00 : 58

Do Now:

Turn to the person next to you and share:

What projects, if any, have you done for your electricity & magnetism unit?

What was the outcome? (or what would you want the outcome to be?)

T4T Physics

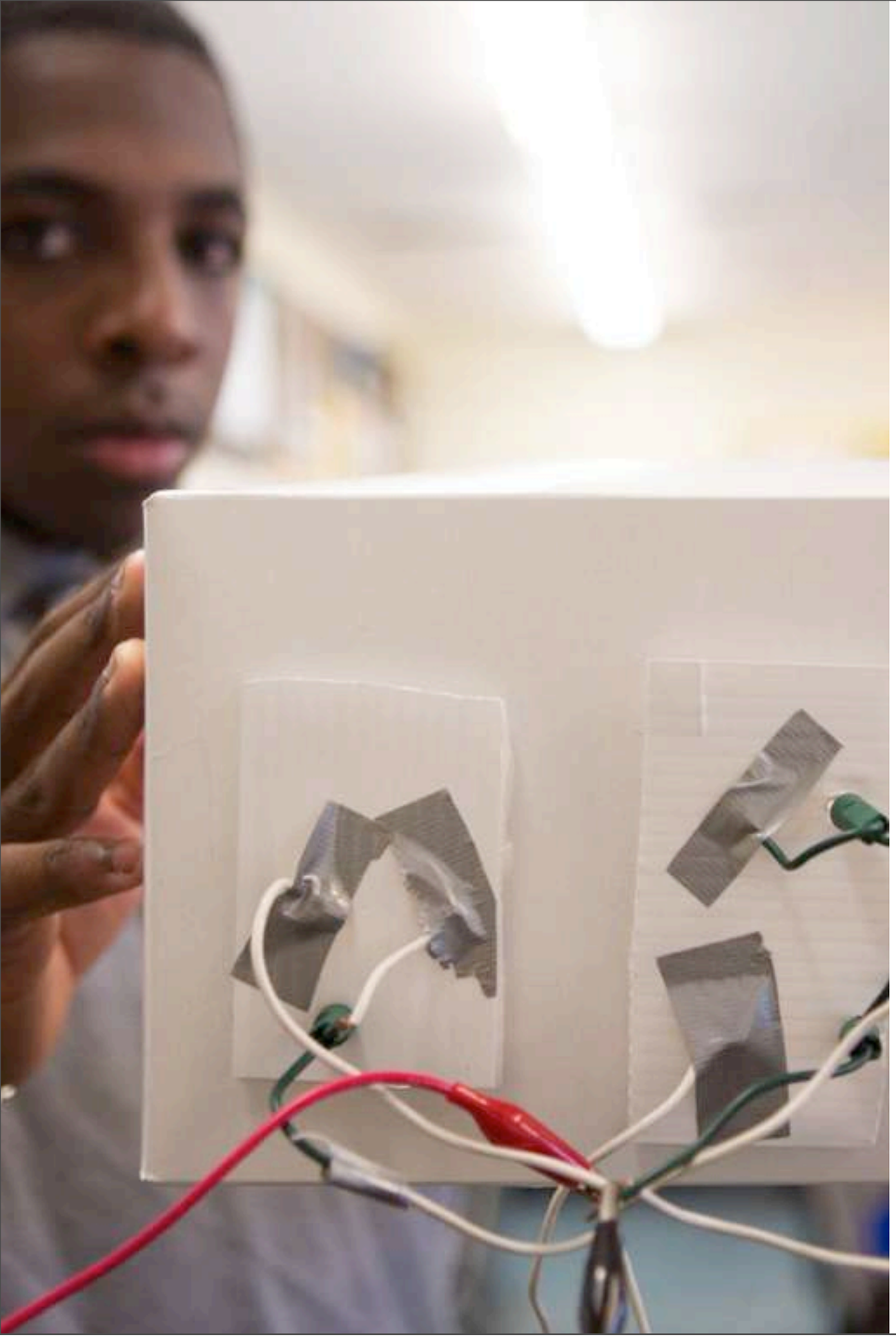
4/27/13

Light-House Project

Headphone Project

Tony Wagner, Harvard Education Specialist

“Today, because knowledge is available on every Internet-connected device, what you **know matters far less** than what you can **do** with what you know.



Tony Wagner, Harvard Education Specialist

The capacity to **innovate** — the ability to solve problems creatively or bring new possibilities to life — and skills like **critical thinking**, **communication** and **collaboration** are far more important than academic knowledge.

Tony Wagner, Harvard Education Specialist

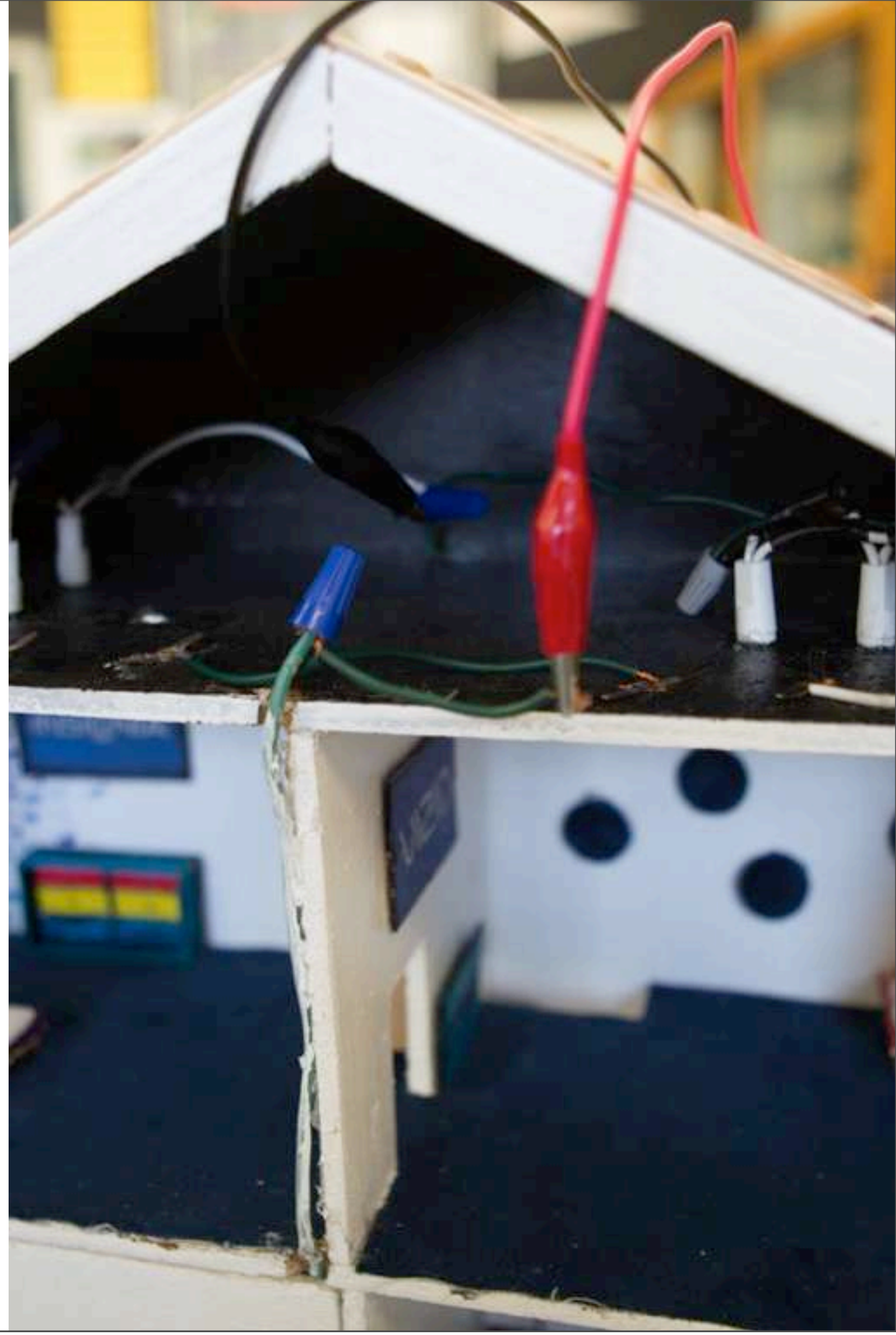
We need to focus more on teaching the skill and will to learn and to make a difference and bring the three most powerful ingredients of intrinsic motivation into the classroom: **play**, **passion** and **purpose**.”

	Agenda
9:10-9:30	**Light-House Project** Description & Handout
9:30-11:30	**Headphone Project** Build

	Wire Diagram	Switch & Circuit Prototypes	The Light-House Build & Blueprint
Student Experience	Students use circuit schematics to create a wire diagram for their house. Students must get diagram approved by “the city” (teacher) in order to get project materials.	Students receive essential project materials (listed below) and must build prototypes of their series and parallel lights circuits, including switches. They determine a way to power both prototyped circuits from the same voltage source.	Students design and build a functional model of their "dream house." Minimum requirements: 2 lights in series, 3 wired in parallel, and 1 stand-alone light, powered from a 9V battery with individual off and on switches. Students create design poster showing wire diagram and blue building blueprint.
Material	--	For each student: 6 Christmas lights + wire 3 paper clips 6 brads Section of cardboard or foam core	The cart
Big Idea	Diagrams allow engineers, architects, and contractors to analyze the performance of a circuit before building it.	The three “branches” of lights are in parallel with each other so they may operate independently.	Engineering requires planning, prototyping, and analysis. Blueprints are accurately-scaled diagrams of structures or machines.
Time	One 55-min period	One 55-min period	Two 55-min periods, plus time (~1 week) for students to work on projects at home.

Objectives

- Teachers will feel prepared to plan a Light-House culminating project in a future electricity unit



Work Flow

1. Make circuit diagram

2. Submit diagram

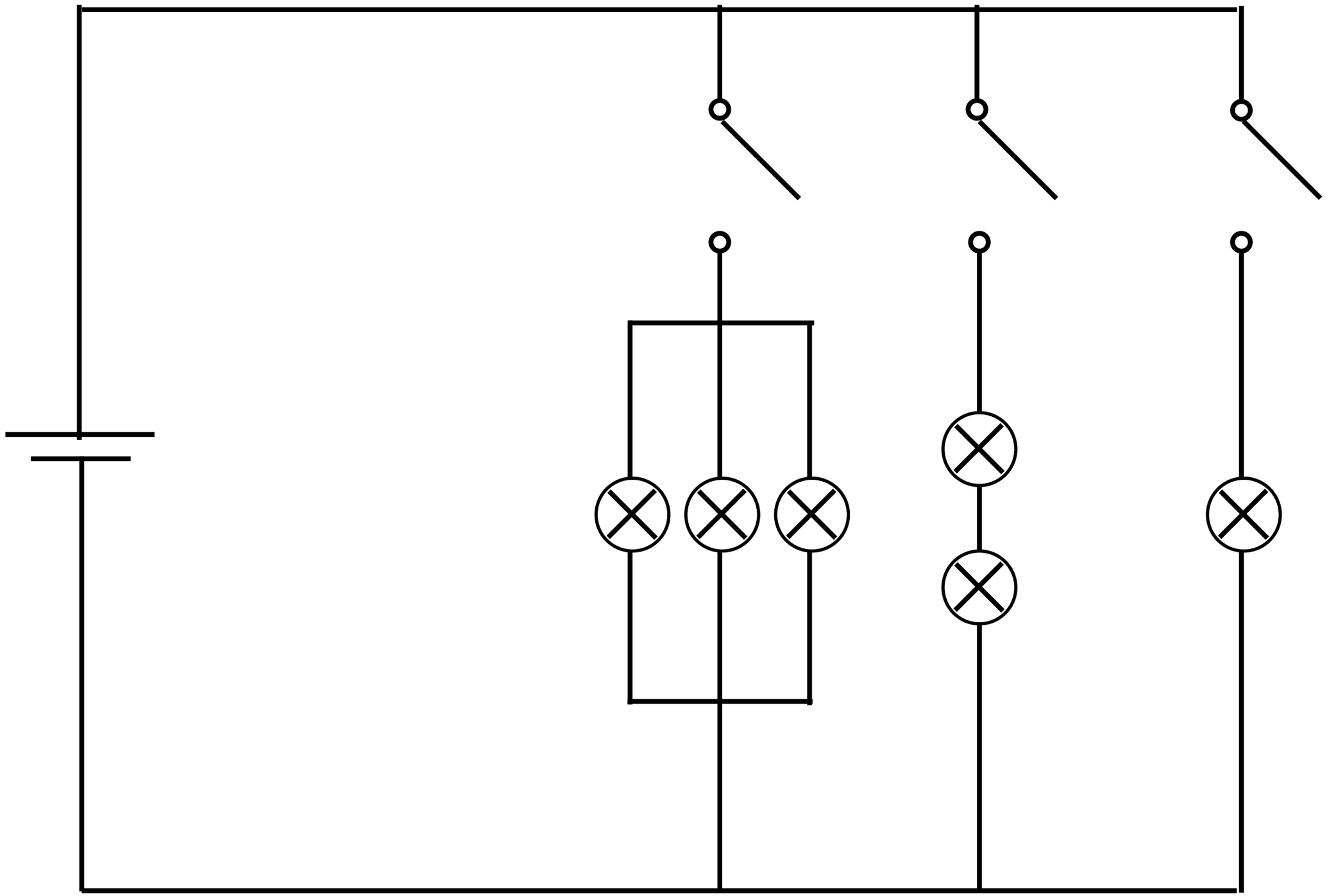
Diagram approved / Diagram denied

3. Get materials

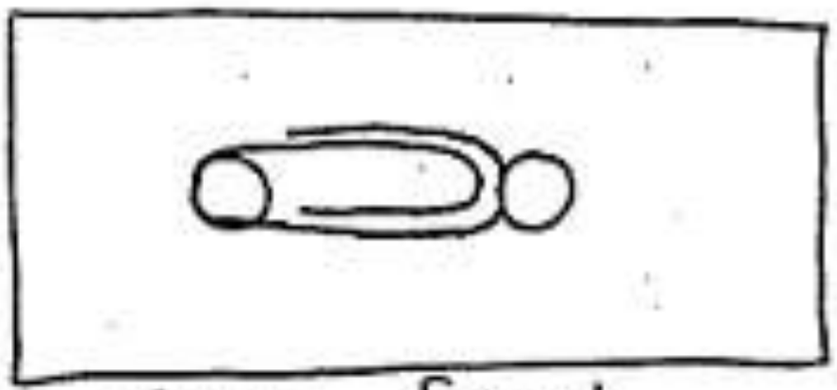
- 6 lights
- 3 paper clips
- 6 brads
- foam/cardboard

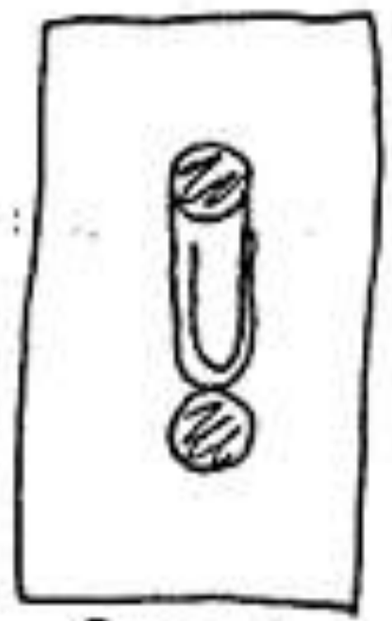
4. Start prototyping circuits

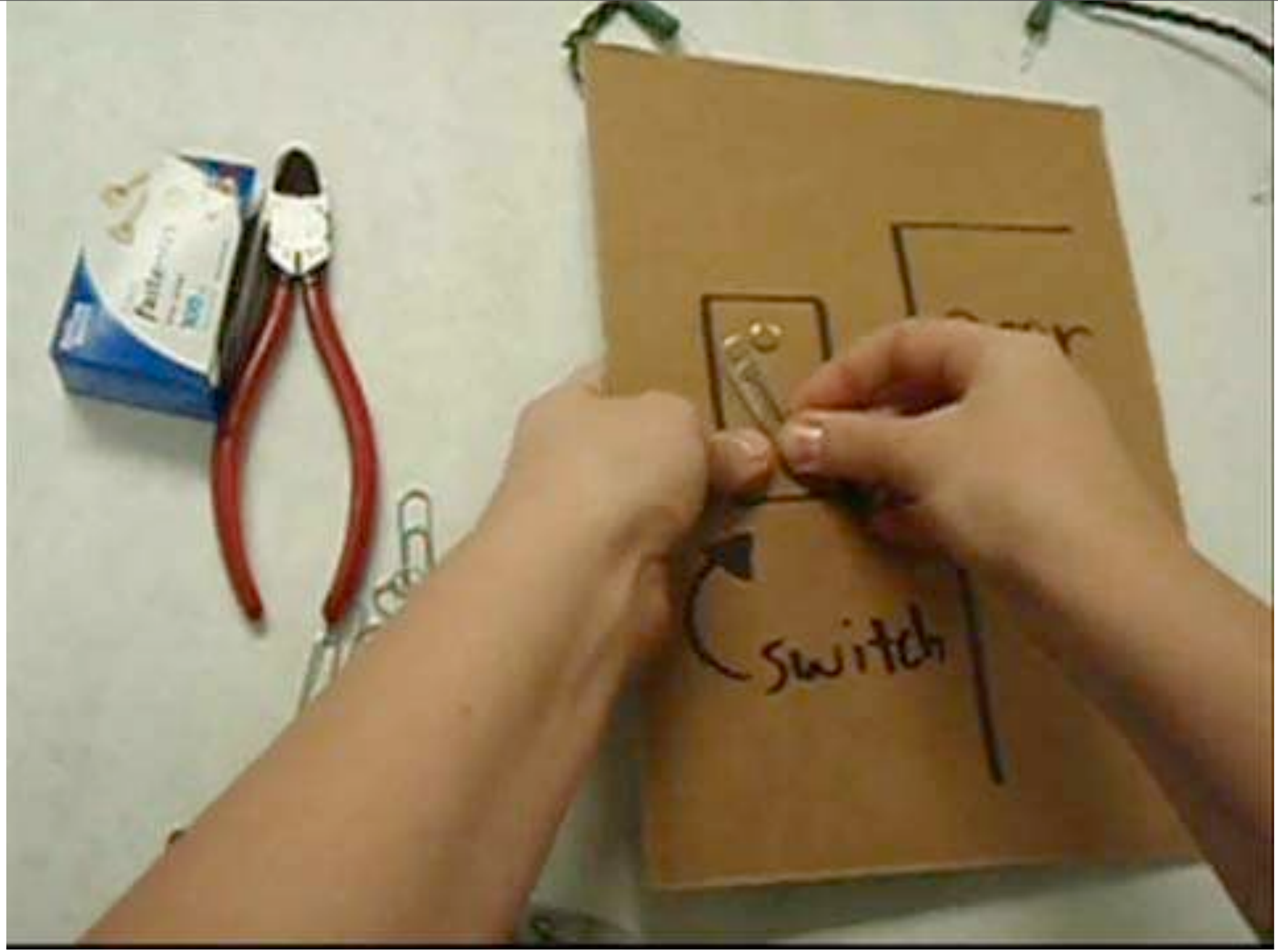
Light-House Wire Diagram



Switches made from 2 brass brads and one paperclip

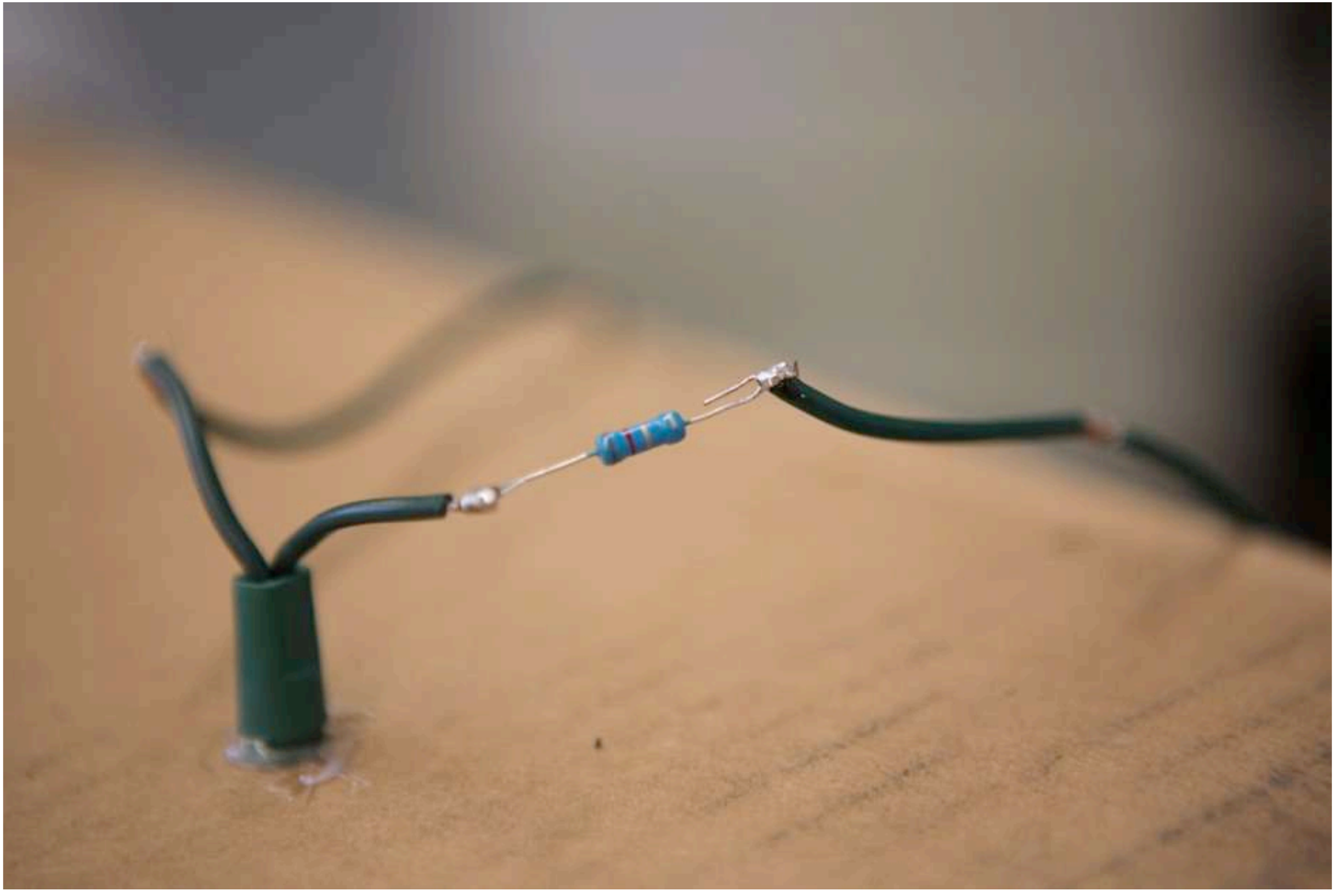






http://www.youtube.com/watch?v=o0MDBbH9eGk


TO TRY NOW!




Ms.Pac~Men
Power
OFF THE WALL
STOP
teen
TWEET TWEET
super bad
Snacks
Open
E-E

	Agenda
9:10-9:30	**Light-House Project** Description & Handout
9:30-11:30	**Headphone Project** Build

Headphone Project Objectives

- Teachers will understand how a speaker works by dissecting one

- Teachers will prototype a working speaker

- Teachers will feel prepared to plan a headphone culminating project in their next E&M unit

	Culminating Activity – Headphone Engineering		
	Speaker Dissection	**Prototype & Elevator Pitch**	**Headphone Construction and Design Brief**
Student Experience	Students are introduced to the Culminating Activity (if not done at the beginning of unit). Students dissect a speaker and hypothesize the role of each component.	Students experiment with magnets, wire, and paper, plastic, or Styrofoam cups to prototype a single headphone speaker.	Students build headphones using T4T materials. Students prepare design brief defending their product and documenting the engineering design process.
T4T Material	Speaker	2nd Speaker Thin-gauge wire Paper, plastic, or Styrofoam cups or plates	2 magnets (if not already provided) Additional wire (enough for ~35 loops in voice coil in each headphone speaker)
Big Idea	What is required to create a speaker? What does each component do?	Alternating current through a wire produces an alternating magnetic field, and therefore force, between the voice coil and permanent magnet. The speaker cone transfers the vibrations from the voice coil to the air, producing sound.	To maximize volume and clarity, speaker cone should be made from a lightweight material (low mass = high acceleration, for a given force). Speaker cone and voice coil assembly must vibrate freely. Mono vs. stereo designs.
Δt	One 55-min period	Two 55-min periods	Five 55-min periods

Research

Requirements

Brainstorming

Prototyping

Analysis

Production

The Technology

How do speakers work?

The User

What does the user need/want?

Research

Requirements

Brainstorming

Prototyping

Analysis

Production

What is required that the headphones have or do?

Research

Requirements

Brainstorming

Prototyping

Analysis

Production

Brainstorming is the process of coming up with ideas

Research

Requirements

Brainstorming

Prototyping

Analysis

Production

Prototyping

Prove that your design will work
& test different designs

Research

Requirements

Brainstorming

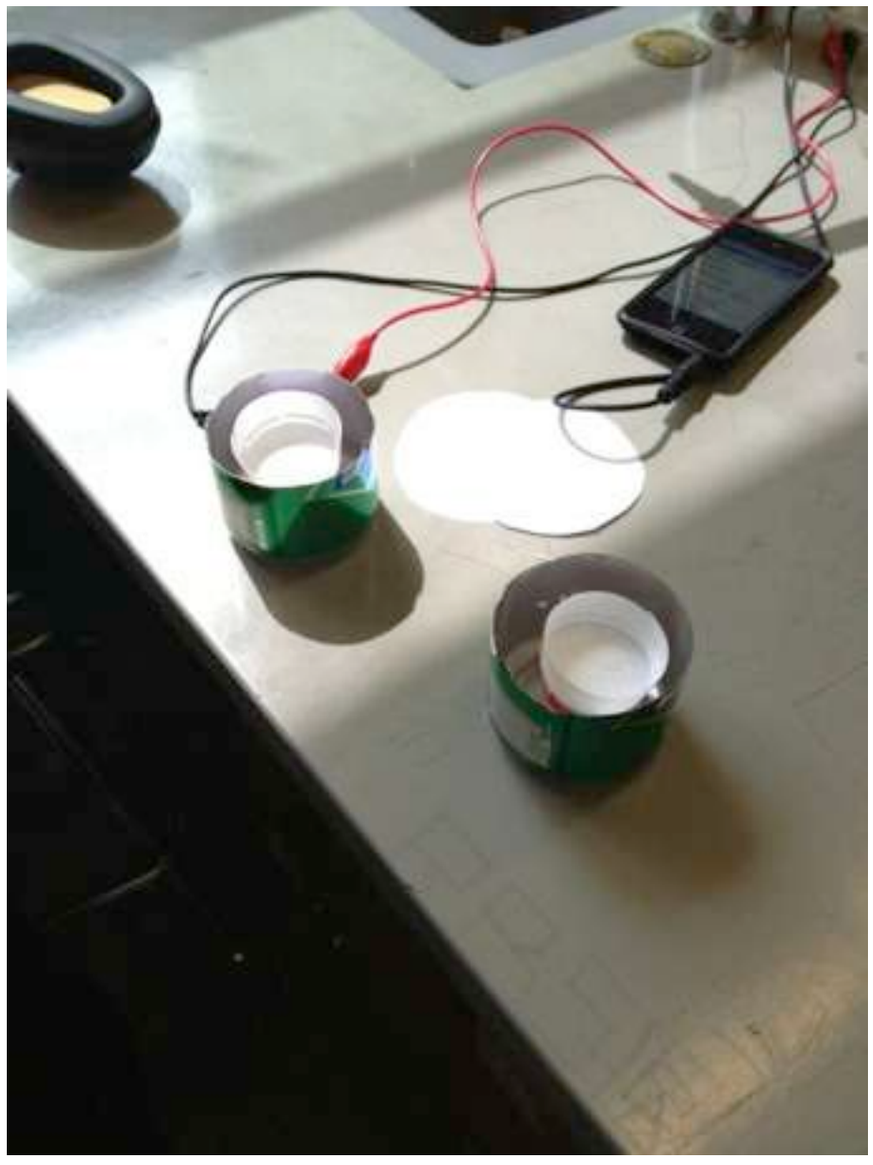
Prototyping

Analysis

Production

Analysis

What about the prototype is **good**?
What needs to **change**?
What **questions** does it bring up?
What **ideas** does this give us?



Research

Requirements

Brainstorming

Prototyping

Analysis

Production

Production

Do it to it.

Brainstorm Rules

Go for quantity

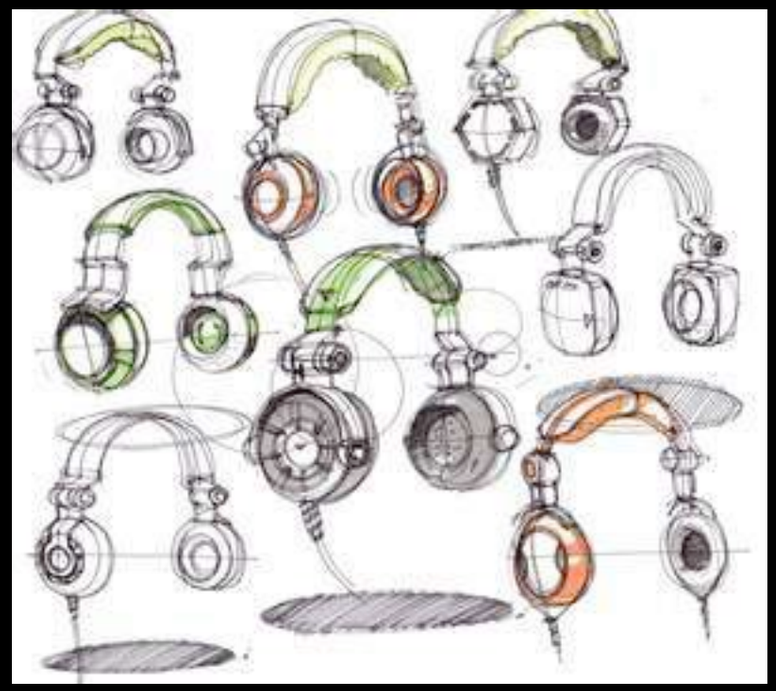
Build off of ideas

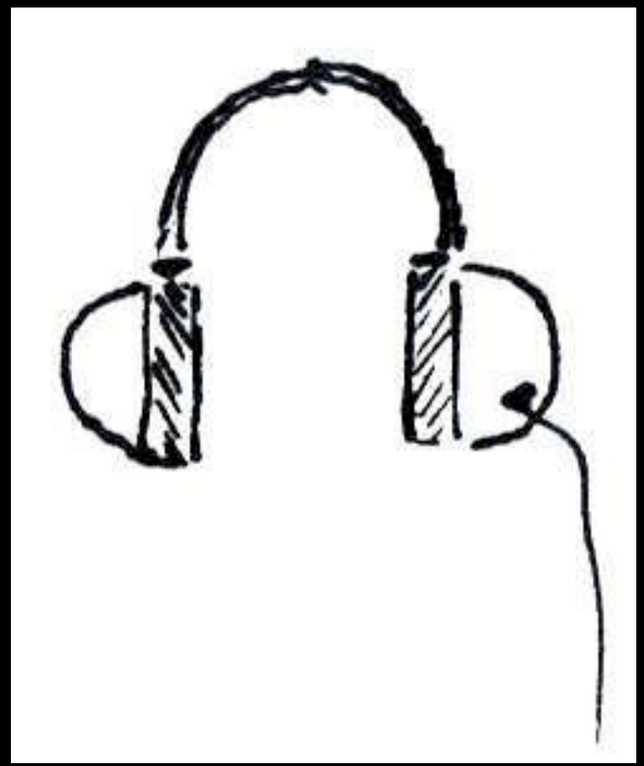
Encourage wild ideas

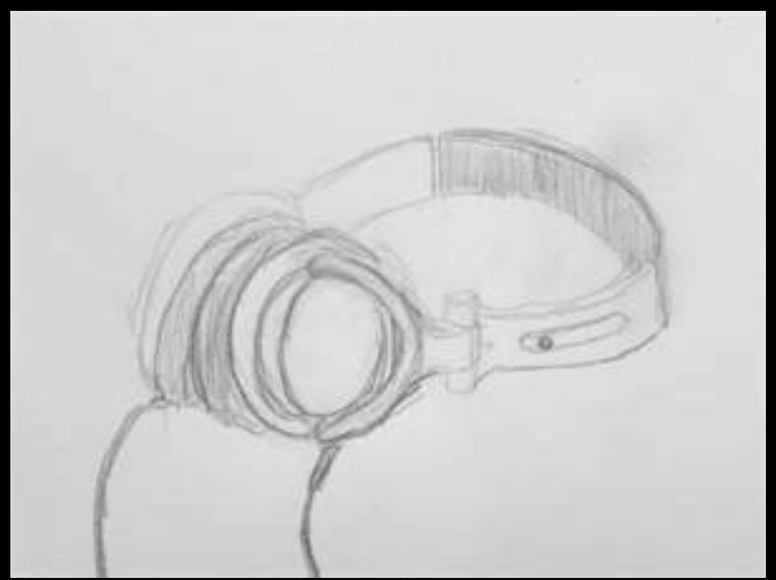
Be visual

Stay on topic

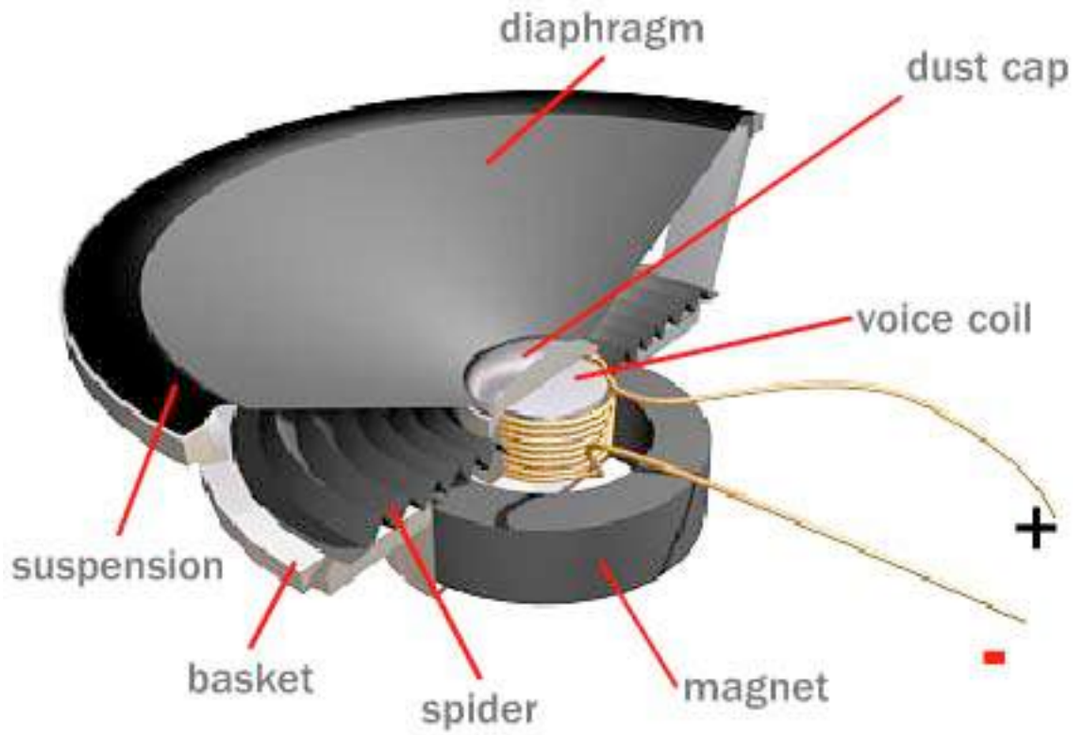
Do not judge ideas–yet







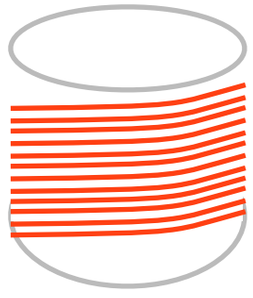
Speakers



http://electronics.howstuffworks.com/speaker5.htm

Voice coil

- Solenoid (coil of wire)
- Magnetic field changes with alternating current (AC)
- Strength of mag. field depends on number of coil loops



Cone

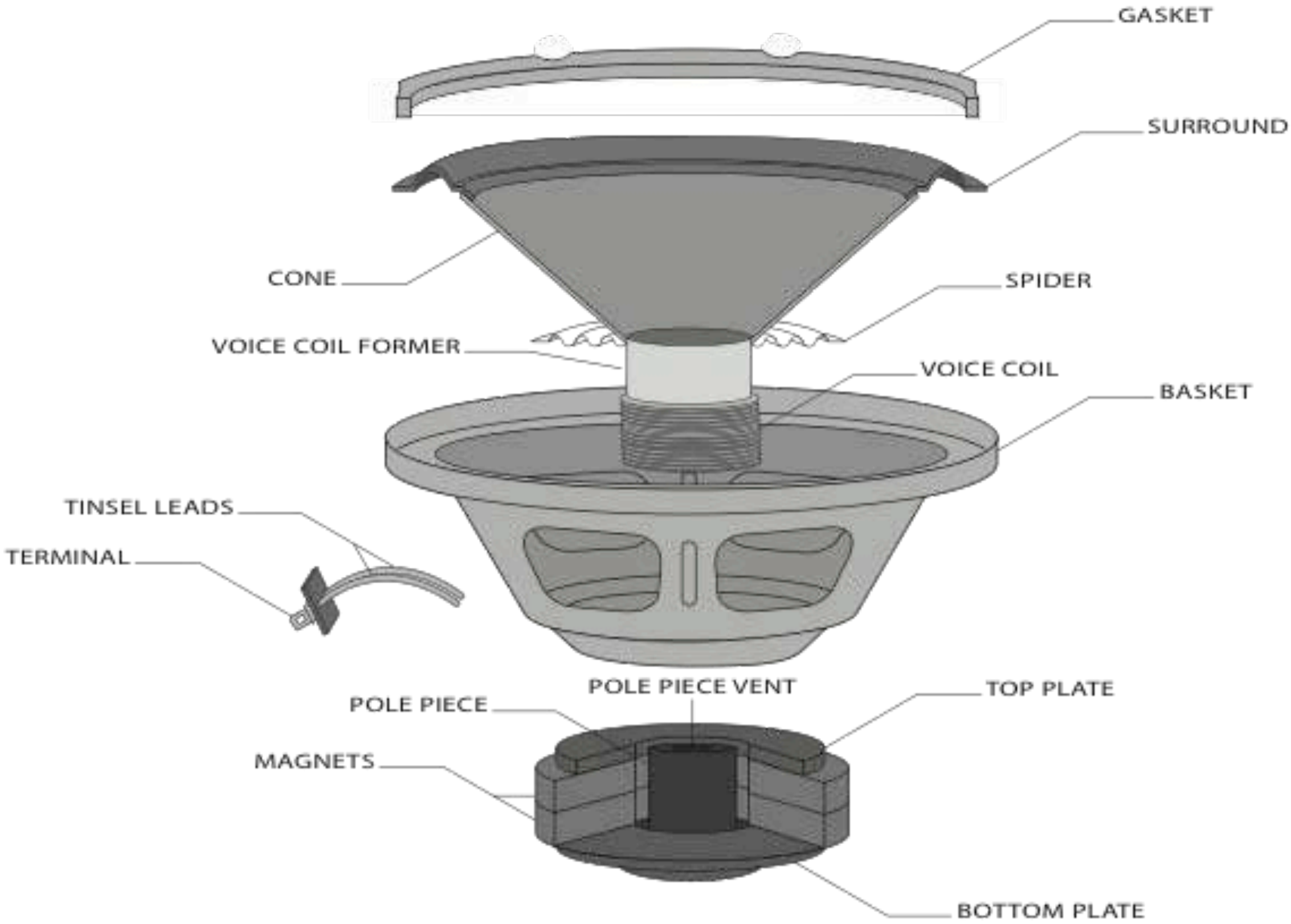
- Attached to voice coil, and vibrates with it
- Creates pressure waves in the air (sound)
- The lighter the better (why?)

Magnets

- Permanent magnetic field required to interact with voice coil

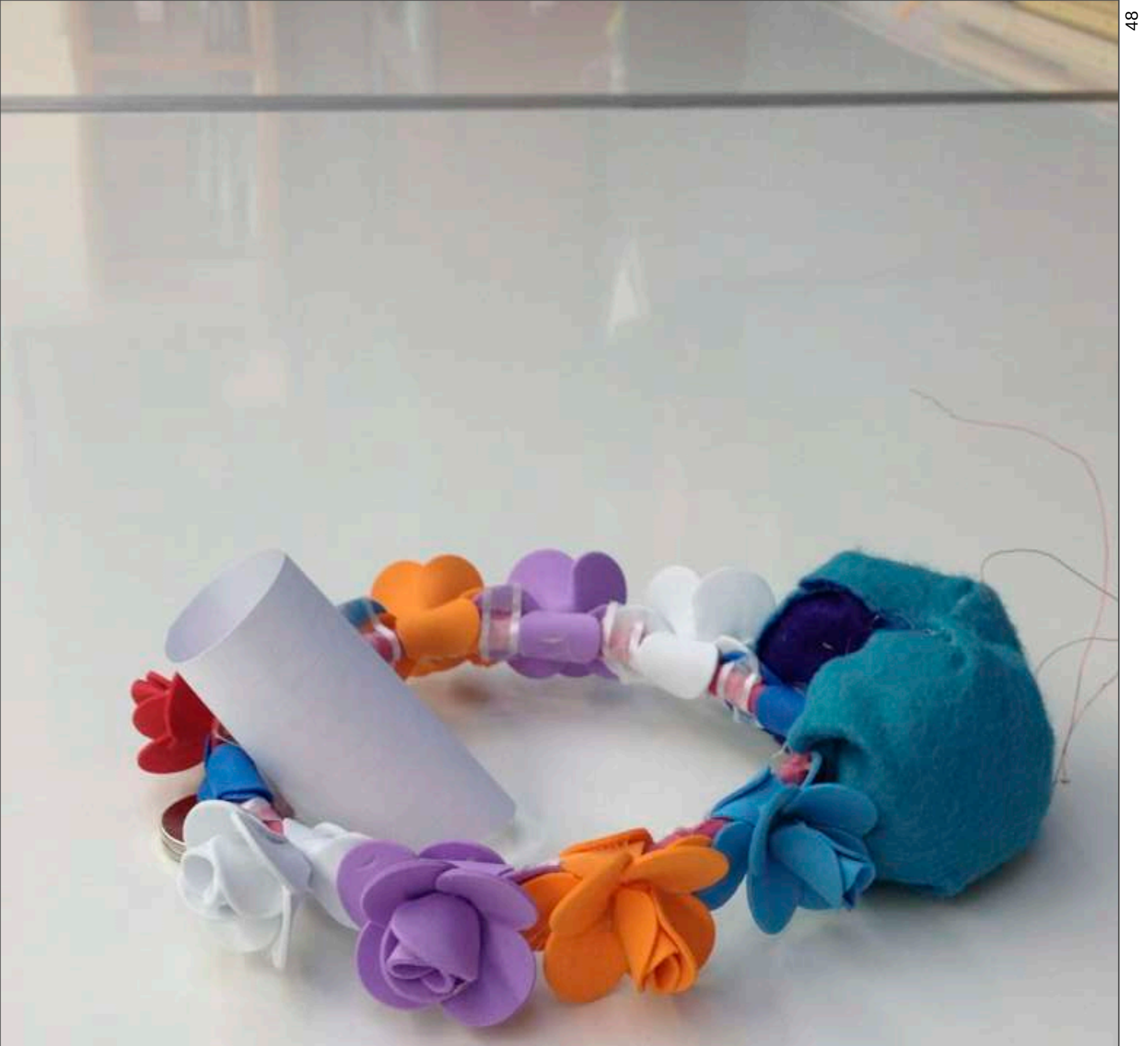
Suspension

- Suspends voice coil and cone above the permanent magnet.
- Allows free movement (why is this important?)


GASKET
SURROUND
CONE
SPIDER
VOICE COIL FORMER
VOICE COIL
BASKET
TINSEL LEADS
TERMINAL
POLE PIECE VENT
POLE PIECE
TOP PLATE
MAGNETS
BOTTOM PLATE


eats!


Wilson




BULLDOGS

Exit Ticket:

As a result of today's workshop...

1. I feel prepared to _____.
2. I'm still unsure about _____.

T4T Physics

4/27/13

Light-House Project

Headphone Project