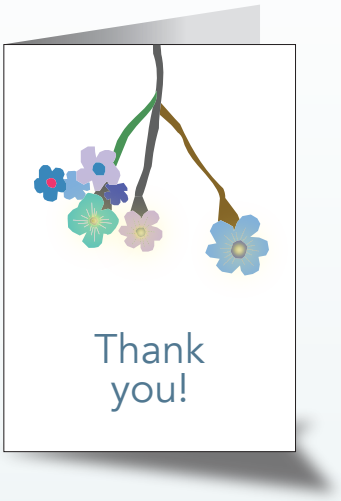
Making Simple Circuits Using Greeting Cards



Topic: Learn how to make a simple electric circuit.

Suggested grades 3 – 6

Target standards - Grade 4

Materials/Resources needed:

- SMUD downloadable circuit template
- SMUD downloadable "I Had a Bright Idea at SMUD" card and template
- Copper adhesive tape
- Button batteries 2032
- LED light stickers
- Small binder clips
- Large needle or sharp object to poke a hole
- Cardstock
- Assorted art supplies: markers, scotch tape, scissors, pencils, pens, rulers, construction paper
- Student Greeting Card worksheet (optional)

Prep time: 15 minutes

Lesson time: 10 minutes

Teacher-guided templates: 1 hour per template

Outcome: Students follow a template to make a simple circuit with an LED. They apply what they learn to creating greeting cards which have LED light.

Standards:
In appendix

Vocabulary:
In appendix

Powering forward. Together.

SMUD®

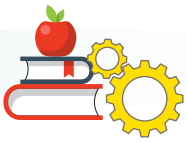
Prep

- Tray #1 (1 tray per group)
  - One Circuit Template (1 per student)
  - Pre-cut 5" copper adhesive strips (2 per student)
  - Button batteries (1 per student)
  - Small binder clip (1 per student)
- Tray #2 (1 tray per group)
  - One "I Had a Bright Idea at SMUD" card template (1 per student)
  - Pre-cut 7" copper adhesive strips (2 per student)
  - Button batteries (1 per student)
  - Small binder clip (1 per student)
- Make craft items available at a separate, common table.
  - Art supplies (markers, colored pencils, tape, etc.)
  - Card stock
  - Additional batteries
  - Pre-cut, adhesive copper tape
  - Copper tape band-aids
- Purchase sample greeting cards which have lights, sounds, music etc. when opened.

Engage

- Show students a fancy electronic greeting card "you just received in the mail."
- Ask students if they would like to make their very own greeting card that lights up.

Teach/Build/Activity



- Ask students, "What stores electricity?"
- Write/draw the responses on the board (encourage students to notice objects which store energy in the room). Have a flashlight handy.
- Draw and label battery on the board with lines extending from the positive and negative sides.
- Ask students to give examples of what the battery can power. List examples on the board.
- Draw in a light bulb and make a complete circuit.
- Write the word circuit on the board.
- Ask students, "How we can turn the light on and off?"
- Write the word "switch" on the board and draw a switch on the circuit.
- Tell students they will be making a circuit to power a LED light bulb.
- Have students draw and label the following terms on the circuit on the student worksheet.
  - Wire
  - Battery
  - Load /LED light bulb

    - Switch
    - Positive
    - Negative
- Using the materials which have already been set up on Tray #1, help students follow the steps to create a circuit on the Circuit Template.
    - Apply copper tape placing it directly over the template markings.
        - Some students may require help in peeling the backing from the tape.
        - If the tape tears, make any repairs with the copper band-aids.
    - Apply the LED sticker on the outline for the sticker.
        - Pointy end (negative –) should touch the negative copper tape.
        - Wide end (positive +) should touch the positive copper tape side.
    - Poke one hole (Step 4) on page 3, using a sharp object.
    - Place button battery on the designated template marking.
        - Ensure that the positive side is facing up.
        - Observe how the electricity will move from the positive side of the battery to the LED and then back to the negative side of the battery.
    - Close the circuit by closing page 3 over page 2.
        - This closes the circuit and the LED will glow on the back cover.
        - Secure the battery in place with a small office clip.
- Using the materials which have already been set up on Tray #2, help students follow the steps to create a circuit on the "I Had a Bright Idea at SMUD" greeting card.
    - Apply copper tape placing it directly over the template markings.
        - Some students may require help in peeling the backing from the tape.
        - Demonstrate with duct tape on a board how to fold the corners back.
          ✔ A good folding technique will be tear free and ensure conductivity.
        - If the tape tears, make any repairs with the copper band-aids.
    - Poke the one hole, where indicated, using a sharp object.
    - Apply the LED sticker on the outline for the sticker.
        - Pointy end (negative –) should touch the negative copper tape.
        - Wide end (positive +) should touch the positive copper tape side.
    - Place button battery on the template marking.
        - Ensure that the positive side is facing up.
        - Put a small dab of glue or small double sided tape to hold the battery in place.
          ✔ Avoid placing glue on the copper tape.
        - Observe how the electricity will move from the positive side of the battery to the LED and then back to the negative side of the battery.
    - Close the circuit by folding along the dotted lines.
        - This closes the circuit and the LED will glow through the front cover when the card is closed.
    - Have the students use the proper electronic terms when discussing their circuits.
        - Battery, wire, positive, negative, switch and etc.

Explore/Engineer

- Have students create their own greeting cards.
  - Students must first complete the "Student Greeting Card" worksheet and draw out their circuits for approval before giving them additional tape and batteries. The drawing should indicate:
    - Electricity path
    - Battery placement
    - Position of LED light sticker
    - Nature of switch
- Encourage students to experiment and create new switching devices for their greeting cards.
- Have available conductive materials on the craft table such as brads, wire and paper clips.

Assessment

Students apply their learning in developing a circuit by designing, drawing and creating a correct circuit using appropriate vocabulary.

Crossover

Have the students create a card to celebrate an event in another subject:

- Pi day - Math
- Poetry - Language Arts
- Capital Light Up Map - Geography

Experiment with varying circuit switching devices and journal the observations.

Accommodations and Extensions

Have students start a marketing campaign to sell their greeting cards for a fundraiser.

Have students make greeting cards for a specific holiday: Father's Day, Mother's Day, Chinese New Year and etc.

Make Valentine's Day special by creating mailboxes in which a light shines when the mailbox flag is raised.

Anticipated Misconceptions

Students may think that circuits have to be a circle.

Students may think that wire is the only available conductive material.

Safety

Supervision may be needed when using a sharp object to poke holes.

Front Loading

Read one or more of the following books:

Children Around the World Celebrate Christmas by Susan Titus Osborn

Children Just Like Me: Celebrations! by Anabel Kindersley and Barnabas Kindersley

How I Celebrate: A Young Person's Guide to Celebrations of the World by Pam Robson

Zoe's Extraordinary Holiday Adventures by Cristina Minaki

Kids Around the World Celebrate!: The Best Feasts and Festivals from Many Lands by Lynda Jone

References

History of the Greeting Card
quillcards.com/blog/the-history-of-greeting-cards-unfurled/

Read/Write/Think Greeting Card Lesson Plan
readwritethink.org/classroom-resources/lesson-plans/using-greeting-cards-motivate-1066.html

Greeting Card Lesson Plan
myartcards.com/wp-content/uploads/MyArtCardsClassroomLessonPlan.pdf

Holidays and Special Days
educationworld.com/a_lesson/archives/holidays.shtml

Additional References and Digital

Instructible
instructables.com/id/Light-Up-LED-Card/

Chibitronics.com - LED light stickers

chibi® tronics

Appendix

Standards

4-PS3 Energy

Students who demonstrate understanding can:
4-PS3-4 Apply scientific ideas to design, test and refine a device that converts energy from one form to another.

Common Core State Standard Connection

- Mathematical practices.
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Vocabulary

Battery – Device which stores electricity.

Circuit – Path which the electricity follows.

Electron – A sub atomic particle with a negative charge.

LED – Light emitting diode.

Load – Device which uses electricity on a circuit.

Negative – Part of the battery which receives electrons.

Positive – Part of the battery which pushes electrons.

Switch – Mechanism which opens and closes a circuit.

Wire – Material through which the electric current passes.