An Energizing Experience!

Day 4: "Let's get wired up!" – Learning about series circuits

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4th Grade

Let's get wired up!
Series Circuit

Time: 40 Minutes

The main concept to be constructed during the lesson:

There are three main parts of a series circuit; energy source, energy receiver, and energy conductor.

Materials Needed:

- Flashlight (that you can easily take apart)
- 1 - D-Cell battery for each group of 4 or 5 students (plus one for the teacher)
- 2 - 6 inch copper wires with plastic coating for each group of 4 or 5 students (plus one for the teacher)
- 1 – small light bulb for each group of 4 or 5 students (plus one for the teacher)
- Light bulb holder for each group of 4 or 5 students (plus one for the teacher)
- Colored stickers
- 5 plastic zip-lock baggies
- 5 ?/! Papers
- Chalk/White Board
- Chalk/Dry-Erase Markers
- Student Data and Answer Booklets for all children
- Pencils for all children
- Student Resource Booklets for all children
- Student Resource Books for all children
- Flip Camera (Or other digital video camera)

Safety Precautions & Special Procedures:

Teacher will be turning off the lights in the classroom. Make sure students know that they are expected to stay seated while lights are out. Also, the teacher will be taking apart a flashlight, prevent possible shock by making sure the switch is turned to the off position before dissembling it.

Students will be creating circuits, if wires/batteries feel hot at any point students should stop working and notify the teacher. Also, warn students not to touch exposed pieces of the copper wire. (Shocks will not be strong, but students might feel a slight tingle).

~~~~~~Engagement ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Time: 10 minutes

- How does a flashlight work?
  - Turn off all the lights in the classroom and close the blinds to produce a completely dark environment.
    - Before doing this explain your expectations to the students. (ie: no moving around the room when the lights are off, no screaming when the lights are off, etc)
  - Using a flashlight for light, ask the students a variety of engaging questions.
    - How does a flashlight work?
    - Have you ever had a flashlight that didn't work? Why do you think it stopped working?
    - What do you think is inside a flashlight?
  - Teacher turns the lights back on and opens the blinds
  - Teacher than takes apart the flashlight to reveal its make up.
    - Should see a battery, a light, and possibly a switch / wires
    - Make sure all students can clearly see this demonstration from their seats

~~~~~~Exploration ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Time: 10 minutes

Process Skills: Making Inferences, Communication, Experimenting, Forming Models

- Let there be light!
  - Teacher should group students into groups of 4 or 5 (depending on class size). Students can be grouped using any method you prefer.
    - One possible way of grouping students in using the "word chant method". To do this, the teacher will develop a phrase ("Our class loves science") and the students will go around the room repeating this phrase. Each student says only one word. When all students have participated in the chant, the teacher will group all the "our"s together, all the "class"s together, all the "love"s together, and all of the "science"s together.
  - Assign roles to the students within each group. If your science class works on a rotation of jobs, continue this rotation. If not, random assignment will probably work best. (For this lesson, I will randomly be giving each member in the group a different color sticker – this sticker will designate their role for this activity.)
    - Principle Investigator
    - Materials Manager
    - Maintenance Director
    - Recorder

- Reporter (If there are only 4 students in a group, then the recorder will also be the reporter.)
- NOTE: Review the expectations and jobs of each member's role. This can be done using the SMART lesson which accompanies this unit. Role information can be found on slide three of the SMART lesson.

- Ask the materials manager to get a battery, 2 wires, a light bulb, and a bulb holder for their group.
  - The teacher may choose to place these items in a baggy before the lesson.
- Students groups should be spread out around the classroom.
- Ask student to use the materials to make there light bulb light up.

  - Do not give them direction or tell them how to do this; they should explore and discuss different options among themselves.
  - Teacher should make sure all lights and batteries work before class. If students are complaining that their materials don't work the teacher should have a private testing station set up to test these issues without letting the students see how you are doing it.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Explanation~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Time: 12 minutes

- How did you do it?

  - After successfully completing this task, students should draw a picture of the model they created using all the materials in their Student Data and Answer Booklets. They should explain in writing how they made the light come on.
  - Student Data and Answer Booklet (pg 4)
  - If time allows, ask students to return to their materials and see if there are other possible ways to make the connection.
  - When all groups have created and made recordings for at least one circuit, ask the groups to clean up their materials and areas.
    - The materials manager should return the materials to their appropriate places.
    - The maintenance director needs to make sure the space is completely cleaned and notify the teacher after doing so,
  - The class will reconvene, and the teacher will use slide _____ of the SMART lesson to review the circuits they created. The reporters should be chosen to explain their circuits using the SMART board.
    - The teacher may choose to record this part of the lesson using the Flip camera.
  - Teacher will write the following vocabulary words on the board: (teacher should not give definitions yet) – This step is included on slide _____ of the SMART Lesson.
    - Electrical Circuit (Specifically Series Circuit)


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- Energy source
- Energy conductor
- Energy receiver

- Students will return to their groups with their Data and Answer Booklets.
- Students will discuss the new vocabulary words with one another and label the parts of circuit using the appropriate word.
- After students have made conclusions and are confident in their labeling, ask one group to meet with another group to share information and see if they have the same answers.

- Reconvene the class and make sure all students have labeled the parts correctly. You can check for understanding using slide _____ of the SMART lesson
- Ask questions to check for misconceptions.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Evaluation ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Time: 5 minutes

- Vocabulary review
  - Students should turn to the vocabulary section of their Student Data and Answer Booklet and fill in definitions in their own words for the words they learned that day.

  - Teacher will then review these words with the entire class to make sure that students have written appropriate definitions and have a complete understanding of the day's concepts. - This step is included on slide _____ of the SMART Lesson

* Teacher should be using formative assessment throughout the lesson*

Pictorial Assessment: Students will be drawing and labeling circuits during the Explanation of this lesson.

Hands on Assessment: Students will cooperatively work in a group to build a series circuit.

Reflective Assessment: Teacher will be asking reflective questions throughout the Exploration and the Explanation. Student's answers to these questions will identify their understanding of newly learned concepts.

Teacher Records and Observation: The teacher will keep a record of student understanding during all areas of this lesson. Observations will be based off the student's ability to critically think about teacher questions and ability to communicate and work in a scientific team.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~Elaboration ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Time: 3 minutes

- Oh no! My flashlight won't turn on!
  - Pose an everyday situation where a flashlight that you need won't work.

    - Ex: There was a really bad storm at night, and all of the lights in your house went out! You grab a flashlight, but it won't turn on! Oh no!!! Why won't it turn on? What can you do?
    - Ask students to use the think-pair-share method to discuss this situation. They might want to refer to their Student Resource Book, but they should be able to answer this question without using this reference.

Science in personal and social perspective/Science as inquiry:

Students will use the real life situation posed in the Elaboration portion of the lesson to apply their knowledge of electrical circuits.

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