Lesson Five Spring 2011 Grades 2 to 4

Saturday Science: Grades 2-4 Week 5

Learning Objectives:

1. Students will be able to record the differences and similarities between static electricity and current electricity using a Venn diagram.
2. Students will experiment with different materials recording which are conductors and insulators.

Indiana Academic Science Standards:

Process Standards:

- Make predictions and formulate testable questions.
- Perform investigations using appropriate tools and technology that will extend the senses.
- Identify simple patterns in data and propose explanations to account for the patterns.

Core Standard:

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.

4.1.4- Experiment with materials to identify conductors and insulators of heat and electricity.

4.1.5- Demonstrate that electrical energy can be transformed into heat, light, and sound.

Teacher Content Knowledge:

Static electricity is the buildup of electrons on an object when it is rubbed with another object that gives them up easily. This is what causes your hair to stick up from a balloon rubbing on your head. Atoms make up everything and they consist of a nucleus (center) and an outer shell of electrons. 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 and let electrons flow through them easily. Insulators are needed for static electricity because they take on the electrons from the conductors, while current electricity needs conductors to let the electrons flow through them.Electricity is a form of energy produced by the movement of electrons. Current electricity needs a closed circuit for electrons to travel around. Batteries produce electricity through a chemical reaction within the battery which lets electrons travel out the negative side and back into the positive side.

The lightening rod, which gave an exit for electrons to be released, was discovered by Benjamin Franklin in the 1740's. His hypothesis concluded that lightning was composed of a natural flow of electrons. During his key experiment he discovered that he was indeed correct; electricity and lightning are the same thing! Teachers need to

know that lightning is formed by water vapor rubbing against each other in the cloud creating positive and negative charges that separate in the cloud similar to static electricity. With the negative (electrons) forming at the bottom of the cloud, the ground under the cloud builds up positive charges since opposites attract. After much build up the charges from the ground and cloud meet creating lightening! Static requires insulators to take on the electrons and become statically charged while current electricity requires conductors to transfer electricity. Both of these types of electricity include electrons to create the charge. We use current electricity to power our home, but don't use static.

Materials:

- Small spiral notebooks for each student
- Variety of different fabrics for each small group: cotton, polyester, silk, wool – for each group
- Plastic Comb, Plastic Spoon, PVC Pipe, Straw, Glass Rod, Magnet, tweezers, paper clips, - for each small group
- Manila folders
- 24 D batteries
- Battery clips
- Aluminum foil
- Light bulb clips
- Electrical Tape
- Material for a simple circuit (bulb, battery, wire for each student) (12)
- Scotch Tape
- Glitter
- Lab Computers
- Tissue Paper
- Large White Art Paper
- **Lesson Description:**
- **Introduction:**
- To begin class, we will open with an ice breaker as we do each week. This week's ice breaker is the Candy Game. Students will be seated in a circle as we pass around a candy bowl, and each student may choose a couple pieces of candy that they like. Then we will choose one type of candy and any student who has it will stand and answer a question or follow the directions given. We will do this until we have gone through all of the different candy and each student has had an opportunity to stand and participate. This ice breaker will allow us to continue to get to know each other, as well as provide an opportunity for the students to do something active and silly at the beginning of the day.
- **Engage:**
- Wrap up of circuit board. Take turns with neighbors to experiment if they work. As students tryout their circuit boards, teachers will ask how the circuit board works to see their understanding.

- **Explore**:
- We will be having six centers so students can experience both static and current electricity again. There will be three static activities and three current activities. Each station will last ten minutes and then we will transition. Each teacher will have a station to lead and the other two stations will be on the computer so direct contact with the teacher is not necessary. We all will keep an eye on these two tables making sure they are using the computers appropriately.
- Station one:
- **"How can static be used to pick things up**
- Dancing Paper Bunnies/Glitter Pick Up
- Students will rub pieces of plastic wrap with a piece of wool and hold it over glitter to see how much they can pick up using the materials. Also students will have a chance to explore rubbing Plastic sheets and see how it can react to the paper bunnies on the table. Students will explore how the bunnies jump up and why some of them repel.

If the dancing bunny does not work we will have a contest that involves tissue paper, PCV pipe, and wool. "Whoever picks up the most pieces wins!" Amanda will lead this station Station two:

"How many combinations of circuits can you find?"

http://www.sciencekids.co.nz/gamesactivities/circuitsconductors.html

In this station Students will investigate different materials that complete a circuit. Also they will manipulate different parts of the circuit and see how the light bulb is affected.

Station three:

What kind of circuits can you make with unlimited supplies of batteries, bulbs, and wires?

This station will allow the students to use their creativity with the circuits. They will be given unlimited supplies and see what happens to the light bulb as more batteries and bulbs are added. Meghan will lead this station.

Station four:

Can you make a balloon follow you?

Secret Admirer

In this station students will have a balloon (attached to the ceiling by string) and some fabrics and will attempt to make the balloon follow them using static. Students will rub the face of the balloon and see how it acts toward them and their other classmate's balloons.

Station five:

What are the differences and similarities between parallel and series circuits?

The lead teacher will show the difference between parallel and series circuits. Heidi will lead this station

Station six:

Can you win Who wants to be a Millionaire by answering questions about static and current electricity?

The students will be given time with one partner to answer questions about static and current electricity. This game is an overview of everything we have learned so far in the classroom.

http://www.quia.com/rr/48147.html

Explain:

While the students are in their stations we will be walking around providing explanation of what is going on in that particular station. During this time we will deter their misconceptions and provide the correct justification for those particular phenomena.

Elaborate:

Draw or write a personal narrative on what you felt was your favorite part about Saturday Science. During this time we will encourage them to talk/represent with pictures what they learned during these five weeks. We will have a large role of paper in the middle of the room and invite the students to come up and do their reflection on this.

Evaluate:

Students will be provided with a Venn diagram worksheet to fill in with their groups. Additionally, we will rejoin as a whole group and fill out a large Venn diagram answering the questions, "What are the main differences and similarities between static and current electricity?"

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 in which the students will record any predictions, observations and reflections, as well as general class discussion. As an ending summative assessment we will collect the groups Venn diagrams to see more of an individual understanding. Additionally, we will have the large white reflection sheet to see what the students felt was more important and the overarching idea they got from the class.

Handouts/Journals: The Venn diagram below will be provided for the students.