

Grades

4 - 8

Time Frame

2-3 hours

Vocabulary

- Simple circuit
- Series circuit
- Parallel circuit
- LED (light emitting diode)
- Conductor
- Electricity
- Polarity
- Electric current
- Conductivity
- Architecture
- Neon
- Gooie

Lesson Objective

Students will learn about electric circuits and explore iconic Las Vegas signs and architecture. They will then create a sign-inspired greeting card using a simple circuit that lights up an LED in their design.

What's Included?

In this lesson plan you will find the lesson procedure, NVACS standards for Science and Visual Arts (grades 4-8), vocabulary and definitions list, circuit guides, and a rubric for assessment.

Materials Needed

- 5mm Light emitting diodes
- 3V Lithium batteries
- 1/4" Conductive copper tape
- Scissors
- Scotch tape or black electrical tape
- 8.5" x 11" white cardstock
- 2"x2" white paper squares
- Cardstock or construction paper in various colors
- Colored pencils, markers, etc.
- Circuit guides*
- Rubric*
- Photos of neon signs, Las Vegas architecture, skylines



*Provided in this lesson plan

For more lesson plans and educator resources please visit www.neonmuseum.org.

Introduction

1. Have students explore The Neon Museum's Online Guide, found in the Education area of the museum website.
2. Discuss with students if they have been to the Strip and what hotel/casinos they have seen or visited. What do they remember? What signs or buildings stood out to them and why?
3. Explain that all of the signs we see are lit up by electric circuits and currents. Today they will be making their own artwork light up! Introduce/review electricity terms.

Artwork Creation

1. Provide photos of neon signs, Las Vegas architecture, and skylines to use as inspiration and reference.
2. Give each student a piece of 8.5"x11" cardstock and instruct them to fold it in half "hamburger style".
3. Students will draw or collage their own Vegas-themed or sign-inspired artwork on the right half of the paper. Their design can be portrait or landscape.
4. Remind them to think about what part of their artwork they would like to light up. Their circuit is going to go on the inside of the card. When finished with their design, they will need to poke a hole in their artwork where they want the LED to go. You may need to assist with this step.

Adding Electricity

1. Provide students with the circuit guide page as well as an LED, 2"x2" white paper square, battery, copper tape, and scotch or electrical tape.
2. If your students do not want to bend part of their card to close the circuit, they can fold the white paper square in half diagonally and attach it to a front corner of the card. They will then use that as their "switch" instead of bending the card itself to close the circuit.
3. Have them push the LED through their artwork so the metal legs stick out the back.
4. Demonstrate how to create a simple circuit or show one of the linked videos in the Resources section of this document.

5. Using the circuit guides, students can sketch out in pencil what their circuit will look like before starting with the tape. Have them label the parts of the circuit.
6. Remind students how important it is to know which side of the battery is + vs. -, same with the LED legs. Show them how the LED lights up when you close the circuit.
7. Assist students as needed while they create their circuits.

Group Share & Assessment

1. Have students share their artworks, demonstrating that they successfully created a working circuit. They may say why they chose their imagery, what they wanted to light up, and/or what they learned.
2. Use the attached rubric in this lesson plan for student's projects. There is a space for written teacher feedback at the bottom. Students could also complete the rubric as a self-evaluation.

Lesson Extensions

1. Students can design their own signs and skylines for fictional businesses or cities.
2. Have students explore parallel and series circuits and using multiple LEDs or batteries.
3. Try out different types of switches to turn the LED on and off.
4. Students can write reflective artist statements explaining their choices, struggles, and accomplishments.

Troubleshooting

- If a student's project is not working, first check that the positive (+) and negative (-) sides of the battery and LED are matching.
- It could also be that the battery or LED are not securely attached. Press down firmly and use more scotch or electrical tape as needed. Be careful to make sure the battery can still touch the copper tape without being blocked.

Artists/Makers to Look At

- Jie Qi: artist, engineer, and founder of Chibitronics.
<http://technolojie.com/>
- Leah Buechley: engineer, designer of wearable tech.
<https://twitter.com/leahbuechley>

Resources

- The Neon Museum's Online Guide (password: neon)
<https://www.neonmuseum.app/>
- Sparkfun's Great Big Guide to Paper Circuits
<https://learn.sparkfun.com/tutorials/the-great-big-guide-to-paper-circuits/all>
- Paper Circuits for Makerspaces
<https://www.makerspaces.com/paper-circuits/>
- 60 Seconds DIY Paper Circuit Tutorial by Fawn Qiu
<https://www.youtube.com/watch?v=IZGWkCR7T6E>
- BrainPOP: Electricity
<https://www.brainpop.com/science/energy/electricity/>
- DK Findout! Electricity
<https://www.dkfindout.com/us/science/electricity/>
- Chibitronics - LED circuit stickers, tutorials, and more
<https://chibitronics.com/>

NV Academic Content Standards: 4th Grade

Science:

- **4-PS3-4** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Visual Arts:

- **VA:Cr2.4.1** Explore and invent art-making techniques and approaches.
- **VA:Cr2.4.3** Document, describe, and represent regional constructed environments.

NV Academic Content Standards: 5th Grade

Science:

- **5-PS1-3** Make observations and measurements to identify materials based on their properties.

Visual Arts:

- **VA:Cr2.5.3** Identify, describe, and visually document places and/or objects of personal significance.
- **VA:Cn11.5.1** Identify how art is used to inform or change beliefs, values, or behaviors of an individual or society.

NV Academic Content Standards: Middle School

Science:

- **MS-PS2-3** Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- **MS-PS3-5** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

Visual Arts:

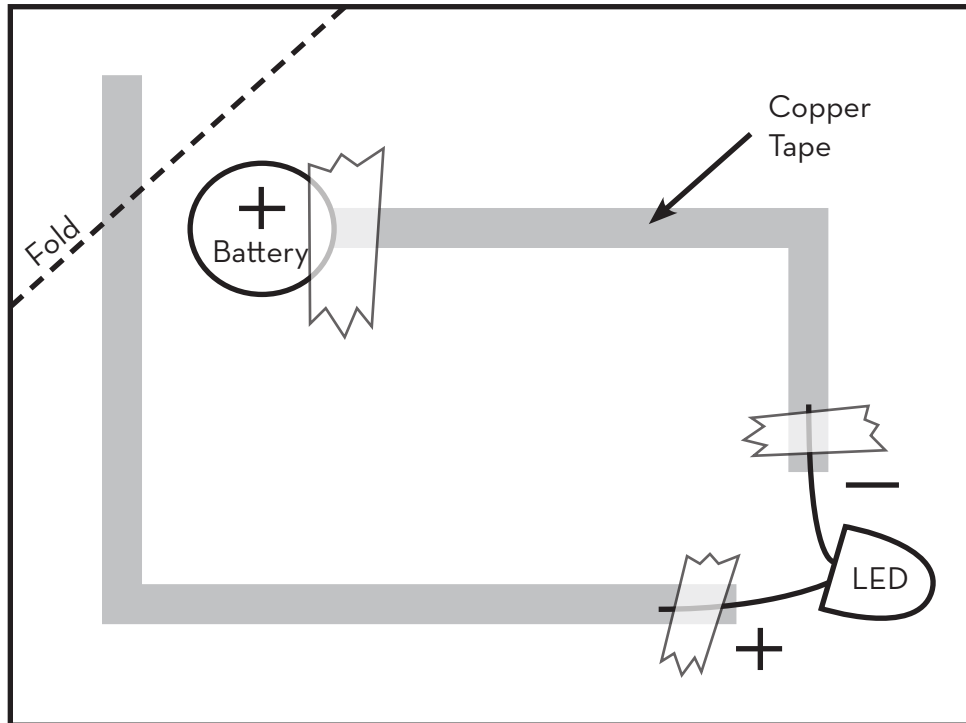
- **VA:Cn11.6.1** Analyze how art reflects changing times, traditions, resources, and cultural uses.
- **VA:Cr2.7.1** Demonstrate persistence in developing skills with various materials, methods, and approaches in creating works of art or design.
- **VA:Cr1.8.2** Collaboratively shape an artistic investigation of an aspect of present day life using a contemporary practice of art and design.

Vocabulary List & Definitions

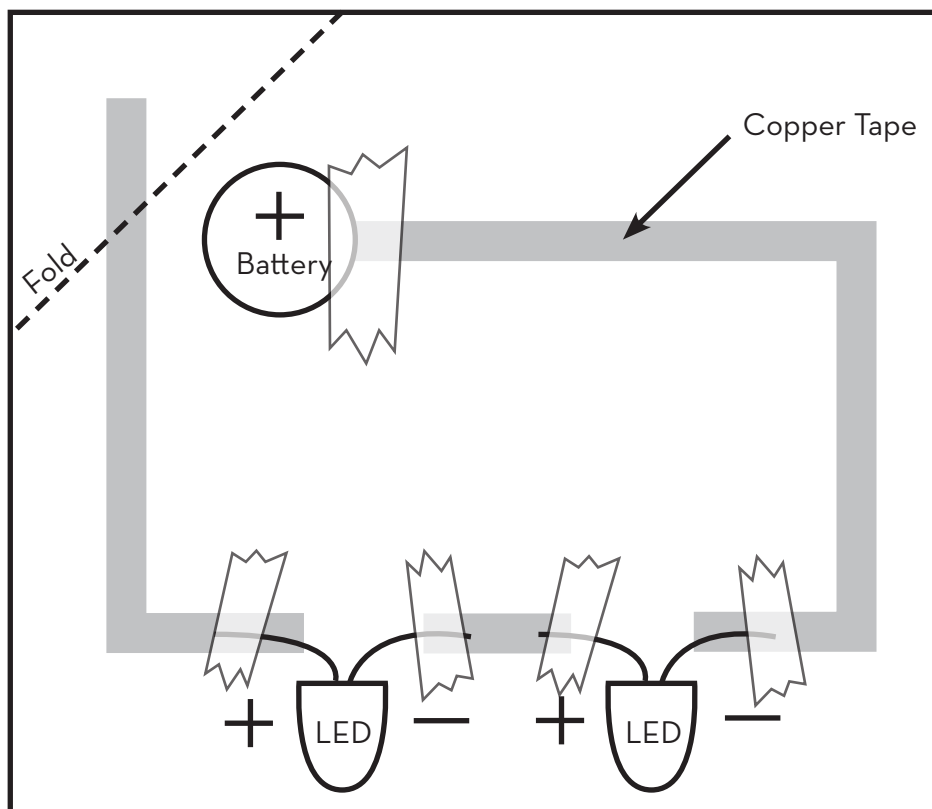
- **Circuit** - a complete path through which electricity flows
- **Load** - something using the electricity (ex: lightbulb)
- **Simple circuit** - consists of a power source, one load, and wire
- **Series circuit** - has more than one load arranged one after another but has only one path for electricity to flow (ex: string lights). If one stops working, they all stop.
- **Parallel circuit** - has multiple paths for electricity to flow and multiple loads. If one load stops working the others are unaffected (ex: car headlights).
- **LED** - light emitting diode, glows when voltage is applied to it
- **Conductor** - substance that can easily transfer electrons (ex: copper)
- **Electricity** - a type of energy caused by the flow of electrons
- **Polarity** - electric charges have either positive or negative polarity
- **Electric current** - the rate of flow of electric charges (electrons)
- **Conductivity** - how well a material conducts electricity
- **Neon** - a tasteless, colorless, inert gas. When an electric current is discharged through it, neon produces a reddish-orange glow.
- **Architecture** - the art and science of designing buildings
- **Googie architecture** - an American roadside building style popular in the 1950s designed to attract car-driving customers. Outrageous, futuristic and garish these commercial buildings were often the work of carpenters, contractors, marketers and not necessarily architects.¹
- **Skyline** - outline of land and buildings against the sky

1. The Paul Revere Williams Project, "Architecture Glossary," Paul Revere Williams - American Architect (The Paul Revere Williams Project, 2010), <https://www.paulwilliamsproject.org/uploads/files/Architecture%20Glossary.pdf>.

Simple Circuit Guide



Series Circuit Guide



Name: _____



Paper Circuits Rubric

	4 (Exceeds)	3 (Meets)	2 (Approaches)	1 (Emergent)
Functionality: Complete circuit and working LED	The circuit is complete and the LED lights up. Explored other circuit types.	The circuit is complete and the LED lights up.	The circuit is complete but the LED is not working.	The circuit is not complete and the LED does not work.
Theme: Las Vegas signs & architecture	Shows creative use of theme in design.	Incorporates the theme.	Limited understanding of theme.	Does not incorporate theme.
Knowledge: Can identify parts of a circuit	All parts of the circuit are labeled and student can discuss with others.	All parts of the circuit are labeled.	All but one part of the circuit are labeled.	Few to no parts of the circuit are labeled.
Total				

Comments:
