

Black Out! Seeing the Light

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Grade Level

4th Grade

Lesson Overview

How might we design a light source using common household materials for use during a black out? In this lesson students build empathy and needfinding skills, brainstorm solutions, and build and test prototypes. The students will interview their families and find out about energy needs during a blackout. They will design and construct a working prototype to fulfill this need.

Standards

NGSS 4-PS3-2: Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Preparation

- Teach FOSS Electricity and Magnetism Investigations 1, 2, and 3 OR develop a knowledge base for electricity and magnetism.
- Prepare a “Tinker Lab,” a cart or area with materials that can be used to make a light source (see suggestions below).

Materials and Resources

- Electricity Science Unit (OR lessons that develop a strong sense of electricity and magnetism)
 - Must cover hands-on experiences around electricity and magnetism
 - Electricity schematics
 - Some required vocabulary: Switches, simple/parallel circuits, LEDs, batteries
- Tinker Lab materials
 - wires, LEDs, copper tape (**required**)
 - energy sources: coin-cell and D batteries (**required**)
 - toilet paper rolls
 - variety of recycled goods for prototyping

Day 1: Introduce the Activity, Interview Family (30 minutes)

- Tell students the following scenario. It is 5:30pm in the summer, and they have just finished dinner with their family. They have forgotten to charge their phones tonight, so they are devastated when they hear the bad news: “There will be a power outage in your local area for the next 36 hours or more. Sundown has been reported to be 7:00pm. A flood watch alert has been given, and it is recommended that everyone stay indoors tonight and tomorrow.”
- Students will develop interview questions to ask their family members what they will need in this situation. Talk about how to write productive interview questions, and circulate to help students develop their questions.
- For homework, students will interview their family members about their needs in this situation.

Day 2: Empathy, Defining the Need (45 minutes)

- Students return to school with a list of 3 priorities that emerged in their interviews.
- The class will prioritize the most important needs (hopefully light source comes up at number one!)
- The class will come up with a point-of-view statement (also called a needs statement). Use the following template.

POV Statement:

My family (user) _____ needs
 _____ because
 _____.

Example

“During the blackout, the Yamada family needs a strong, long lasting, bright light source because there is a blackout for the next 36 hours.”

- Working in teams of two, students will generate a list of qualities that make for a good light source (e.g.: bright, long lasting, flexible, easy to turn on and off, etc.)

Day 3: Ideate/Design (20 minutes)

- Teams will ideate to come up with many forms of ideal light sources, based on their previous conversations. (Use white boards, paper, post its, etc.)
- At the end of the ideation period, give a five-minute period for students to select one idea (or a combination of compatible ideas) that they would like to build in the next lesson.

Day 4: Prototype & Test (45 minutes)

- Teams will build their prototypes using the Tinker Lab materials and test them out to make sure they light up and work as expected.
- Monitor progress by reminding students of constraints and their plans for the most ideal light source.
- Give time for students to share their light designs with each other or with other classes at your school.
- Allow one partner from each team to take their light source home to their family to get additional feedback about how it would fulfill their needs in a black out. Give class time for them to debrief with their partners following the at-home test.

Assessment

Ask the following questions to help assess students' learning and conclude the activity:

- What was it like to interview your family members about needs?
- How did you create your design?
- What are some of your design's best features? What are you most proud of?
- Is your family happy with your design?
- What might you change based on your family's feedback?
- If you were designing it for someone different, what might you do differently?
- If you had access to different materials, what would you love to have?
- What was your favorite part about this design challenge and why?
- Why was this important?