Electricity Unit

Diane Gosney
Andrea Neuschwander
Cathy SooHoo
March 15, 2001
Who Is This For?

- Almaden Country School, San Jose, CA
- 4th grade science teacher
  - Relatively new teacher
- Students
  - 20 per class
  - Ethnically diverse
- Two (2) 40-minute classes a week
What Does Learning Involve?

- Construction of knowledge
- Working together
- Understanding underlying structures and principles
- Arousing curiosity and interest
- Making connections with real life
- Applying knowledge in new situations
- Communicating and sharing with others
- Experiencing information through a variety of methods and senses
What Theories Informed Our Design?

- Duckworth - constructivism
- Gardner - multiple intelligences
- Eisner - forms of representation
- Bruner - underlying structures
- Dewey - experiential learning
What Are Our Broad Goals?

- Students understand content and concepts
- Students use and build on their understanding of the scientific method
- Students work cooperatively within groups
- Students apply knowledge and skills to novel situations
- Students develop continued interest in the subject
Unit Outline

1. What is Electricity?
2. Where Does Electricity Come From?
3. Atomic Structure
4. Static Electricity
5. Current Electricity
6. Conductors and Insulators
7. Resistors
8. Create a Hot Dog Cooker
9. Series Circuits
10. Series vs. Parallel Circuits
11. Electromagnets
12. Let’s Wire Our Town! (Final Assessment)
Current Electricity - Pathfinders

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>G</td>
<td>H</td>
<td>I</td>
</tr>
</tbody>
</table>

**PATHFINDERS**

1. Make a prediction that a star on the over will think will light.
2. Test then color in the sales that did light.
Current Electricity - Pathfinders

Objectives

Students will

- understand that electric current is the flow of moving electrons
- know that energy must be used to push electrons through a circuit - that energy is called voltage
- understand that the energy source is where the energy “push” begins

Assessment

Students’ understanding of the objectives can be assessed through

- observing group and class discussions
- evaluating Pathfinder worksheet
- observing participation in group activity (role play)
CONNECTED UP

You will be building several different series circuits to see what happens when you add more batteries and what happens when you add more light bulbs. A series circuit is a one-way circuit. That means all items in the circuit are connected in a straight line with only one way for the electricity to flow. Remember to write your hypotheses before you begin your experiment.

Questions

Hypotheses (please be sure to tell why you think this)

Materials used

Experiment Steps

<table>
<thead>
<tr>
<th>Data</th>
<th>What happens to the light bulbs?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 battery and 1 bulb</td>
<td></td>
</tr>
<tr>
<td>2 batteries and 1 bulb</td>
<td></td>
</tr>
<tr>
<td>3 batteries and 1 bulb</td>
<td></td>
</tr>
<tr>
<td>4 batteries and 1 bulb</td>
<td></td>
</tr>
<tr>
<td>1 battery and 2 bulbs</td>
<td></td>
</tr>
<tr>
<td>1 battery and 3 bulbs</td>
<td></td>
</tr>
<tr>
<td>1 battery and 4 bulbs</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion (What are the answers to your questions? How do these compare to your hypotheses?)

Draw a circuit diagram of the circuit that made the lights the brightest. Explain why you think this circuit has the brightest bulbs.

Draw a circuit diagram of the circuit that made the lights the dimmest. Explain why you think this circuit has the dimmest bulbs.
Series Circuits - Connected Up

Objectives

Students will

- be able to identify and use the electrical symbols for a battery and a resistor
- be able to correctly draw a circuit diagram of a built circuit
- understand that a series circuit is a single pathway circuit that can connect any number of batteries and bulbs
- understand that adding batteries to a series circuit makes the lights brighter and adding more bulbs makes the lights dimmer

Assessment

Students’ understanding of the objectives can be assessed through

- observing group and class discussions
- evaluating Connected Up worksheet for use of the scientific method and content
Let’s Wire Our Town!

CHECKLIST FOR OUR TOWN

Group members:
_________________
_________________
_________________

Dear town planners,
Please look at your town map. Check off the items you have finished! Good luck and have fun.

☐ Do we have a town name? What did we name it?

☐ Do we have a power plant? What type of power plant is it?

☐ Do we have seven (7) homes?

☐ Do we have three (3) businesses?

☐ Did we wire ALL the buildings with power lines?

☐ Did we use parallel or series circuits?
  ☐ Parallel circuits only
  ☐ Series circuits only
  ☐ Both parallel and series circuits

☐ Did we decide on the materials to use for the electric lines, thinking about conductors and insulators?

Assessment Rubric for the Town Planners

<table>
<thead>
<tr>
<th>Skill / concept</th>
<th>completely demonstrate</th>
<th>partially demonstrate</th>
<th>did not demonstrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Choose a type of power plant and explain the reason and drawbacks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Include 7 houses and 3 businesses in the town map</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Use atoms and electrons to explain current electricity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Provide an example of an insulator for protecting the power lines with explanation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Provide an example of a conductor for creating power lines with explanation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Identify series and parallel circuits correctly in his/her town map</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Connected each building in the town with power lines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Demonstrate cooperative behavior (listening, sharing, respect) within the group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Describe the parts of the activity that he/she enjoyed most and least</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Demonstrate artistic interests / abilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Raise questions during discussion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
Let’s Wire Our Town!

Objectives

Students will

- apply their content knowledge of power plants, current electricity, series and parallel circuits, resistors, conductors, and insulators to their town-wiring project
- be able to connect 1 power plant, 3 businesses, and 7 houses with electrical wires

Assessment

Students’ understanding of the objectives can be assessed through

- observing group work
- evaluating the Checklist
- using the assessment rubric
- evaluating the “How is Our Town Shaping Up” worksheet
- observing participation in class discussions
The End