Electricity Unit Plan

Name of unit: Electricity

Target grade and course: 9th Physical Science

Essential Question:

- ➢ How essential is electricity to everyday life?
- ➢ What doesn't work without electricity?
- ➢ How long could you survive without electricity?
- ➢ What devices could you live without?

Sub-Questions:

STANDARDS (taken from BSD curriculum document)

Science Performance Expectations:

- Use mathematical representation to describe and predict the forces between objects.
- Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Idaho Core Connections

ELA/Literacy:

- Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- Write arguments focused on discipline-specific content.
- Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Mathematics:

- Reason abstractly and quantitatively.
- Write, read, and evaluate expressions in which letters stand for numbers.
- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about quantities.

Standards Reflection: One of the reasons I create inquiry based units is to try and meet the standards in an interesting way. Writing in science is very important and writing lab conclusions helps students relate to real scientist scenarios. Researching is also a great skill for students to continually practice, using information they have gathered to come up with their own conclusions. Using the math equations during labs helps students reason abstractly and quantitatively. After creating a method of power generation, students will use their own variables to calculate their own equations from their own generators.

Conceptual Knowledge (the knowing):

- Students will communicate how electricity and magnetism generate power for a small neighborhood.
- Students will use Ohm's law to describe the system they've created.
- Students will communicate why they've wired their system in such a way for maximum efficiency.

Procedural Knowledge (the doing):

- Students will calculate all parts of the system, using Ohm's Law.

- Students will create a generator that utilizes the relationship between electricity and magnetism.
- Students will use their knowledge of circuits to wire and electrify 6 house from the generators they created.

THE UNIT FLOW

Unit Timeline: based on 15 to 20 – 44 minute periods.

Equipment or materials needed:

- ❖ Computers with internet access – science laptop cart on multiple days.
- ❖ Various supplies students need to make generators and neighborhoods (cardboard, wire – with and without alligator clips, magnets, houses with light bulbs, switches, etc.)
- ❖ Guest speakers in various power production fields.
- ❖ All handouts that go with each lesson or activity.

Day 1 (move #1: Frontloading Activity, activating background knowledge)

1. Introduction to EQ.
2. Quick discussion about "see, think, wonder" pictures.
3. Inventory of electrical items in your house, which ones are essential?

Day 2 (move #1)

1. Pick one "essential item" and research how these devices work (use electricity and provide the "essential" quality).
2. Present to your table group and fill out the rest of the guide sheet. Whose item was the most essential and why??

Day 3-4 (move #2: acquiring knowledge about the topic, #3: practicing with knowledge)

1. Electricity and Magnetism discovery stations.
2. Visit each station, interact with the station, and answer the questions on your investigation sheet.

Day 5 (move #2, 3)

1. De-brief stations and write summaries for each station in your journals. See example for guidance.

Day 6 (move #2, 3)

1. Watch video on electricity and generate a set of 5 questions you'd ask someone if they watched this video. (We will use these later!)

Day 7, 8 (move #2, 3)

1. Guest speakers from power production facilities. (hydropower, solar farm, wind farm, INL)
2. Listen and answer some generic questions about each presentation.
3. You will decide which type of power you want to use in your culminating project at the end of this unit (starts tomorrow!!)

Day 9 (move #4: Using gained knowledge to create something)

1. Introduce the culminating project: Build your own generator and electrify a neighborhood.
    a. Prepare, organize, assign jobs

b. Start researching a solution for power generation. How will you electrify your neighborhood of 6 houses??

Day 10 (move #4)

1. Research how to create your own generator or use the one you created during the discovery stations.
    a. Readings and computers
2. Start building! If you run into issues, or your system doesn't light up – figure out a solution.

Day 11 – 14 (move #4)

1. Build and problem solve!

Day 15 (move #4)

1. Present your design (gallery tour) and grade your peer's power systems.
2. Answer analysis questions independently.
3. Rubric on how I will grade you.

EXTENSIONS and LOCAL CONNECTIONS: (Move #5: where else can we go with this plan??)

Here are some ideas about how to extend this material:

- Students could research different types of power generation and give their own reports; possibly create a proposal to give to a power company.
    - Students could debate about the efficiency of each type of power generation.
- Student could add a cost analysis to their project – upfront costs of initial production vs long term costs of maintenance.
- Students could add the environmental impact of their chosen power generation.
    - If the power generation is petroleum based, the options could be vast.

REFLECTION:

I have been slowly converting all of my units into inquiry based units. This is the latest one. It's always a challenge to try to engage the students about concepts that are theoretical or hard to see. There are also many topics we cover in physical science that require a specific set of vocabulary and many mathematical equations to complicate the learning of content. Using inquiry based strategies has created a spark in the learning of content that I was hoping for. I have put off converting my electricity unit because I find it difficult to narrow down the scope, I want to get into alternative energy production and how the petroleum based production methods are creating lots of pollution but none of this is in the standards. I think this unit is a happy medium between narrowing scope and adding the extensions that relate to the real world.

I didn't get a chance to teach this unit, so I wasn't able trouble shoot real problems, but I can speak to the concerns I have about the potential problems. My biggest concern is the vocabulary attrition during the unit. Without having a vocabulary section, it makes the unit more interesting to the students, but will they get the exposure to the vocabulary that I'd like? A lot of this unit is student-driven. This is expressly the point, but letting more of the control be in the students hands makes me nervous. Will they get the content that I want them to get? Will I have to re-teach so they meet the standards? Because we are still driven by an EOC and

standards, we are all still in a battle between things that are interesting and things that are mandated. Hopefully this unit does both; covers the standards and is interesting for the students.