KNOWLEDGE BUILDING IN ACTION
JUNIOR (4–6)

Exploring Electricity: A Knowledge Building Approach to Science in Grade 6

Written by Elaine Heaver

Bringing IDEAS to life!

2.2 EXPLORING ELECTRICITY: A KNOWLEDGE BUILDING APPROACH TO SCIENCE IN GRADE 6

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INTRODUCTION

The following case study describes part of a Grade 6 Science focus on Electricity at Guy Brown School in Waterdown, Ontario.

START WITH THE KB PRINCIPLES

Community Knowledge — All students would be responsible for advancing our class's knowledge and understanding of electricity by sharing their findings, seeking connections to other students' findings, and using their knowledge to contribute theories and solutions to other students' problems or wonderings.

Epistemic Agency — Students would set their own goals based on their individual wonderings, then through ongoing sharing and monitoring of each other's progress, they would decide how to further our class's collective knowledge and understanding.

KB PROVOCATION

After exploring with static, batteries, and circuits, students had some understanding of how electricity was generated and transmitted. Students then identified questions they still had related to electricity (e.g., How do you get a battery to power a vehicle? How does an electric eel make electricity? Why doesn't the CN Tower catch on fire when hit by lightning?). Students sought to find answers to their questions through experiments, models, experts, and research. Each student kept an ongoing record of his/her learning "journey" by representing it as a roadmap, showing their detours and dead ends.

STRATEGIES FOR SUSTAINING IDEA IMPROVEMENT:

The most important part of this process was the ongoing sharing of discoveries and difficulties with each other. We regularly stopped our explorations to circle around someone who was experiencing an "aha! moment" or was encountering an obstacle. Together, as a learning community, we made connections between our independent findings and applied these findings to brainstorm solutions to each other's obstacles.

What surprised you?

I was surprised by the perseverance and motivation students demonstrated as a direct result of being part of a collaborative Knowledge Building community. Students looked forward to a classmate encountering a problem so we could circle around, listen to the problem, and try to pool our knowledge in order to pose theories, propose options, and solve the problem together. This gave a real sense of **collective responsibility** so that all students felt valued and part of the problem-solving process.

The conversations took many twists and turns as they represented the authentic wonderings and current understandings of the students. All students had responsibility for advancing our class's knowledge. The ongoing engagement in **Knowledge Building Discourse** moved our thinking forward and challenged students to think deeper about how their own explorations were related to others in the class. Most notable was how the learning was driven by the students' efforts to understand the world around them. One specific example of this is described below:

Jenna wondered, "How can I make Alessandro Volta's wet battery?" After having some success experimenting with salt water, aluminum foil, and pennies, Jenna decided to demonstrate her makeshift "battery" to the class. Unfortunately, she had stored her extra materials in the bottom of her backpack for several days. Upon pulling them out, she discovered the salt water had leaked into the aluminum foil, turning it a brown, rust colour. Unsure if this would affect the outcome of her demonstration, Jenna shared her unexpected discovery with the class. When the class saw the discoloured aluminum foil, a lively discourse began. Here are some ideas and theories that came out of the conversation:

- "Salt on the road rusts cars, so the salt in the water rusted the aluminum foil."
- "But a bike left in the rain can rust, so just the water could have rusted the foil — not the salt."
- "Maybe there's salt in rain water, because the water cycle means water from the ocean travels in the clouds."
- "When saltwater evaporates, does the salt make it to the clouds?"
- "We can conduct an experiment to see what causes rust. We can put metal objects in a dish of salt, a dish of water, and a dish of salt and water combined."
- "How do you know for sure if water has salt in it? Salt is found in the ground, so maybe tap water has some salt in it."
- "I think bottled water is the purest. It wouldn't have any salt in it."
- "But I'm reading the Nutrition Facts on this bottle of water, and it says it contains 10mg of sodium."

Students designed and conducted an experiment to find an answer to their question, "Was it the salt, the water, or the combination of both that caused Jenna's aluminum foil to turn brown?"

SOME REFLECTIONS

As the teacher, it can be a challenge to keep student conversations 'on track' while allowing student wonderings to drive the learning. Our curriculum focus was Electricity, but the conversation above resulted in students wondering about chemical reactions and changes in state of matter. I didn't intervene or dissuade this new train of thought for the following reasons:

What was one "Aha!" moment?

Many students far exceeded their original plans due to the fact that they had the support and input of the entire class. Students saw obstacles as an opportunity to reflect and collaborate — not a reason to quit.

1. Students were demonstrating and practising investigation and inquiry skills. They designed and conducted an experiment to answer their questions, which is an important learning and life skill.
2. 'Changes of matter' and 'understanding the characteristics of matter' are areas of focus in Grades 5 and 7. This impromptu exploration of matter demonstrated that what they learn in other grades is meaningful and related.
3. Our work with Electricity continued in full force. This experiment took its place along with the electricity-related experiments that lined our counters and tables.