
Synopsis: Kinesthetic Current II... Loads and Batteries

In this activity we will return to our macroscopic kinesthetic model to gain a hands-on understanding of how batteries and devices affect current and voltage in a circuit.

- We will model current as the flow of balls
- We will model voltage potential as the height of the balls

Standards

4th Grade

1a. Students know how to design and build simple series and parallel circuits by using components such as wires, batteries, and bulbs.

1c. Students know electric currents ~~produce magnetic fields and know how to build a simple electromagnet.~~

9-12th Grade

4a. *Students know* waves carry energy from one place to another.

5f. *Students know* ~~magnetic materials and electric currents (moving electric charges) are sources of magnetic fields and are subject to forces arising from the magnetic fields of other sources.~~

Driving Questions

1. What is a circuit? Open? Closed? Short?
2. What does a battery do?
3. What does it mean to have devices: in parallel? in series?

Learning Objectives

Students will learn that:

- A battery increases the potential (by a fixed amount ... its voltage)
- A load decreases the potential
- What is parallel? series?

Kinesthetic Current II... Loads and Batteries

Procedure

This is a whole class activity. You may need to go outside to have enough room.

For these activities individuals may take on special jobs:

- a. Wire: pass every ball that reaches you to your neighbor without changing the height of the ball.
- b. Switch: close the circuit by saying "ON!"... you then become wire.
- c. Battery: take every ball that reaches you and lift it above your head before you pass the ball to your neighbor.
- d. Device: take every ball that reaches you and lower it by a fixed amount before you pass the ball to your neighbor. As you lower the ball make a "Beep" (or some other obnoxious noise) to let us know energy has been used.

Part A: Switch and Battery

1. Form a circle. Approximately every other person should have a ball.
2. Designate one person the switch and one person the battery. Everyone else is wire for now.
3. Flip the switch and ... Lets try it!

Quick follow up questions...

Does the potential change? Is the current the same in every place?

Part B: Switch, Battery and Device

1. Form a circle. Approximately every other person should have a ball.
2. Designate one person the switch, one person the battery and one person the device. Everyone else is still wire for now.
3. Flip the switch and ... Lets try it!

Quick follow up questions...

Does the potential change? Is the current the same in every place?

Part C: in Series

1. Form a circle. Approximately every other person should have a ball.
2. Designate one person the switch, one person the battery and three people the devices. Everyone else is still wire.
3. Flip the switch and ... Lets try it!

Quick follow up questions...

Do all of the devices receive the same current?

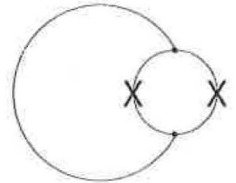
Do all of the devices receive current with the same potential?

Imagine all three devices are identical bulbs. Predict what dictates relative brightness (current or voltage potential):

- If all of the bulbs have the same brightness
- If all of the bulbs do not have the same brightness (ie. the first bulb is the brightest and the last bulb is the least bright)

Part D: in Parallel

1. Form a big circle with a nestled little circle (like the picture to the right). Approximately every other person should have a ball.
2. Designate one person the switch, one person the battery and two people the devices. The battery and switch should be in the big circle. The devices should both go in the small circle (marked with x's in the diagram). Everyone else is wire. Note: If you are a wire at one of the two points where the circles intersect, you need to pass the ball to every other side.
3. Flip the switch and ... Lets try it!



Quick follow up questions...

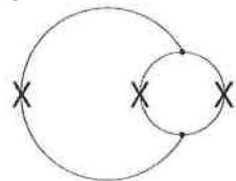
Do both devices receive the same current?

Is current higher or lower than in series?

Do both devices receive current with the same potential?

Part E: A circuit

1. Form a big circle with a nestled little circle (like the picture to the right). Approximately every other person should have a ball.
2. Designate one person the switch, one person the battery and three people the devices. The battery and switch should be in the big circle. The devices are marked with x's in the diagram. Everyone else is wire. Note: If you are a wire at one of the two points where the circles intersect, you need to pass the ball to every other side.
3. Flip the switch and ... Lets try it!



Quick follow up questions...

Do all the devices receive the same current? If not, which receives the most?

Do all the devices receive current with the same potential? If not, which is highest?

Imagine all three devices are identical bulbs. You make the following observation:

the direction of the battery does not effect the relative brightness of any of the bulbs.

Given this observation... what dictates relative brightness (current or voltage potential)?

Instructor Notes: Kinesthetic Current II... Loads and Batteries

This activity requires some space and mobility. Be patient getting set up.

Safety

This activity no risk associated with it.

Materials

- ~15 Balloons

Notes
