

Energy and Energy Transformations

Adapted from a lesson plan submitted by Kathryn Woodall from Dodgertown Elementary School in Indian River County, FL

Grade Level: 5

Essential Questions

- How does electricity flow?
- How can energy from the Sun be converted into electricity and how can we use this electricity?

Standards

- **SC.5.P.10.1:** Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.
- **SC.5.P.10.4:** Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.
- **SC.5.P.11.1:** Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).

Student Objectives

- Students will be able to describe electrical energy and how light from the sun is transformed into electrical energy.
- Students will demonstrate that the flow of energy requires a complete circuit.
- Students will solve real-world division problems using data from the lesson and check their work for reasonableness of results.

Key Terms

- **Energy** - The ability to do work
- **Heat** - The flow of thermal energy from one object to another; always moves from warmer object to cooler object.
- **Chemical Energy** - Stored energy that can be released by chemical reaction such as burning.
- **Light** - Electromagnetic waves caused by vibrating electrons in the atoms of matter.
- **Sound** - Energy created by waves from vibrations of matter.
- **Electrical Energy** - The energy of moving electrons; potential energy.
- **Mechanical Energy** - Energy that an object has because of its motion or its position; kinetic and potential.
- **Motion** - A change in an object's position.
- **Circuit (open and closed)** - The pathway through which electrical current flows;
 - **Closed:** A complete circuit through which electricity flows

- **Open:** An incomplete circuit through which electricity will not flow
- **Conduct** - When energy is transferred by direct contact of two objects.
- **Reflect** - When energy is returned and not absorbed by a material/object.
- **Absorb** - When energy is soaked up or “taken in” by a material/object.
- **Insulator** - Material through which heat or electricity does not easily flow.
- **Energy Transfer** - Movement of energy from one place or object to another.
- **Solar Energy** - Energy that comes from the sun such as solar-powered batteries and cars.

PROCEDURES

Activating Strategy:

- Initiate lesson with video from Solar Car Races:
<http://supertube.indianriverschools.org/district-office/features/Rvn72hXUnLHgOWfAivN4>

Teaching Strategy (Gradual Release Model):

- **DAY 1**
 - I Do: SmartBoard Lesson “Electrical Energy”
 - Discuss Learning Goals, Target Standards, Lesson Objectives.
 - Review Energy and other Vocabulary Terms
 - We Do: SmartBoard Lesson “Electrical Energy”
 - Sort and Identify energy. Write summaries on energy conversion.
- **DAY 2**
 - I Do: WeatherSTEM Lesson “Solar Power”
<https://learn.weatherstem.com/modules/learn/lessons/37/index.html>
 - Discuss Learning Goals, Target Standards, Lesson Objectives.
 - Introduction- Sensational Sensors
 - We Do: WeatherSTEM Lesson “Solar Power”
 - Energy from Sun (2 min video)
 - Energy Conversion (SmartBoard MatchUp)
 - I Do: WeatherSTEM Lesson “Solar Power”
 - Electricity, Solar PV Cells (4 min video)
 - Alternative Video: TedED Talk “How do Solar Panels Work”
<https://www.youtube.com/watch?v=xKxrkht7CpY>
 - WeatherSTEM Fusion: Graph on Solar Radiation
 - We Do: I Do: WeatherSTEM Lesson “Solar Power”
 - Math Connection (solve 2 problems)
 - Writing Connection (Letter to Superintendent)
 - Review Key Points and Quiz

- **DAY 3**
 - You Do: Inquiry Based Learning Activity
 - Create a fan/car/device utilizing solar power.
 - What else can you create with solar power?

Extended Thinking Activities:

- Write interview questions for an electrician.
- Literature Integration:
 - Static Electricity: The Wartville Wizard by Kon Madden
 - Insulators and Conductors: Switch On, Switch Off by Melvin Berger; All About Electricity by Melvin Berger
 - Dear Mr. Henshaw by Paul O. Zelinsky
 - Electricity by Karen Bryant-Mole
 - The Magic School Bus and the Electric Field Trip by Joanna Cole & Bruce Begen
 - Electricity by Samantha Berger and Pamela Chanko
- Websites:
 - <http://www.neok12.com>
 - <http://www.studyjams.scholastic.com>
 - <http://www.sciencemadesimple.com/static.html>
 - <http://resources.woodlands-junior.kent.sch.uk/revision/science/electricity.htm>
- Scientists:
 - Thomas Edison
 - Alexander Graham Bell
 - Lewis Latimer

Summarizing Strategy:

- Entry in Science Journal -
 - What would you do differently next time?
 - What changes did you make?
 - Three things I wonder about...
 - I would like to learn more about...

Integration with Other Subject Areas:

- Mathematics
 - *MAFS.5.NBT.2.6*: Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Additional WeatherSTEM Resources:

- Build A Solar Oven:
<https://learn.weatherstem.com/modules/learn/lessons/8/index.html>
- Energy from the Sun:
<https://learn.weatherstem.com/modules/learn/lessons/5/index.html>
- Fun Facts about Solar Energy:
<https://learn.weatherstem.com/modules/learn/lessons/3/index.html>