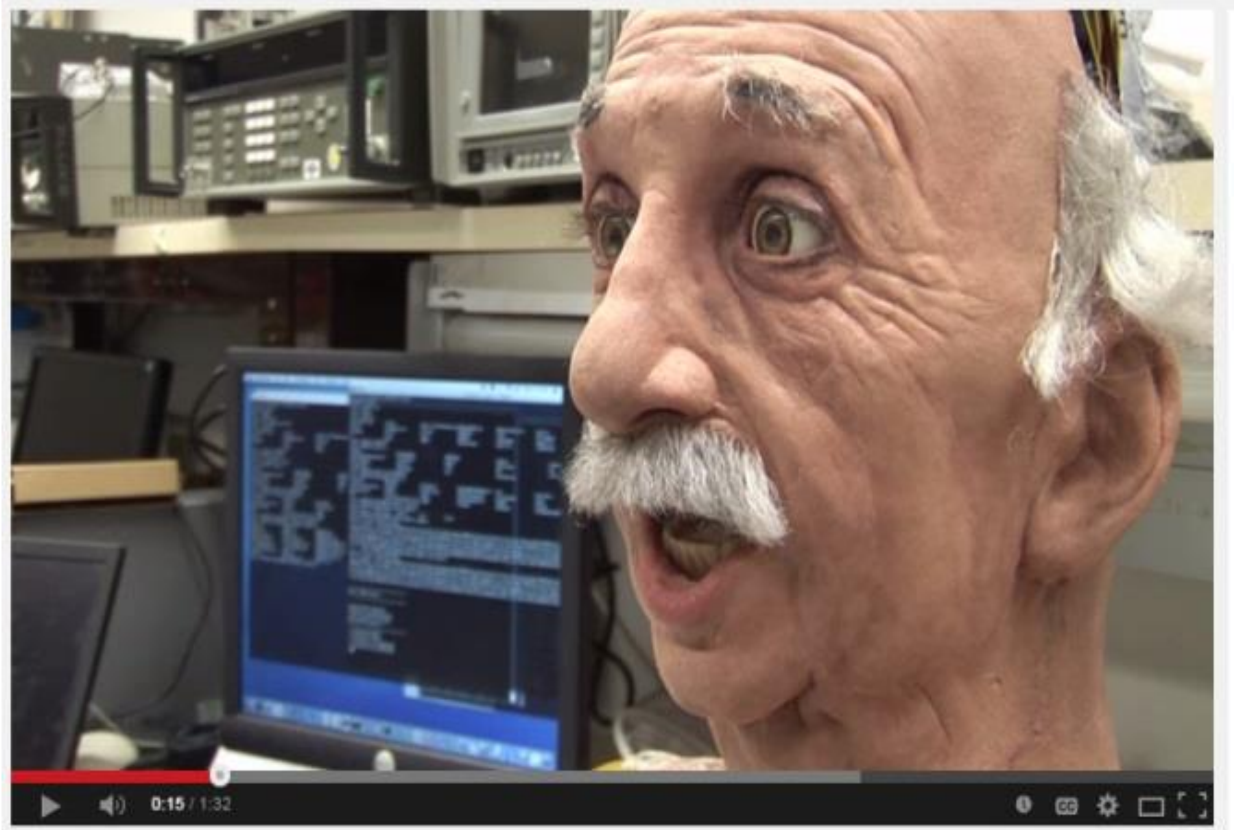
Robot Skin

While robots have moved up, they've run into a valley, where they aren't quite real enough (you don't want to see that in an alley!) So it's time to figure out just what's up with robot skin and Albert Einstein is always a great place to begin.



Einstein Robot - UCSD Machine Perception Laboratory

Robot Skin

For example, which of the images below seems off, or "uncanny"? The animated and slightly cartoonish Anna from Frozen, the realistic girl from Polar Express, or the hyper-realistic painting (yes, painting!) of Morgan Freeman?

Robot Skin

Have students experiment with the ingredients to change the thickness, stickiness, and stretchiness. They should make notes as they try different formulas so the group can determine which one they like best.

IMPORTANT: Be careful not to get their concoctions ground into furniture or clothes and don't pour it down the drain, or it will clog up the plumbing.

Silver Skin Slime

Tips: *Always shake your* liquid starch *container a bit to make sure that it is well-mixed.*

Materials (per batch):

- 5 oz. bottle Clear Elmer's glue (Colorations clear glue also works well)
- Silver metallic liquid watercolor, ex. Colorations brand or Sax, etc.
- Sta-Flo liquid starch
- Option: Silver glitter

Directions

1. Pour the bottle of clear glue into a bowl.

2. Add 2 tablespoons of silver liquid watercolor to the glue. Mix well.
3. (Optional) For extra sparkle, carefully add several tablespoons of silver glitter and mix well.
4. Add 4 tablespoons of liquid starch. Mix well.
5. Add another 2 tablespoons of liquid starch. Mix well.
6. Add 2 more tablespoons of liquid starch and knead (just like you would with bread dough). At this point, you should have added a total of 8 tablespoons of liquid starch to the mixture.[1]

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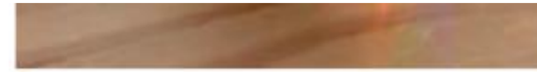
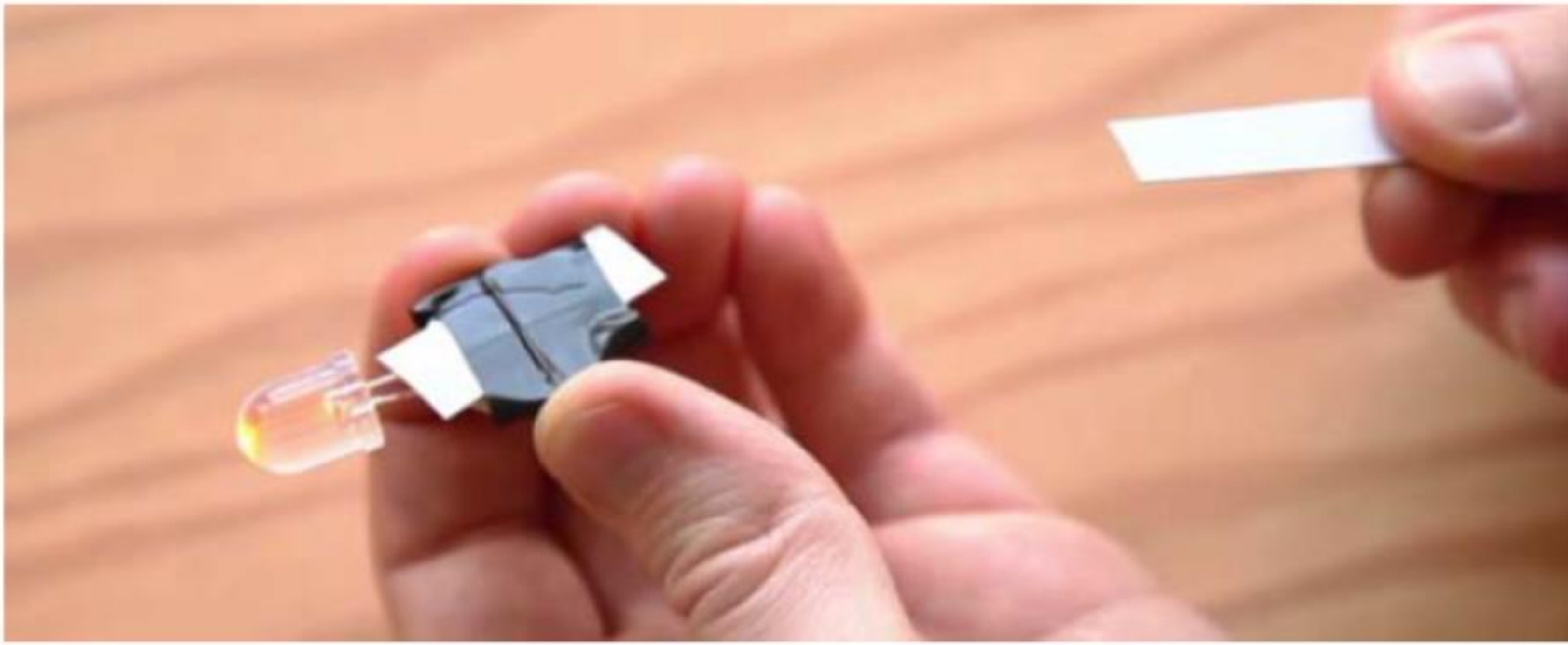
LED THROWIES

LED throwies are cheery glow-dots (a.k.a. magnetic, closed
circuits that stay lit for weeks!) students can make in seconds
from simple components and they stick to any ferro-magnetic surface.



ON OFF SWITCH



Once we make a basic throwie it stays lit, until it uses up the whole battery. To modify it so that we can turn it on and off whenever we want, we need a circuit breaker.

DrTechniko

www.facebook.com/drtechniko

ROBOT LANGUAGE DICTIONARY

	LEFT	RIGHT
LEG FORWARD		
LEG BACKWARD		
BODY ROTATE		

Robot, Or Not?

Procedure:

1. Set up an obstacle course
2. Divide students into pairs
3. Introduce the game:

So now that we've learned a bit how robots work, you will get to train your own robot! But, wait. Do you guys see any robots around here? Well, I do. Your partner! Let's turn your partner into your own personal robot. Imagine you are on the planet Mars and you cannot go out of your station. There is a very precious element called B-Rainium that you want to retrieve.

Your mission is to write a program that will send your robot around these obstacles retrieve the ball of B-Rainium and bring it back to the station.

But your robot doesn't understand a human language. It only understands the Robot Language. Here is the Robot Language Dictionary. Let's all practice the moves and then you can use these moves to tell your robot what to do!

That about Sums it up