



MSOSW Curriculum

Lesson Three: Electricity Basics

What is electricity and where does it come from?

Overview: In this lesson, the student will get a basic understanding of electricity, its production, and how it is used in his/her home.

Objectives:

The student will:

- Define energy and understand that it comes in many forms, including electrical energy.
- Understand that atoms cannot be broken down by natural processes and are made of neutrons, protons, and electrons, each with their own specific charge.
- Understand that electrical energy is the energy of moving electrons.
- Explain the difference between an insulator and a conductor.
- Explain how energy usage is measured in watts.
- Calculate basic kilowatt-hours use for a given appliance.
- Label the major parts of a generator and understand how a turbine spins.
- Compare renewable with nonrenewable resource.
- Describe the major methods of energy production, including coal, natural gas, nuclear, water, wind, and solar.
- Compare the risks and benefits of different energy production methods.
- Identify devices in his/her home that use electrical energy.

Standards Addressed (Grades 5-8)

- Science as Inquiry: Use of Mathematics in All Aspects of Scientific Inquiry
- Physical Science: Properties and Changes of Properties in Matter; Transfer of Energy
- Science and Technology: Understanding About Science and Technology
- Science in Personal and Social Perspectives: Populations, Resources, and Environments; Natural Hazards; Risks and Benefits; Science and Technology in the World

Suggested Grade Levels: Middle School (6th- 8th)

Timeline: 3.5 class periods

Materials:

Day 1:	Electrical Energy Presentation	Plug-In Appliance Inventory
Day 2:	Energy Production Worksheet	Computer Access
Day 3:	Vocabulary Jeopardy file	
Day 4:	Energy Quiz	

Procedure:

Day 1: Electricity: What it is and how it's measured

- Ask students to define energy and electricity to gauge current knowledge and/or misconceptions. Guide the discussion and refine the definitions so that the students understand that **energy is the ability to do work** and comes in many forms. **Electricity is one form of energy and is energy in the form of moving electrons.**
- Give the Electrical Energy Presentation (see notes for each slide)
 - For this presentation, you may have the students take their own notes (they'll need the information for the quiz) and provide paper for that purpose in their project packet.
 - Alternatively, you can print the presentation in Handout Format (a handy feature: on the Print menu, under Print what, choose "Handouts" and then choose "3 per page" in the section on the right) this will leave area on the printed page for students to take their own notes and allow you to go through the presentation a bit faster.
- Ask students to estimate how many items in their homes are plugged in right now. Discuss the importance of electricity in the modern world. Handout and go over the instructions for the Plug-In Appliance Inventory.
- Homework: Plug-In Appliance Inventory – Rather than having each student do a whole house inventory which may take a great deal of time for some students, you may wish to have students form teams and determine which room they will inventory (living area, kitchen, bedroom, etc.) and return to class and combine their inventory.

Day 2: Energy Production methods

- Show Creating Electricity videos from the HowStuffWorks website (~9 min) <http://videos.howstuffworks.com/discovery/41266-powering-the-future-electricity-video.htm>
- Discuss some of the types of energy production presented in the video and hand out Energy Production Worksheet.
- Define the terms *renewable* and *nonrenewable* resources for the students. Using the Energy Production Worksheet, have the students classify each form of energy production on the sheet as a renewable or nonrenewable source.
- Watch a video about wind energy such as <http://video.nationalgeographic.com/video/wind-power?source=relatedvideo>
 - Discuss video and fill in wind energy section
- Assign students to small groups, one for each remaining type of energy production.
- Each group will define the form of energy production they're assigned and research the benefits and drawbacks of each form of energy

during the remainder of Day 4. Encourage students to use the Energy Quest website (<http://www.energyquest.ca.gov/>) as well as others to get their information. (Students can work separately to research and then compile their information in the final 10 minutes of class or can have one computer per group and research together.)

- Homework: Continue working on Plug-In Appliance Inventory.

Day 3: Student Energy Production Presentations

- Students should turn in their Plug-In Appliance Inventory worksheets
- Give students 10 minutes to create a short presentation (2-3 minutes) about their assigned form of energy production.
- Groups present their findings.
 - Each group will educate their classmates about the different forms of energy production.
 - When one group is presenting, the other group members in the audience should be recording notes on their Energy Production Worksheets and asking questions of the presenters.
 - At the end, fill in any missing information the students didn't cover.
- Review material with Vocabulary Jeopardy.
- Homework: Study for quiz (Energy Production Worksheet will be turned in at the beginning of quiz).

Day 4: (Partial Day) Energy Quiz

- Students should turn in Energy Production Worksheet.
- Have students take the Energy Quiz.
- Continue on to Whyville introduction Lesson.

Assessment Options for this Lesson:

- Plug-In Appliance Inventory
- Energy Production Presentation
- Energy Production Worksheet
- Energy Quiz

Extension Options for this Lesson:

- Lab Activity – Charge and Carry Science Snack activity
 - From the Exploratorium (<http://www.exploratorium.edu/>); Click “Educate” tab at the top; Choose “Science Snacks” from the options listed; Click “Charge and Carry”
 - Demonstrates a static electrical charge
- Math/Data Analysis – Light it Up!
 - Have students record the number and wattage of the lights in their homes and, with parent or guardian, estimate how many hours a day those lights are on.
 - Create data tools:
 - Enter collected data into a spreadsheet program (Excel)

- Each student can create a graph showing the number of each type of bulb they have in their homes.
- Calculate the average amount of time a light bulb is on in the house.
- Analyze data:
 - Calculate the kilowatt-hours (kWh) generated by each type of bulb.
 - Calculate the total kilowatt-hours spent on lighting (multiply by average electrical cost to get actual cost estimate for the month and year).
 - Calculate the kWh and money saved by switching to lower wattages or to CFL bulbs.