Lesson Three Spring 2011 Grades 2 to 4

Saturday Science: Grades 3-4 Week 3

Learning Objectives:

1. The students will be able to create a functional circuit using given materials.
2. Students will be able to correctly order the process of receiving electricity to one's house.
3. Students will be able to discuss/draw the difference between static and current electricity.

Indiana Academic Science Standards:

Process Standards 4th Grade:

- Make predictions and formulate testable questions.
- Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.
- Identify simple patterns in data and propose explanations to account for the patterns.

Core Standards

Design and assemble electric circuits that provide a means of transferring energy from one form or place to another.

- 4.1.3 Construct a complete circuit through which an electrical current can pass as evidenced by the lighting of a bulb or ringing of a bell.
- 3.1.3 - Keep and report records of investigations and observations using tools, such as journals, charts, graphs, and computers.
- 2.1.5 - Demonstrate the ability to work with a team but still reach and communicate one's own conclusions about findings.

Teacher Content Knowledge:

Positive and negative charges (opposite) attract and like charges repel. Some materials can have a tight hold on their electrons and not give them up easily. Electrons do not move through them very well. These things are called insulators. Plastic, cloth, glass and dry air are good insulators. Other materials let go of their electrons easily and they can move through them very easily. These are called conductors. Most metals are good conductors. Current Electricity is caused by electrons that move through metal. This flow is called an electric current. Objects that need current electricity are powered by batteries or by electricity which travels along wires from a power station. The circuit is completed by a switch, which turns the appliance on. When the switch is turned off, the circuit is broken and the

appliance is turned off. The steps of transferring electricity from the power plant to one's house are: power plant, transformers, transmission lines, substation, distribution lines, service drop, service panel and, finally, outlets and switches throughout one's house.

Materials:

- Small spiral notebooks for each student
- White board & markers for each group
- Multiple books for students to reference current electricity & how it gets to one's home
- Computers on website for students to reference how current electricity gets to one's home: http://www.alliantenergykids.com/EnergyBasics/AllAboutElectricity/000416
- Battery, 2 wires and light bulb for each small group (12)
- Handout with potential possibilities for lighting the light bulb

Lesson Description:

Introduction: We will begin the class by having the students do a short ice breaker to get to know each other. Each table of students will be asked to find three things the all have in common and three differences between them. Now that we've done a few whole group ice breakers, this week's will help the students get to know their team/table groups better. After the ice breaker, we will finish the online lightning safety quiz that we did not have time for last week. We will then review how lightning begins in the form of static electricity and ends up being current once one is able to see it to transition the students' thinking from static to current electricity as the main focus of the class. Once the students know what the new focus is we will build on our KWL, asking the students what they already know and would like to know about current electricity.

Engage: We will engage the students by telling them, "We are all going to become physicists today!" We will pose questions to the students about how electricity gets to our homes, schools and other buildings.

Explore: We will let the students begin to explore the answers to these questions by providing them with books and a website to reference. One pair of students from their table will look through the books while the other pair is on the website, then they will switch.

Explain: The students will then come together as a table to gather their ideas and create a picture that shows the steps and order of the process of creating and transferring electricity to one's house. We will have the students share their knowledge of the process with us (teachers) as we come around to each table. When each of the groups is done, we will let them share with the class.

Elaborate: Then we will share a book that describes the creation and distribution of electricity to reinforce the information they have discovered during class.

Evaluate: We will reflect on the book and return to our KWL chart as a class. We will ask the students whether there is anything else that they would like to add to the W

(What do we want to learn) part of the KWL, and see if there are any previous questions that we may have answered for the L (What we have learned) part.
Explore: After the students have developed a concept for how electricity is distributed everywhere, we will have them create a circuit of their own. We will give each pair of students a battery, light bulb and single wire, and ask them to make the bulb light. After giving them time to explore this on their own, we will ask them to record their trials by drawing a picture in their notebooks of all the ways they attempted, and chart them based on whether or not they lit the bulb.
Explain: We will explain to them what a "claim" is and have them develop one of their own about how to light the bulb based on what they've noticed from their attempts. We will have them share and discuss what the students think is needed in order to light the bulb. We will be looking for them to describe the wire connecting one end of the battery to the side/bottom of the bulb.
Elaborate: We will then do an activity with the students that let them all create a circuit through touch which then lights up an energy ball. During this activity we will ask students to get into a circle and hold hands to see the ball light up then one of us (James, Amanda, or Heidi) will open the circuit and have the students think and try to trouble shoot why the energy ball won't light up.
Once the students are able to see how a circuit works, we will give them another wire to add to the equation. To help some of the struggling groups we will provide students with a worksheet of pictures of potential ways to make the bulb light. They will attempt what's in the pictures and record whether or not each one worked.
Evaluate: To evaluate the students' knowledge we will go back to our KWL chart and ask them what we have learned, seeing if we have answered any of our questions yet. We might add more to the W if students have more questions they have thought of.

Assessment: Our forms of assessment will include a KWL Chart that we will elaborate on with the students as a large group and keep throughout the entire session, individual notebooks and the light bulb worksheet with which the students will record all potential trials for lighting the bulb, as well as general class discussion.**H**

Handouts/Journals:

Experiment 6-Electric Light Bulb Experiment Report Sheet

Name: _____ **Section:** _____

Part A Section 1:

1. Please select the configurations(s) of battery, light bulb and copper wire that will produc light from the bulb. More than 1 correct answer is possible. Circle the circuits that work.