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UTeach Outreach



Snap Circuits



Lesson created by: UTeach Outreach

Date of lesson:

Description of the class: CNS 101 Teachers

Length of lesson: 25-30 minutes

Source of the lesson:

<http://www.explainthatstuff.com/electricity.html>

<http://www.energyquest.ca.gov/story/chapter04.html>

<http://www.edu.pe.ca/kish/Grassroots/Elect/circuit.htm>

TEKS addressed:

5.6 Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to (B) demonstrate that the flow of electricity in circuits requires a complete path through which an electric current can pass and can produce light, heat, and sound.

I. Overview

Electricity is a type of energy that builds in one place and flows to another. Electricity exists in nature, and is only usable in modern society through the creation and application of circuits. Circuits allow for the flow of electrical currents, and control the flow of electricity. Electrical engineers use circuits to create closed paths for electrical current to flow, and can use this flow of energy to power objects. The career that focuses on electricity and how to control circuits is called "Electrical Engineering".

II. Objectives

The Students will be able to...

- Create circuits using supplied tools

- Complete circuit-board challenges

- Articulate that electricity flows in a circuit

III. Resources, materials and supplies

- 9V battery

- 2 wires (optional)

- 1 LED light bulb

- Snap Circuits kit

IV. Advanced Preparation:

Have Snap Circuits boxes neatly organized for efficient passing out. Double-check all pieces are in the box and that all batteries work.

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V. Supplementary worksheets, materials and handouts

Printout of challenges listed at end of lesson

VI. Background information

Electricity is the movement of electrons through a conductor. Electricity must flow in a circuit, and the electrons flow from a negative charge to a positive charge. A battery creates electricity through a chemical reaction in the cell, which is how our snap circuit boards are powered.

VII. Possible Misconceptions

Students may think that electricity can flow like water, with a beginning and an end. Actually, electricity must flow in a circle to perpetuate the flow of electrons.

VIII. Vocabulary & Definitions:

Energy source- source of electrical energy for a circuit

Energy path- pathway the electrical energy takes to complete the circuit

Energy transformer- mechanism on circuit that converts electrical energy to another form of energy

IX. Safety Considerations

Short circuits are made when a circuit contains only an energy source and path, but no resistors. The resulting short circuit can get extremely hot, destroy electronics, or even cause fires. **Never make short circuits.**

X. Question of the Day

How does electricity flow?

Five-E Organization

ENGAGEMENT		Time: 3 – 4 minutes
What the Teacher Will Do	Probing Questions	Student Responses Potential Misconceptions
<p><i>Hello everybody and welcome to a station all about electrical engineering. Today we are going to be talking about electricity!</i></p> <p><i>I brought with me a few supplies that I want you to look at. Now, working with your partner, figure out a way to make the light bulb turn on.</i></p> <p><i>To make the light bulb shine,</i></p>	<p>How did you get the light bulb to shine?</p>	<p>Connected it to the battery; created a circuit</p>

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<p><i>you had to connect it to the battery. Connecting the light bulb to the battery created a circuit.</i></p> <p><i>Before you leave today, you will be able to answer the question of the day: How does electricity flow?</i></p> <p><i>Circuits are used in every electronic device. Electrical engineers have to know the answer to questions like these in order to be able to successfully design the most efficient and successful circuits.</i></p>		
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EXPLORATION		Time: 25-30 minutes
What the Teacher Will Do	Probing Questions	Student Responses Potential Misconceptions
<p><i>Before we get started, because today's lesson involves electricity, we want to warn you to be careful and follow our exact directions so that there are no accidents or injuries.</i></p> <p><i>Today you will be working with a partner on a series of challenges. Listen carefully to these rules:</i></p> <ol style="list-style-type: none"> <i>1. Each challenge has a time limit. You must stop when I say stop.</i> <i>2. You and your partner are a TEAM. You should both work together to solve these challenges.</i> <i>3. use only the pieces that are listed for each challenge.</i> <p><i>Safety notice: do not create a short circuit. A short circuit is when electricity is allowed to flow around a circuit</i></p>		

<p>without making any energy transformations. That means it is only battery and connections- no light bulbs, fans, motors, sounds, etc. Short circuits are dangerous because they create a lot of heat, can cause fires, and destroy electrical devices.</p> <p><i>You'll be partners with the person you're sitting next to at your table.</i></p> <p>Call the partner on the left from each group to come get the snap Circuits board.</p> <p><i>Raise your hand if you're to the left of your partner (students raise their hands). If you have your hand raised, please come and get a circuit box.</i></p> <p><i>The challenges are on your paper. You should work on the challenges in order until time is up to see how many you can complete. Be sure to work together to accomplish these tasks. You have _____ (~10) minutes. Go!</i></p> <p>Teacher should walk around and check in with groups. Be sure to give the students updates about how much time is left.</p>	<p>Probing questions to ask each group:</p> <p>Where is the electrical energy coming from?</p> <p>What does the electricity flow through?</p> <p>What happens to the electrical energy when it comes in contact with the motor/ light bulb/ alarm?</p> <p>How does the switch work?</p>	<p>Battery</p> <p>The snap connectors; it travels around the circuit.</p> <p>The energy gets converted.</p> <p>The switch breaks the circuit</p>
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EXPLANATION		Time: <u>5-7 minutes</u>
What the Teacher Will Do	Probing Questions	Student Responses Potential Misconceptions
<p><i>Now that you are a little more familiar with circuits, let's discuss some of the parts of a circuit.</i></p>		

<p><i>The first piece we will discuss is the energy source. The energy source is the source of electricity for the circuit.</i></p> <p><i>The second term is energy transformer. The energy transformer converts electrical energy to other forms of energy, like mechanical or sound energy.</i></p> <p><i>The last component of a circuit is the energy path. The energy path is the material that conducts or carries the electrical energy.</i></p> <p><i>Very good! These are the three main components of a circuit. I saw lots of teamwork today, something that is very important to being an electrical engineer.</i></p> <p><i>That's right! Metal is a type of material that allows the flow of electricity while other materials (such as wood and plastic) do not conduct electricity well.</i></p> <p><i>These types of materials are called conductors and insulators. Materials that electricity can pass through easily are conductors, and</i></p>	<p>What is the energy source of the electricity in your circuits today?</p> <p>What are some of the energy transformers you used to build your circuits?</p> <p>What did you use to connect the energy source to the transformers?</p> <p>What strategies did you and your partner use to build the circuits?</p> <p>What kind of material do you think the snap wires are made of?</p> <p>Why would electrical engineers be interested in conductors and insulators?</p>	<p>The battery</p> <p>Fan, motor, alarm, etc.</p> <p>The snap wires; the purple/blue strips</p> <p>Divided responsibilities; discussed then built; one gathered supplies while the other connected</p> <p>Metal</p> <p>To better understand how to control electricity</p>
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<p><i>materials that electricity cannot pass through easily are insulators.</i></p> <p><i>Let's discuss why this knowledge can be useful in real-life situations. Electrical engineers, for example, are interested in how to transport electricity to power high-tech equipment. Circuits are used in every electronic device!</i></p>		
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EVALUATION		Time: 5-10 minutes
What the Teacher Will Do	Probing Questions	Student Responses Potential Misconceptions
<p>If time allows: <i>Now that you are all experts on circuits, let's review that you know. First let's go back to our question of the day:</i></p>	<p>Turn to your partner and discuss: How does electricity flow?</p> <p>What are the different parts of a circuit?</p> <p>What is a conductor?</p> <p>What is an insulator?</p> <p>What is a short circuit?</p>	<p>Starts at the source, travels through the path, converts at transformer, then back to source Misconception: energy travels from source to transformer then stops. But in reality, circuits are a complete flow of electricity from source, around the circuit, and then back to source.</p> <p>Energy source, path, and transformer(s)</p> <p>Material that conducts electricity</p> <p>Material that doesn't allow electricity to flow easily</p> <p>A circuit with a source and a path but no transformers</p>

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Complete the following challenges using only the materials listed:

Directions: Complete each of the tasks with the materials listed with your group. Be sure to take turns.

Warning: Never create a short circuit. This is a circuit consisting only of wires and batteries; you must always put another component in your circuit.

Task One: Create a circuit with a lighted bulb using the least number of materials from:

- Snap board
- Four length 2 snap wires
- Two length 3 snap wires
- One battery pack
- One lamp socket

Task Two: Create a circuit with a lighted bulb that includes a switch using the least number of materials from:

- Snap board
- Four length 2 snap wires
- One length 3 snap wire
- One battery pack
- One lamp socket
- One slide switch

Task Three: Create a circuit with a spinning motor and fan that includes a switch using the least number of materials from:

- Snap board
- Four length 1 snap wires
- Two length 3 snap wires
- Battery
- Motor and fan
- Slide switch

Task Four: Create a circuit with a spinning and noisy motor that includes a speaker along with a switch using the least number of materials below. NOTE: there may be extra materials that you won't need.

- Snap board
- Three length 2 snap wires
- Two length 3 snap wires
- Battery
- Press switch
- Speaker
- Motor and fan
- Slide switch
- U2 Alarmic piece
- One length 4 snap wire

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Task Five: Create a circuit that utilizes a spinning fan, a lit bulb, and a switch using the least number of materials below. NOTE: there may be extra materials that you won't need.

- Snap board
- Two length 3 snap wires
- Two length 1 snap wires
- Four length 2 snap wires
- Battery
- Slide switch
- Lamp socket
- Motor and fan

Task Six: FLYING SAUCER! Create a circuit that will launch the fan blade to simulate a flying saucer using the least number of materials below. NOTE: there may be extra materials that you won't need.

- Snap board
- Four length 2 snap wires
- Three length 1 snap wires
- One length 3 snap wire
- Battery
- Slide switch
- Motor and fan

Challenge task: Make a circuit using any needed material that complete ALL the following tasks:

- Lights a light bulb
- Makes a sound
- Turns a fan

REMEMBER: Short circuits can...

- Create a lot of heat/thermal energy—**ouch!**
- Cause fires—**dangerous!**
- Cause electrical devices to stop working—**oh no!**

NO SHORT CIRCUITS!