Lesson Objective:
Students can develop understanding of the flow of electrons in a circuit through movement.

21st Century Skills:
- Collaboration
- Critical Thinking
- Creativity

Content Standards:

**SCI- 4-PS3-2.**
Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat and electric currents. **Students develop choreography in this lesson and observe the transfer of energy through dance.**

**DA:Cn10.1.4.b.**
b. Develop and research a question relating to a topic of study in school using multiple sources of references. **By choreographing movements to explain how circuits work, students will develop a greater understanding of how to communicate information through dance.**

Essential Questions:
How can we demonstrate circuitry through choreography?

Warm-Up - 10 Min

Dancing through Sound - follow these steps:
1. Choose a series of sound effects.
2. Listen to the sound and pick a word to describe it.
3. Play the sound again. Students move their bodies in a way that depicts the sound and the word they chose.
4. Extend using this card: https://educationcloset.com/2012/11/13/dancing-through-sound/
Lesson Sequence:

Circuits were first discovered in the 1800s but were being used in new and creative ways during the early 1900’s following Edison’s discovery of the lightbulb in 1879. Through this lesson students practice developing meaningful choreography while cementing their understanding of energy transfer.

PRE-ASSESSMENT

Review the definition of a circuit. The word circuit literally means “a movement that starts and ends in the same place” but in the context of science we understand a circuit to be “a closed path of energy flow.” As a class, brainstorm different types of circuits used in daily life.

Have students view the Tiny Circus Elephant Trap video and analyze how energy was transferred to trap the elephant. Was this a circuit? Did the movement start and end in the same place?

Use the Artful Thinking Routine listed below.

Ask: What is the relationship between the first action taken by the elephant and the final action of the basket falling? How is sound used in this artwork? (5 minutes)

ENGAGEMENT

Have students move to an open space for movement and introduce the concept of the six movements of the spine.
- Arching Forward and Back
- Reaching Side to Side
- Twisting Left/Right

Then, have the students move specific parts of their bodies in isolation. Ask: Can you move just your shoulders up and down? Can you move just your elbows forward and backward? Can you move just your head side to side? (10 minutes)

Artful Thinking Routine

Connect/Extend/Challenge routine. Ask the following questions about the video:

• How is the video connected to something you know about?

• What new ideas or impressions do you have that extended your thinking in new directions?

• What is challenging or confusing? What do you wonder about?

Artful Thinking by Project Zero is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License. Routine found here: http://pzartfulthinking.org/
Next, gather students into a circle and guide them through an exploration of the six directions. First students will practice side-to-side movement.

**Ask:** Can you make your body move to the right as if it is sliding? Can you move to the left in a folding motion? A chasse motion? What other ways can you move your body in these directions?

Explain to the students that the circle they make with their bodies is like a circuit. Students bodies are acting as conductors while the teacher’s body is acting as a battery, which powers the circuit. Electrons can be passed through the conductor because they all have the same negative charge and repel each other. Try passing a motion all the way around the circle until it returns to the original dancer.

**Ask:** What part of a circuit does our movement represent?

*(10 minutes)*

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**Step 4: Main Activity/Project**

Students will break into small groups up and decide who will be the “battery.” Instruct students to stand in a circle.

The “battery” will indicate a direction by taking an action with a isolated part of their body and will stop their movement after they have shown it once (i.e.: swinging their arm direction or sliding their foot out at a diagonal).

The students in the circle will repeat the motion one at a time as it moves around the circle. The students will switch roles to complete the task a two more times, developing new choreography each time.

**Ask:** How do these actions represent a transfer of energy from one student to another?

*Estimated Time: 15 minutes*
EXTENSION (Optional):

To extend this activity have one or two students within the circuit act as “lightbulbs” and one student act as a “switch.”

What happens when the switch is off, can the electrons be transferred to power the lightbulb? What about when the switch is on?

**Ask:** How can you develop choreography that shows a switch being turned on or off in the circuit circle? What choreography can be used to represent a lightbulb being on or off?

*(10 minutes)*

CLOSING

**Exit Ticket**

Have students use a notecard and pencil to draw a basic closed circuit and label the:

- load
- source
- conductor
- and electrons.

Lesson Assessment - RUBRIC

**Circuit Study**

Have students break into small groups. Each group will select one task card and read it aloud. Together the group will need to determine how to best represent their specific circuit through original choreography.

Teacher To Teacher

Make sure to model safe movement before and during student dance instruction.

Try to speak in a rhythmic fashion while instructing students to encourage beat recognition.
TEACHER SCORING GUIDE

Utilize this scoring guide to provide consistency in student circuitry dances.

## Circuit Study Teacher Rubric

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Distinguished (Level 4)</th>
<th>Excelling (Level 3)</th>
<th>Adequate (Level 2)</th>
<th>Basic (Level 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The dance accurately demonstrates the movement of electrons in a circuit.</td>
<td>All attributes of the circuit are correct.</td>
<td>Most attributes of the circuit are correct.</td>
<td>Some of the attributes of the circuit are correct.</td>
<td>Few to none of the attributes of the circuit are correct.</td>
</tr>
<tr>
<td>The dance uses representational choreography to model energy transfer.</td>
<td>The dance contains choreography that represents each part of the circuit and all are appropriate choices for each step in the circuit.</td>
<td>The dance some representational choreography and all or most are appropriate choices for each step in the circuit.</td>
<td>The dance contains some of choreographed aspects of a circuit and some are logical choices for each step in the circuit.</td>
<td>The dance contains few or no choreography representing the steps of the circuit or the choreography used is not appropriate for the subject.</td>
</tr>
<tr>
<td>The dance accurately depicted the relationship between a battery and electrons.</td>
<td>The dance provides a clear and obvious relationship between the battery and the electrons.</td>
<td>The dance provides a distinguishable relationship between the battery and the electrons.</td>
<td>The dance provides a vague relationship between the battery and the electrons.</td>
<td>The dance displays no relationship between the battery and the electrons.</td>
</tr>
<tr>
<td>Everyone in the student group worked collaboratively to create and perform the circuit choreography.</td>
<td>All students in the group have an active role in the creation and performance of the dance.</td>
<td>Most students in the group have an active role in the creation and performance of the dance.</td>
<td>Some students in the group have an active role in the creation and performance of the dance.</td>
<td>Few students in the group have an active role in the creation and performance of the dance.</td>
</tr>
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</table>
# STUDENT SCORING GUIDE

Use this rubric to help guide your work and to reflect on your finished circuitry dance.

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<tr>
<th>Criteria</th>
<th>Distinguished (Level 4)</th>
<th>Excell (Level 3)</th>
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<th>Basic (Level 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our dance accurately shows the movement of electrons in a circuit.</td>
<td>All the parts of the circuit are correct.</td>
<td>Most of the parts of the circuit are correct.</td>
<td>Some of the parts of the circuit are correct.</td>
<td>Few to none of the parts of the circuit are correct.</td>
</tr>
<tr>
<td>Our dance uses meaningful choreography to model energy transfer.</td>
<td>The dance contains choreography that represents each part of the circuit and all</td>
<td>The dance some representational choreography and all or most movements are</td>
<td>The dance contains some of choreographed aspects of a circuit and some movements are</td>
<td>The dance contains few or no choreography representing the steps of the circuit and/or the movement used is not appropriate for the subject.</td>
</tr>
<tr>
<td></td>
<td>movements are appropriate choices for each step in the circuit.</td>
<td>appropriate choices for each step in the circuit.</td>
<td>logical choices for each step in the circuit.</td>
<td></td>
</tr>
<tr>
<td>Our dance correctly depicted the relationship between a battery and</td>
<td>Our dance provides a clear and obvious relationship between the battery and the</td>
<td>Our dance provides a distinguishable relationship between the battery and the</td>
<td>Our dance displays no relationship between the battery and the</td>
<td></td>
</tr>
<tr>
<td>electrons</td>
<td>electrons</td>
<td>electrons.</td>
<td>electrons.</td>
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</tr>
<tr>
<td>Everyone in our group worked together to create and perform the</td>
<td>All students in our group have an active role in the creation and performance of</td>
<td>Most students in our group have an active role in the creation and performance of</td>
<td>Some students in our group have an active role in the creation and performance of</td>
<td>Few students in our group have an active role in the creation and performance of</td>
</tr>
<tr>
<td>circuit choreography.</td>
<td>the dance.</td>
<td>the dance.</td>
<td>the dance.</td>
<td>the dance.</td>
</tr>
<tr>
<td><strong>Open Circuit:</strong> The circuit is not complete or becomes disconnected and electricity is unable to pass through. When this occurs, the circuit is unable to power anything.</td>
<td><strong>Parallel Circuit:</strong> Multiple loads are connected to the same source but have their own conductors (two or more paths from the conductor to the individual loads).</td>
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<tr>
<th><strong>Closed Circuit:</strong> All conductors are connected and electricity is able to flow through the conductor and reach the light bulb.</th>
<th><strong>Series Circuit:</strong> One circuit (and one conductor) contains multiple loads. The electricity must travel through the first load to reach the second load.</th>
</tr>
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<tbody>
<tr>
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