redhat.

Return of the Blinky Flashy

How to teach the blinken flashen

Jen Krieger - @mrry550
Gina Likins - @lintqueen

All code can be found at:
http://bit.ly/teachingblinky

Plan

1. Hello & Intros
2. Why BlinkyFlashy?
3. Pedagogical considerations: Part I
4. Workshop To Do
5. Key concepts to Teach
6. Common Gotchas
7. Pedagogical considerations: Part II
8. Some new things!
9. Supplies & links

Us

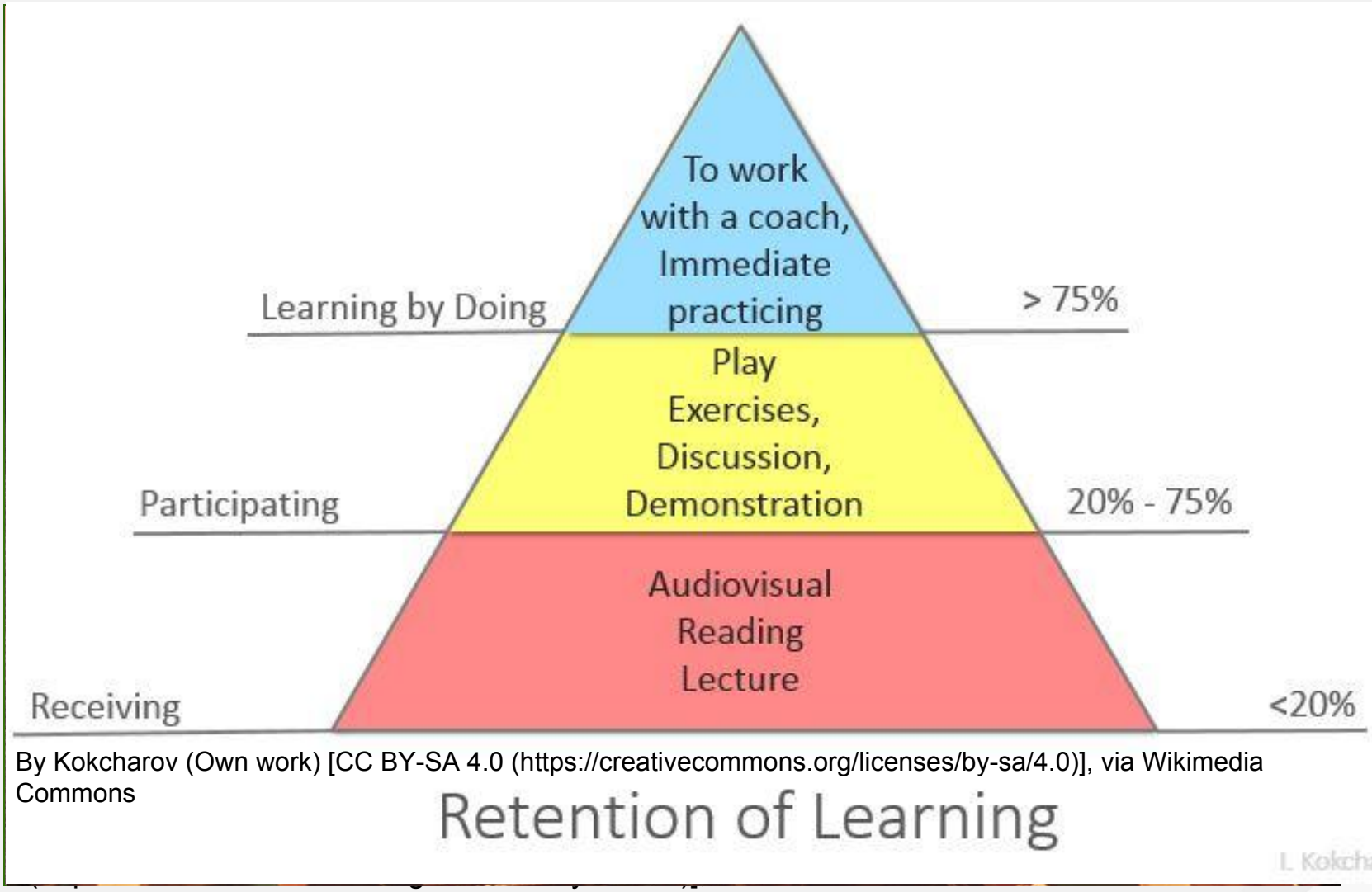
Jen

@mrry550

Gina

@lintqueen

Why Blinky Flashy?



By Kokcharov (Own work) [CC BY-SA 4.0 (https://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

Pedagogical[1] Considerations: Part I

Retention increases:

reading / lecture → **demonstration / play** → **doing / experimenting**

def. pegagogy: the method and practice of teaching, especially as an academic subject or theoretical concept.

(whew)

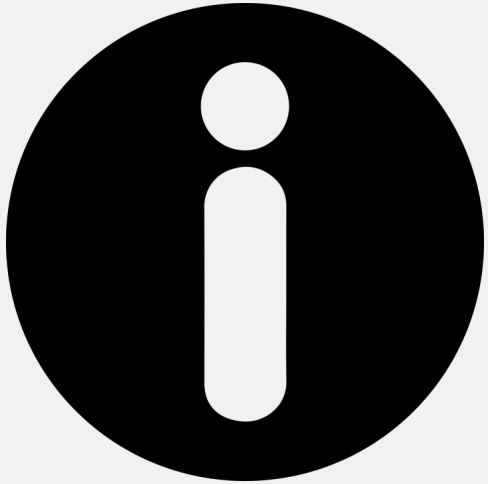
Workshop To-Do

(call it homework)

Gather Information

What are the workshop logistics?

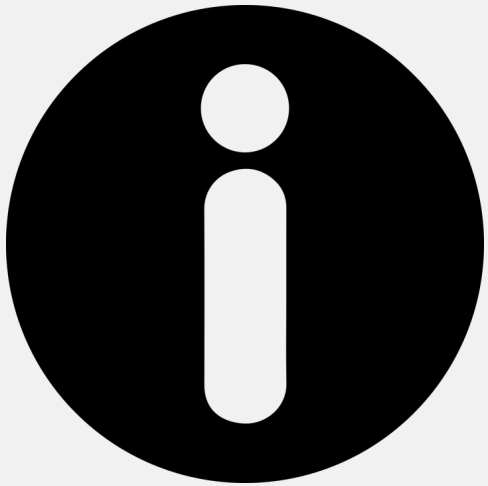
- Age
- Skill
- Time limit
- Group size
- Power available
- Room configuration



Gather Information

What is the context?

- “For fun” or part of a larger curriculum?
- If part of curriculum, how does it fit?



Pedagogical Considerations: Part II

Learning objectives: what should student be able to **do** upon completion

a. Good: Student will be able to arrange 2 polarized components and power supply into working circuit
b. Less Good: Student will understand how circuits work

Rubrics: way to tell if student achieved learning objectives?

c. Usually a matrix
d. One/learning objective:

Learning Objective	Did Not Meet expectations / Failed	Somewhat Met Expectations / Passed	Met Expectations / Good	Exceeded Expectations / Excellent
Arrange 2 polarized components & power into working circuit	Did not attempt	Aligned at least 1 component correctly with battery	Arranged all components correctly with battery	Arranged all components correctly with battery and provided trace paths or circuit diagram

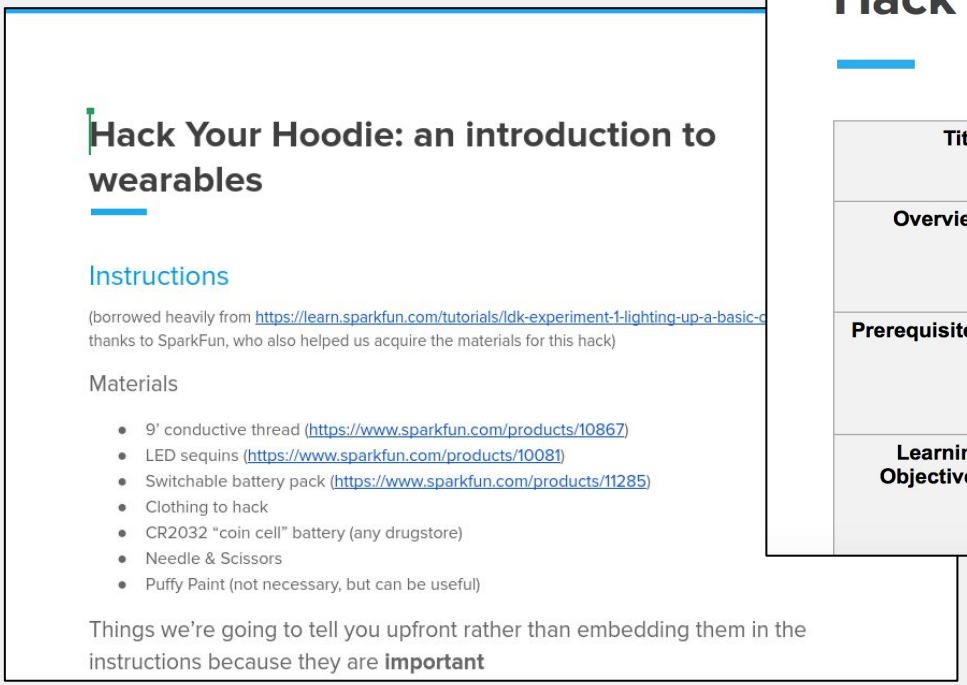
Core Teaching Concepts

1. What is a Circuit?
   a. Closed path that electricity can flow around
   b. Parallel v. series
2. Conductivity
   a. Metal conducts current: any metal (snaps, etc.)
3. Polarity: it matters.
   a. Components often (usually, but don't always) have a positive (cathode) & negative (anode).
   b. Plus should connect to plus and negative to negative.

      The cathode on battery, for instance, connects to the cathode of the LED
4. Don't cross the streams
   - Don't let + and - circuit legs, or "traces", touch

Plan the Workshop

- Decide what project you will be teaching
  - Create instructions (for students)
- Gather sign-ups so you know how many students to prepare for
- Purchase supplies, and make sure to get extras



Hack Your Hoodie: an introduction to wearables

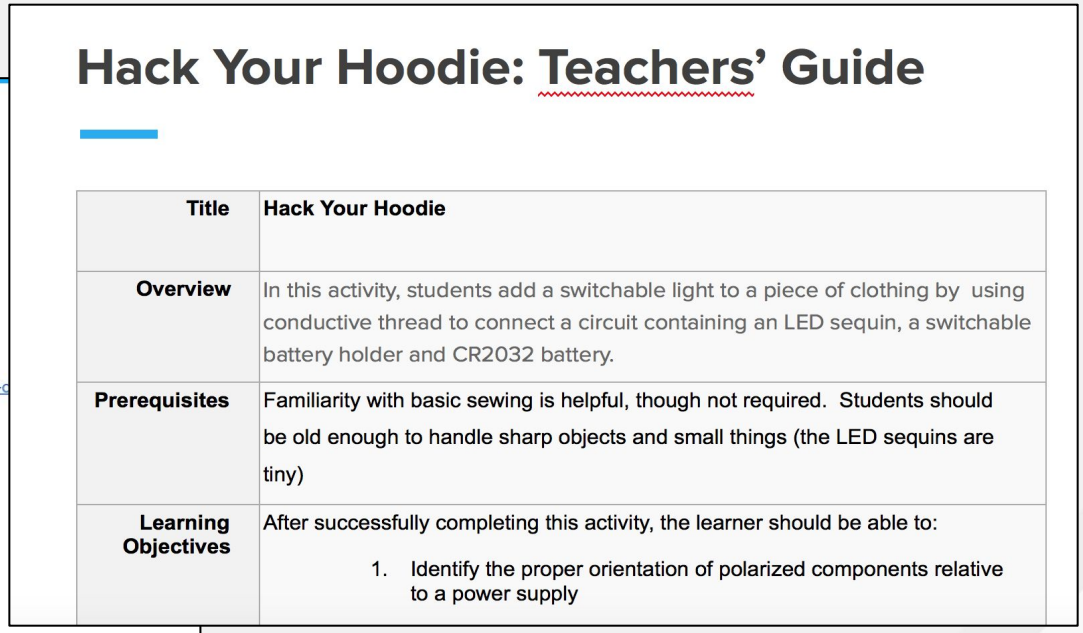
Instructions

(borrowed heavily from https://learn.sparkfun.com/tutorials/ldk-experiment-1-lighting-up-a-basic-c
thanks to SparkFun, who also helped us acquire the materials for this hack)

Materials

- 9' conductive thread (https://www.sparkfun.com/products/10867)
- LED sequins (https://www.sparkfun.com/products/10081)
- Switchable battery pack (https://www.sparkfun.com/products/11285)
- Clothing to hack
- CR2032 "coin cell" battery (any drugstore)
- Needle & Scissors
- Puffy Paint (not necessary, but can be useful)

Things we're going to tell you upfront rather than embedding them in the instructions because they are **important**



Hack Your Hoodie: Teachers' Guide

Title	**Hack Your Hoodie**
Overview	In this activity, students add a switchable light to a piece of clothing by using conductive thread to connect a circuit containing an LED sequin, a switchable battery holder and CR2032 battery.
Prerequisites	Familiarity with basic sewing is helpful, though not required. Students should be old enough to handle sharp objects and small things (the LED sequins are tiny)
Learning Objectives	After successfully completing this activity, the learner should be able to: 1. Identify the proper orientation of polarized components relative to a power supply

Plan the Workshop

Put together a toolkit

- Multimeter
- Jumper wires
- Electrical tape
- CR2032 batteries
- Needlenose Pliers
- Wire cutters or scissors
  - 1 for each 2-3 students
- Puffy paint (optional)

Adjustments to Decrease Risk

- Change ratio of helpers to class size
  - More experienced attendees = fewer helpers needed
- # of components
  - Each component you add, adds complexity
- Pre-Work
  - Avoid “crossing the streams” *and* polarity issues by printing traces or pre-attaching components
- Trace length: shorter = better
- Time
- Dexterity
- Cost
  - 1, 25, 100 - Bulk Ordering
- Learning objectives

Prep Before Class

1. Print Instructions
    a. 1 copy/student + a couple of extras
2. Assemble kits
    a. LED, battery, battery holder & needle
    b. **no thread**
3. Run through workshop
    a. At least once and preferably with another “student”
    b. Make your demo item
4. Set up room in advance
    a. Clusters of desks work better than lecture-hall style seating
    b. Kits on desks, with shared tools interspaced

    If there’s a kit, they can sit.

Now we show you the blinken flashen

Easy Printed Fabric

Supplies

- Printed cotton
- Sewable LED sequins
- Conductive thread
- Battery pack

Upcycled Felt LED Bracelet

Supplies

To make felt

- 100% wool sweater
- Hot water
- Agitation (for the sweater, not you)

For bracelet

- LED sequins
- Conductive Thread
- Embroidery Floss (optional)
- Snaps (two pair)
- Battery pack (unswitched)
- CR2032 battery
- Felt (storebought) for backing

Tools

- Hot glue or felting needle
- Scissors
- Needle

Glowy Halloween LEGO House

Supplies

- LEGO Bricks
- SMD LEDs
- Wire
- Battery Pack
- Batteries
- Electrical Tape

Resin Crystal LED Necklace

Supplies

- Resin (ICE Resin)
- Color Changing LED
- 5mm color cycling LED

3D-Printed Glowy Unicorn Wig

Supplies

- Neopixel strips
- Flexible (silicone-coated) wiring
- 3D printed unicorn horn (see https://learn.adafruit.com/3d-printed-unicorn-horn/3d-printing-the-horn)
- Gemma MO
- Adafruit Micro Lipo - USB LiIon/LiPoly charger
- Lithium Ion Polymer Battery - 3.7v 500mAh
- 4 NeoPixel Sticks (original plan used 2 but I wanted more:
  - 2 are wired in “parallel”
  - 2 are daisy-chained from them
  - ∴ each side of display = 16 RGBW pixels that are individually addressable, but 2 sides are mirrored
- Silicone coated wire in three colors
- Wig
- Fiberfill (optional)
- Fuzzy Craft Stem (http://pepperell.com/fuzzy-stems-9-foot-coil/) for ears

Tools

- needle and thread
- Soldering tools and supplies
- 3D printer
- scissors
- double-stick foam tape

https://learn.adafruit.com/3d-printed-unicorn-horn/attach-horn

Supplier list

Supplier	Items
SparkFun	Conductive thread, Lilypad wearables, LED “sequins”, standard LEDS, color cycling LEDs, battery holders, copper tape, button, Arduino
Adafruit	Conductive thread, FLORA & GEMMA microcontrollers + wearables, copper tape, NeoPixel Ring
Amazing Magnets	Rare earth magnets
Amazon	Multimeter (most of the basics can be found here)
Chibitronics	Circuit Stickers
Extreme Glow	Fairy Lights, Flat LEDs, EL Wire
Microtivity	Standard LEDs
Plug and Wear	Textile Sensors

Reference, links & misc. goodness

- All materials
  - http://bit.ly/teachingblinky
- Soft Circuits: Improving Attitudes Toward Circuits through Crafternoons
  - http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1002&context=phys_capstoneproject
- Participant Instructions
  - https://docs.google.com/document/d/1Vx15lUIE1cxC01qNEkL3N7WTF0lsCmIw5EpFNWoz1Yw/edit?usp=sharing
- Teacher's Guide
  - https://docs.google.com/document/d/1GHGL87QdpfTYbwxBkYBleTXjJSSxxOxAQOwDf0O1oGE/edit?usp=sharing
- Sample signup form
  - https://docs.google.com/spreadsheets/d/1W9nZSZB128ATyoguR4Jtu3O9blZda6Cb1KKbwyF12_g/edit?usp=sharing

redhat.

THANK YOU!

Jen Krieger
Gina Likins

All code can be found at:
http://bit.ly/teachingblinky