

Lesson Plan for Henrico 21 Awards

Lesson Title: Parallel and Series Circuits

Lesson Submission Number:

Target Grade/Subject: 4th/Science

Length: 5 days: Each day 45 minutes-1 hour block

Summary: *(Summarize your lesson in 250 words or less)*

With just the definitions of series and parallel circuits and their prior knowledge of electricity, students made plans to construct circuits using Educreations on the iPad prior to constructing circuits using the given materials (wires, bulbs, batteries). Students worked in pairs to construct circuits using the given materials. Students made videos documenting their success and reflected on reasons why their circuits were successful. The learning was connected to the wiring of the lights on the Rockefeller Christmas Tree, and students watched a video where an electrician (one of the 4th grade teacher's dad) explains what type of circuit the Rockefeller Christmas Tree uses to ensure that all lights stay on, even if one burns out.

Essential questions: *(What are the foundational questions that students should be able to answer after this lesson?)*

How does electricity affect our lives?

What is electricity?

How can I make a lightbulb light up?

How do you wire a circuit with multiple bulbs to allow a bulb to stay lit when one goes out?

What is the difference between a series and a parallel circuit?

Lesson Development:

Process/Tasks/Assessment: *(Describe what the teacher and students are doing during this lesson. Include details about particular tasks and essential resources/tools. Include a description of the artifact that you will collect as evidence of content/skill mastery and state how you will communicate your assessment expectations to the students).*

Materials Needed:

- Small light bulbs
- Wires
- Batteries
- Light bulb holders
- Battery holders

- iPads
- [Educreations app on iPad](#)
- [Electricity Reflection Google form-](#)
- [Parallel and series check in](#)
- [Google site to help research electricity](#)
- [Video of electrician:](#)
- [Animoto Created about the lesson](#)
- [Sample of student Educreations](#)
- [Photos of students working](#)

Part 1:

Learning Target: I can explain the impact electricity has on our lives.

The students came in to the classroom in the morning with all electricity off: lights out, Promethean board off, iPads weren't charged, etc. They had to complete all assignments with paper and pencil (no technology). This lasted for about 2 hours. We then posed the essential question: How does electricity affect our lives? Students discussed the impact losing electricity had on their learning that day and the importance of electricity in their daily lives.

Part 2:

Learning Target: I can create closed and open circuits.

Students were given materials (wires, light bulb, and battery) with the task to light the bulb. Students worked in pairs of two, which were chosen at random. Once all students had mastered the task of lighting up their bulb (through background knowledge and trial and error), they used the video recorder on their iPads to create a video discussing the steps they took, their findings, and their reasonings for why the light bulb lit up. We then gathered back as a class and students shared their findings. As a class, we discussed the terms open and closed circuits while modeling this with drawings on the Promethean board. Students constructed their own questions while we were talking. Some questions included: What would happen if we used the chair to create a closed circuit? A pencil? An earring? A shirt? We experimented with these materials to see what conducted electricity and could create a closed circuit and what could not. Partners then practiced creating open and closed circuits based on the information learned.

Part 3:

Learning Target: I can create a series circuit and explain how it works.

Students were presented with the definition of a series circuit (a circuit which allows only one path for the flow of electricity) on the Promethean board. They used the Educreations app on their iPads to plan for what they were going to do to create a series circuit. They used the pictures of batteries and light bulbs on Educreations and drew in wires to create the model of the circuit they wanted to construct. Students were then assigned new partners from yesterday at random. Students then shared their Educreations drawing with their partners and decided on one plan to implement. They then built their series circuits. Students shared their findings verbally with the class, while demonstrating with the materials. We discussed what would happen if you removed one of the light bulbs from the circuit. Students explored this concept with

their created circuits. Sticky notes were passed out to students for a quick exit ticket/assessment. On the sticky notes, students were to write what a series circuit is and why one light bulb goes out when you remove the other.

Part 4:

Learning Target: I can create a parallel circuit and explain how it works.

Students were presented with the definition of a parallel circuit (circuit which allows a current to flow along more than one path) on the Promethean board. We discussed that if a light bulb is removed from the circuit, the other bulbs would stay lit. Students used a Google Form to answer questions to reflect on their knowledge of a series circuit and how it will be different from a parallel. (The questions included on the form are listed under materials.)

The students then used the Educreations app on their iPads to plan for what they were going to do to create a parallel circuit. They used the pictures of batteries and light bulbs on Educreations and drew in wires to create the model of the circuit they wanted to construct. Students were then assigned new partners at random. Students then shared their Educreations drawing with their partners and discussed why they chose to construct their circuits the way they did. The two partners chose which plan would work better, discussed why, and implemented the plan. Students were instructed to test their circuits by removing one bulb. If their plan worked and they created a successful parallel circuit, they were instructed to record themselves on Educreations explaining why their plan worked. If they were unsuccessful at first, they explained what went wrong and what they did to resolve the problem. Students shared their findings with the class. We drew how a parallel circuit is created on the Promethean board and any students who had not yet created one that worked went back and did so.

Part 5:

Learning Target: I can compare series and parallel circuits.

We discussed the difference between a parallel and a series circuit and how it relates to a string of Christmas lights. Students were asked what type of circuit they believe is used when designing Christmas lights and why. Students watched a video that an electrician who works on the Rockefeller Christmas tree created for them. In this video he discusses how parallel and series circuits, applies to the Rockefeller Christmas tree, and shows them what happens when a bulb from the tree is removed. As an assessment, students completed the *Parallel and Series Check In* sheet which requires them to draw a parallel and series circuit and explain the difference between the two.

TIP Chart Assessment:

Categories:

Research and Information Fluency:

Ideal/Target - Students constructed their own questions and used hands-on learning and exploration to research the essential questions. Next, they assemble and synthesized this information to address goals authentic circuit creation tasks. Throughout the research, students

made observations and directed their research in order to answer their questions. Finally, students used tools to powerfully display and interact with information.

Communication and Collaboration:

Ideal/Target - Students assessed their authentic task in a variety of ways including verbal whole group and partner discussions/demonstrations, created videos to demonstrate their thinking with classmates, and completed a Google Form reflecting on their findings which was then shared with the class. They also collaborated with other partners in the class to help them problem solve.

Critical Thinking and Problem Solving:

Approaching- Teachers posed questions and gave many different learning opportunities (Educreation planning and hands-on circuit exploration) for students to problem solve how to design specific circuits. The students were only given the definition of a series and parallel circuit (were not provided a diagram) and had to use a baggie of materials, all of which were mixed up and had to think critically about how to make a light bulb light up. When students were unsuccessful with creating a working circuit, teachers proposed questions to facilitate their thinking. Students generated their own questions after experimenting with circuits, which were answered by their own experimenting (ex: Part 3). They also answered questions related to their learning during group discussions, as well as on a Google Form. Students used iPads to videotape their explanation of why they constructed the circuits the way they did and explain what type of circuit it was.

Creativity and Innovation:

Approaching- Teachers did not set a parameter for experimentation. Students made hypotheses and drew conclusions based on their own creativity. For example, when posed with the task of lighting a light bulb up, some students solved the problem using materials not given in the baggie- for example: students connected wires to the metal on the pencil eraser instead of using the wires provided.