ALL LIT UP: CIRCUITRY, ENGINEERING, AND THE LAST GREAT RACE ON EARTH®

Developed by:

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Discipline / Subject:

Science

Topic:

Energy, STEM, STEAM

Grade Level:

3rd grade – 6th grade

Resources / References / Materials Teacher Needs:

Circuit worksheet:

http://e-classroom.co.za/wp-content/uploads/2013/09/EngGr6T3-NS-Electrical-circuits.pdf

Electric Experiments: How to Make a Circuit:

http://www.abc.net.au/science/surfingscientist/pdf/lesson_plan11.pdf

Class set of wires, D cell batteries, small light bulbs

Optional: circuit science kits such as:

http://www.educatorsoutlet.com/index.php?main_page=product_info&products_id=5151

Simple items needed to light up a light bulb:
1 D cell battery
two 10 - 12 inch coated/insulated wires
electrical tape
small light bulb - example: flashlight bulb

Directions:
1. Strip about 2 inches of insulating material off both ends of the wires if the wires have coated ends.

2. Attach one wire to the negative end of the battery and wrap the other end of the same wire around the base of the bulb. Use electrical tape to hold the wire in place around the metal base of the bulb and another piece to hold it to the battery.

3. Attach the second wire to the positive end of the battery with electrical tape and to the base of the bulb, completing the circuit and lighting the bulb.

Lesson Summary:

Students will use their knowledge of a simple circuit to light up a light bulb using wires and a D cell battery. They will then light up a pretend home in Nome, Alaska during the Iditarod race with their lit bulbs and circuits.

Standards Addressed:

Next Generation Science Standards – NGSS

4-PS3-2 Make observations to provide evidence that sound, light, heat, and electric currents can transfer energy from place to place.

PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Texas State Standards – TEKS

6(A) differentiate among forms of energy, including mechanical, sound, electrical, light, and heat/thermal

6(B) differentiate between conductors and insulators

Learning Objectives:

1. Students will understand the difference between and a conductor and an insulator
2. Students will be able to create a closed circuit using wires, a D cell battery and a light bulb
3. Students will use that understanding to "light up" a pretend city by working together to engineer their circuits as partners for their buildings

Assessment:

1. Students will use an online presentation tool such as Emaze or a Prezi to showcase what they learned from this energy lesson
2. Students must have photos of the circuits, explain how to create a closed circuit, and share how energy lights the bulbs for their city

Procedural Activities

1. If students have access to Brain Pop online videos, they can watch a video explaining how circuits work. Another option is to watch a free Bill Nye video online about electricity and energy. Discuss how a circuit works as a class

2. Hand out the D cell battery, wires and the light bulb, and ask students to work in pairs to light the bulb. Spend some time in trial and error to make it work. Discuss the findings as a class

3. Optional Try other sources of energy to light the bulb. What do you need? A conductor is needed to allow energy to flow.

4. Optional: Try some of the other electric experiments, but use aluminum foil instead of a battery

5. Students will either work alone or in partners

6. They will use STEAM skills to design their "Nome Home" for this activity and decide what materials they will need.

7. Send home a Circuit City Parent Letter for information and due dates

8. Students will bring in a shoebox for the Nome cabin, and items for furnishings. They can be as creative as they wish

9. Optional: make the Nome Homes into log cabins by gluing popsicle sticks on the outsides

10. Make a round hole on the top of the boxes for the light bulbs to push through

11. Decorate the homes, light up the circuits, and decorate your Nome city with mushers and their dog teams, and the Iditarod finish line sign, also lit up with lights and circuits

12. Optional: use poly-fill for pretend snow, and hang lights above for the northern lights

13. Have your students take photos of the process and final products and use that information to create a formative assessment in an Emaze presentation or a Prezi

14. Arrange tours of your city with students highlighting how circuits work and electrical safety

Materials Students Need:

Circuit worksheet:

http://e-classroom.co.za/wp-content/uploads/2013/09/EngGr6T3-NS-Electrical-circuits.pdf

Shoebox, or small box

Two or three wires about 20 cm. long with the insulator plastic stripped off the ends

One D cell battery

Small light bulb

Duct tape to hold the wires to the batteries and bulb – *unless you have a science kit with battery and bulb containers*

Art supplies

Optional: toy furniture, little dolls or figurines, poly-fill snow, color printed mushers from the internet to stand 3-D in the scene, the Iditarod finish line color printed and glued onto popsicle sticks.

Technology Utilized to Enhance Learning:

Computer or tablet – if tablets are not available, the teacher can take the photos and download them to share with the students for their formative assessments

Web-based program:

Emaze :

https://www.emaze.com/?emazehome

Other Information:

A Prezi or Powerpoint can easily be substituted for an Emaze presentation

Students can also simply write a report on their learning with this activity

Contact your local power company to see if they will come and demonstrate electrical safety for your students before you begin

Modifications for Special Learners/ Enrichment Opportunities:

Modified:

Students can work in groups or partners instead of alone.

The teacher can help connect the bulb and wires first to help students understand the concept.

Enrichment:

Have students research the Iditarod, a particular musher in their scene, Alaska, or the city of Nome. Students can write a report, or memorize a speech to recite on the tour to others students.

Additional Information – optional:

Share your “Circuit City” with your school by inviting students to tour