Proceed with caution

Teacher's guide

Description

Students explore the science behind the dangers of electricity and natural gas, and the actions they can take to avoid and minimize risk.

Introduction: Interactive quiz

The module begins with an interactive quiz focused on electricity – particularly the causes and effects of electric shocks. The questions on the eight slides that make up the quiz are multiple choice or true/false. Each slide has built-in animations but relies on you to click to reveal the correct answer.

Part 1: Static electricity

Most students have experienced the effects of static electricity. This section of the module uses static electricity as a way to explore how electrons jump from one atom to another – a key concept for understanding electricity and electrical energy. The activity challenges students to identify the correct order of events that lead to a static electric shock.

Part 2: Electric current

An animated definition of electric current anchors this part of the unit, illustrating how electricity is created and how it travels in currents. Next, students investigate how electricity arrives in our homes. This section culminates by looking at how and why electricity can be dangerous, through a series of "What's wrong with this situation?" slides.

Part 3: Natural gas

This section of the module closely mirrors the previous section – except the focus is on natural gas. An animated definition kicks off the section. The unit encourages you to take advantage of a website that allows you to enter your zip code and see a map of the network of underground natural gas pipes in your area. Two additional vides – Alliant Energy TV commercials – address staying safe around natural gas.

Carbon monoxide safety is also covered in this section of the presentation.

Part 4: Teach safety

The unit culminates in students creating safety campaigns. In small groups, students develop messaging for electric and natural gas safety for an audience of younger children. The slides guide them in creating their campaigns. Ideally, they will have an opportunity to teach what they have learned to younger children!

Desired outcomes

The module is designed to:

- Prompt thinking about dangers tied to energy use and how to avoid them
- Identify the scientific causes and effects of dangers tied to electric currents and natural gas use
- Deepen students' learning and understanding, so that they're able to teach others

Academic standards addressed

Wisconsin Science Performance Indicators (Grades 6-8)

SCI.CC5.m

Students understand matter is conserved because atoms are conserved in physical and chemical processes. They also understand that within a natural or designed system the transfer of energy drives the motion and cycling of matter. Energy may take different forms (e.g., energy in fields, thermal energy and energy of motion). The transfer of energy can be tracked as energy flows through a designed or natural system.

SCI.PS3.A.m

Kinetic energy can be distinguished from the various forms of potential energy.

SCI.PS3.B.m

Energy changes to and from each type can be tracked through physical or chemical interactions. The relationship between the temperature and the total energy of a system depends on the types, states and amounts of matter.

Wisconsin Model Academic Standards for Environmental Education

B.8.1

Describe the flow of energy in a natural and a human-built ecosystem using the laws of thermodynamics (see SC Physical Science).

Iowa CORE Standards Science

MS–PS1–1

Develop models to describe the atomic composition of simple molecules and extended structures.

MS–PS3–2

Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

MS–PS3–4

Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

MS–PS3–5

Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

Suggested time to allot

130 to 170 minutes

Materials

- Interactive white board/computer with display screen
- Internet access (including https://pvnpms.phmsa.dot.gov/PublicViewer)

Materials for education campaigns — could be digital, if not …

- Poster board
- Magic markers/pens
- Printed images from the internet of electric safety (e.g., overused outlets, exposed wires, gas flame, etc.)
- Glue

Cross-curricular extensions

Want to extend this unit beyond its core focus on science? Here are some suggestions.

Teach younger students

Coordinate with a teacher of younger students, and have your students create and deliver a lesson on energy safety to his/her class.

Expanded exploration of the natural gas network

Extend the exploration of the natural gas pipe network to see if there are any common characteristics of the areas with the network's main arteries. Are there commonalities in the topography? In the people who live nearby?