

Lesson Five

Circuits with Formative Assessment

Grade: Fourth Grade

Time: 60 Minutes (w/small group accommodations)

Materials: Based on a class size of twenty, 25 wire segments (w/stripped ends exposing bare wire), 25 C batteries, and 25 miniature light bulbs. Students will need their science journals set up w/ a proper heading including the date. 25 copies of the circuits handout, crayons, and colored pencils. The classroom “K-W-L” from the first lesson.

Objective: Students use three simple household items to make a light bulb illuminate. They will record their observations in written text as well as a simple diagram. They will identify the differences between a complete circuit and incomplete circuit. They explore and inquire about new ways of constructing a complete circuit using the three simple materials.

Standards: NYS/National Standards

New York State Standards: Standard One: Analysis, inquiry, and design.

- Scientific Inquiry: Key Idea One, The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing creative process. **S1.1** Ask “why” questions in attempts to seek greater understanding concerning objects and events they have observed and heard about. **S1.1a** Observe and discuss objects and events and record observations. **S1.3** Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed. **S1.3a** Clearly expresses a tentative explanation or description, which can be tested.
- Key Idea 3: Observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena. **S3.2** Interpret organized observations and measurements, recognizing simple patterns, sequences, and relationships. **S3.2a**, state orally and in writing, any inferences or generalizations indicated by the data collected.

National Standards:

NS.K-4.2 Physical Science

- As a result of the activities in grades K-4, all students should develop an understanding of the following: properties of objects and materials, position and motion of objects, and light, heat, electricity, and magnetism. Utilized to build an electrical circuit as well as being able to understand electricity and its path traveled.

NS.K-4.1 Science Inquiry

- As a result of the activities in grades K-4, all students should develop abilities necessary to do scientific inquiry, and understanding about scientific inquiry.

Lesson Five (cont.)

Procedure:

- 1.) The teacher will explain to the students that today they will be learning about circuits, and have actually already created a simple circuit in the previous lesson.
- 2.) The teacher will present students with the circuits handout which can be stapled into their journals.
- 3.) The teacher will have the definition for a circuit on the board as well as orally stated and have students copy it on their handout.
Electrical Circuit: An electrical device that provides a path for electrical current to flow.
- 4.) The teacher will then ask students to reflect on their diagrams from the previous lesson to see if they have anything in common with their neighbors. Students will observe that their circuits did not have any gaps and connected both ends of the wire, the bulb, and to both ends of the battery.
- 5.) The teacher will explain that circuits allow electricity to travel in a path, and in this case the electricity is traveling in as well as out of our power source. This is known as a complete circuit, if there were openings or the path was complete this would be an incomplete circuit.
- 6.) At this point students would have understood exactly what complete circuit is, the teacher will ask students to use the three materials (wire, battery, and bulb) to create and incomplete circuit where the path of electricity will not travel through completely.
- 7.) After the teacher has checked and assisted students to assure there circuit is incomplete, the teacher will ask them to draw a diagram of an incomplete circuit on their handout. Students will also write a brief statement explaining why the bulb will not light. The teacher will be looking for, "The bulb will not light be the circuit is not closed and the electricity does not have a complete path to travel.
- 8.) The next step will be to have students recall what a complete circuit should look like. What makes it different than an incomplete circuit? The students will give information such as: it must touch the metal, it must make contact with both sides of the battery, and the bulb must touch the wire and the battery.
- 9.) The teacher will then give students a challenge, to create a complete circuit using the same three materials, yet the circuit must look different then their original complete circuit. Many students responses may be "this is impossible", or "it can't be done". The teacher "encourages students to discuss with their neighbors and states that it can be as simple as turning or moving the bulb".
- 10.) After the students have created a new complete circuit with the teacher's assistance if needed they will draw a diagram. The diagram will be written on the complete circuit section of the handout. Students will also write a brief statement explaining why the bulb lights up. The teacher will be looking for, "The bulb lights up because the electricity has a complete path to travel.
- 11.) **Formative Assessment:** As part of formative assessment the teacher will be circulating around the room observing students working with science materials. The teacher will be looking for students following the science rules, as well as creativity while working with the three items, the teacher will also be observing students following the directions. The teacher will be looking for students following all three of the above items. The teacher will pull out and assist students when needed.

Conclusion: The teacher will conclude this lesson by having a class discussion regarding their learning of the day. The teacher will ask what types of circuits did we create today? What is a circuit? What does it do? The teacher will also explain that the complete circuits were closed, there were no openings, and the incomplete circuits had opening which broke the path of electricity traveling. The teacher will also ask students to refer to the classroom K-W-L created in the beginning of the unit.

Lesson Five (cont.)

The teacher will refer to the “W” what I want to know section. Students will be asked if any of those questions have been answered, and if so recorded on the graphic organizer. The teacher will also ask students to think of what they have already learned to go in the “L” what I learned section. Students should discuss that electricity travels in a path, circuits, complete and incomplete, as well as any other knowledge made from student observations and guided by the teacher.