**Parallel and Series Circuits**

**LESSON OVERVIEW - Summary** of the task, challenge, investigation, career-related scenario, problem, or community link.

Students will construct and analyze both series circuits and parallel circuits in this lesson’s hands-on, group activity. The lesson begins with some direct instruction that is meant to lead the students to an understanding of the similarities and differences between the two types of simple circuits, and challenge them to relate this to their home’s circuitry.

**STANDARDS - Identify what you want to teach.** Reference State, Common Core, ACT College Readiness Standards and/or State Competencies.

GLE 0607.Inq.5 - Communicate scientific understanding using descriptions, explanations, and models.

SPI 0607.12.1 - Identify how simple circuits are associated with the transfer of electrical energy when heat, light, sound, and chemical changes are produced.

**OBJECTIVE - Clear, Specific, and Measurable – NOT ACTIVITIES -** Student-Friendly

The students will identify the three essential parts of a circuit.

The students will constuct an understanding of the similarities and differences in series circuits with parallel circuits.

Students will aply the concept of the simple circuits to their house, determining what type of circuit it has.

**ASSESSMENT/EVALUATION - Students show evidence of proficiency through a variety of assessments -** Aligned with the Lesson Objective. Formative/Summative. Performance-Based/Rubric

Student will be given handouts that will lead them through the construction models of both the series and parallel circuits. The handouts will also require the students to draw diagrams of the models they develop. The diagrams should be labeled to identify the essential parts of the circuit.

A ticket-out-the-door will be used to assess the final objective. Students will be asked to identify what type of circuit their house is wired with and what reasoning they used to come to their conclusion.

**MATERIALS - Aligned with the Lesson Objective -** Rigorous & Relevant

* Forces in Nature PowerPoint
* battery, 6 V
* flashlight bulb with holder (3)
* wire leads, copper, insulated with alligator clips attached (5)

**ACTIVATING STRATEGY - Motivator/Hook -** An Essential Question encourages students to put forth more effort when faced with a complex, open-ended, challenging, meaningful and authentic questions.

The class will start with a Bellringer question. The question will be on the board as the students enter the room. They should go to their seats and begin answering the questions as soon as the bell rings. This procedure was taught during the first few weeks of school and has been practiced almost daily. The students should understand the expectations be able to follow the procedure with out direction. The Bellringer questions are:

What happens when you turn the lights on?

What allows lights to be turned on and off?

Write your answers or draw an explanatory picture for later reference in your **Interactive Science Notebook.**

What happens beyond the confines of the room when you flip the light switch?

The class will be given time to formulate their answers and record them in their Interactive Science Notebooks (ISN’s). The students will share their answers with their neighbors, then the neighbors will nominate a classmate to share their ideas. Two to three student should be given a chance to share. The teacher will leave the answer open and revisit the question toward the end of class.

**INSTRUCTION - Step-by-Step Procedures-Sequence -** Discover/Explain – Direct Instruction, Modeling Expectations – “I Do”, Questioning/Encourages Higher Order Thinking, Grouping Strategies

The teacher will explain the day’s objectives after the class has finished its discussion of the Bellringer. The day’s objectives are:

* Name the three essential parts of a circuit.
* Compare series circuits with parallel circuits.
* Determining what type of circuit your house is wired with.

Class will continue with a short period of direct instruction during which time the students will be expected to take notes and provide responses when they are requested by the teacher. The lecture will introduce the students to the basic parts of a circuit (energy source, wire conductor, and a load). Examples of a load will be provided and the uses of a switch will also be explained.

The next two slides will define and illustrate series and parallel circuits. Each of the different parts of the circuit will be pointed out in the diagrams in order to reinforce the names attached to the essential parts.

The direct instruction portion of the class will conclude with a brief introduction to the term “short circuit” and a comparison of fuses and circuit breakers.

Before transitioning to the lab for the remainder of the class, the teacher will introduce the circuit building activity. The teacher will explain that every student is expected to provide a completed activity sheet showing his or her own work. The teacher will divide the class into groups. It will be beneficial to devide the visual/special learners and the kinesthetic learners evenly through the group to facilitate the process and provide the best opportunities for learning.

The teacher will remind the students of the safety precaution they need to take while conducting this simple lab. They need to be aware that even the simple, 6v batteries can cause some wires to get hot, and if they notice this happening, they should disconnect the battery immediately. The need to be aware that the light bulbs will get hot and that they should be handled with care. They should also understand that the bulbs are made of glass and that they could be cut if the glass breaks. In the event there is an accident, they should contact the teacher immediately and allow the teacher to clean up the broken glass.

**GUIDED & INDEPENDENT PRACTICE – “We Do”-“You Do” -** Encourage Higher Order Thinking & Problem Solving, Relevance

As stated previously, the teacher will divide the class into groups. It will be beneficial to divide the visual/special learners and the kinesthetic learners evenly through the group to facilitate the process and provide the best opportunities for learning. Each group of 3 - 5 students will be given a kit with the materials needed to construct a simple circuit.

The groups will be asked to first build a series circuit with two light bulbs. They will sketch their model. They will then add another light bulb to the series and record their observations at to how the brightness of the bulbs changed when the third bulb was added. (The bulb should dim slightly.) They will then be instructed to unscrew one of the lights and record what happens to the circuit (all the lights go out). They will also need to explain why happens (because unscrewing the bulb breaks/opens the circuit).

The second activity sheet requires the students to build a parallel circuit using two light bulbs. They will sketch this model as well. They will then add a third light bulb to the circuit and record their observations with regard to how the brightness of the bulbs is affected (they should stay the same, not dim). Once again, they will be instructed to unscrew one of the bulbs, record what happens, and explain why (only the unscrewed bulb will go out because each bulb has its own complete circuit in a parallel circuit).

As the students finish, they will be instructed to clean up their stations, making sure to remove all the leads from the batteries.

**CLOSURE - Reflection/Wrap-Up -** Summarizing, Reminding, Reflecting, Restating, Connecting

Students will return to their seats to reflect on the activity and relate it to their lives at home. The will be asked to sketch a room in their home in their ISN. They will need to include the wiring associated with the electrical equipment in the room (lights, TVs, radios, ect.). They will need to label the different parts of the circuit(s) that make up the room, and identify what type of circuit it is. If time does not allow, this activity can be done as homework.

Students that do not want to draw can be allowed to give a written description of the circuit. It must identify the type of circuit and the different components that make it complete.

**CROSS-CURRICULAR CONNECTIONS**

There is direct connection to language arts as the students will be required to properly structure their sentences during the Guided & Independent Practice.

**NOTES**

Quick Lab DATASHEET FOR QUICK LAB

A Series of Circuits

MATERIALS

* battery, 6 V
* flashlight bulb with holder (3)
* wire leads, copper, insulated with alligator clips attached (5)
* knife switch (1, optional)

SAFETY INFORMATION  

PROCEDURE

1. Connect a 6 V battery and two flashlight bulbs in a series circuit. Draw a picture of your circuit. Label the energy source, wire leads, the load(s), and the switch.

 2. Add **another flashlight bulb** in series with the other two bulbs. How does the brightness of the light bulbs change?

 3. Carefully unscrew one of the lights from it’s socket. What happens to the other lights in the circuit? Why?

Quick Lab DATASHEET FOR QUICK LAB

A Parallel Lab

MATERIALS

* battery, 6 V
* flashlight bulb with holder (3)
* knife switch (1, optional)
* wire leads, copper, insulated with alligator clips attached, (7)

SAFETY INFORMATION  

PROCEDURE

 1. Connect a 6 V battery and two flashlight bulbs in a parallel circuit. Draw a picture of your circuit. Label the energy source, wire leads, the load(s), and the switch.

 2. Add another flashlight bulb in parallel with the other two bulbs. How does the brightness of the light bulbs change?

 3. Replace one of the light bulbs with a burned-out light bulb. What happens to the other lights in the circuit? Why?