

Energy sources and choices

Duration

75 to 90 minutes

Lesson overview

Students think about ways they use energy in their daily lives and identify the sources of energy involved. They consider different sources that can be used for heating and transportation and choose one to learn more about. Students discuss concepts of energy efficiency, energy conservation and sustainability and generate questions about energy sources and choose one to learn more about.

Objectives

Students will be able to:

- identify ways they use energy in their daily lives
- connect the way they use energy to various energy sources
- generate questions about energy sources
- consider the impacts of technology and innovation
- reflect on the implications of our energy choices
- communicate their learning about energy sources

Curriculum connections - Science

Big idea

- Scientific processes and knowledge inform our decisions and impact our daily lives. (Science for Citizens 11)
- Scientific understanding enables humans to respond and adapt to changes locally and globally. (Science for Citizens 11)
- Living sustainably supports the well-being of self, community and Earth. (Environmental Science 12)

Content

- impacts of technologies (Science for Citizens 11)
- practical applications of science in the workplace (Science for Citizens 11)
- beneficial scientific innovations (Science for Citizens 11)
- human impact on natural resources (Science for Citizens 11)
- mitigation and adaptations (Environmental Science 12)



Curricular competencies - grades 11 and 12 Science

- Questioning and predicting
 - demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest
- Processing and analyzing data and information
 - construct, analyze and interpret graphs, models, and/or diagrams
- Evaluating
 - consider the changes in knowledge over time as tools and technologies have developed
 - consider social, ethical and environmental implications of the findings from their own and others' investigations
- Applying and innovating
 - co-operatively design projects with local and/or global connections and applications
- Communicating
 - communicate scientific ideas and information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations

What you'll need

- Energy Sources and Choices Student Handout
- Energy Sources and Choices Slideshow
- Energy Inquiry Student Handout
- Energy Inquiry Questions
- Website Evaluation Guide
- student access to devices and internet
- computer, projector and screen

Preparation

- Make copies of student handouts and Website Evaluation Guide, or have students use them as fillable PDFs.
- Set up computer, screen and projector for slideshow.
- Preview Energy Sources and Choices Slideshow.
- Arrange access to computers for research.



Lesson notes

In this lesson, students learn how much natural gas, electricity and other energy sources they use for daily activities, such as taking a shower, charging their cell phones and getting to school. The energy we use every day comes from the Earth and the choices we make have an impact on the land, water and natural resources.

In Activity 3, students brainstorm questions about energy sources and research their own questions of interest. Inquiry learning encourages students to adopt the mindset of scientists to formulate and investigate real-world questions and build deeper understanding. Decide how many questions from the student handout students will research and to what extent they'll pursue an inquiry question of their own.

Have students record their notes in a format they're familiar with, either in their science notebooks or in a digital format. A Website Evaluation Guide is provided to help students critically analyze secondary sources of information and record their sources. Depending on students' familiarity with evaluating websites, review the guide as a class and discuss what 'bias' means, how to determine the author and their qualifications and whether the information is up-to-date. Students may use a different number of sources and the goal is to identify reliable sources and to properly credit them.

An **energy footprint** measures and calculates the impact of our energy choices. This includes our personal energy use for heating, cooking, washing, etc. It also includes the energy used for transportation, manufacturing and waste management. We use energy directly when we turn up the heat or turn on a light, and indirectly when we buy products that have used energy in their manufacturing and transportation.

Sustainability means using resources in a way that meets current environmental, economic and social needs now and for future generations.

Energy conservation means using less energy. Examples include: putting on a sweater, turning down the heat, taking shorter showers, turning off computers, unplugging devices, turning off lights, carpooling and walking or biking to school. Energy conservation focuses on behaviours and choices we make.

Energy efficiency means using the least amount of energy possible to do the job. Having energy-efficient appliances, adequate insulation, high-efficiency space and water heating systems and water-efficient showerheads are examples of innovations and technologies that help us use energy more efficiently.



Lesson activities

Activity 1: Energy sources and choices (30 minutes)

- On a scale of 1 to 10, ask students how much energy they think they use in a day. With a show of hands, tally the results on the board. Invite a few students to explain why they rated themselves as they did.
- Organize students into pairs to fill in the Energy Use section of the Energy Sources and Choices Student Handout. They'll identify daily activities and the energy source used for each activity. Have two pairs get together to form a group of four and share their ideas. Examples may include:

Daily activity	Energy source
taking a shower	<ul style="list-style-type: none">• electricity to heat the water• natural gas to heat the water• solar thermal to heat the water
getting to school	<ul style="list-style-type: none">• gasoline for the car• electricity for the electric car• food to give me energy to walk to school• renewable natural gas, diesel or electricity for buses

- Show slide 2 of the Energy Sources and Choices Slideshow.
 - The pie chart shows the breakdown of residential energy use according to category.
 - Have students discuss what they think the key message from the diagram is.
 - Note that it doesn't include transportation use. Discuss any other limitations to the graphic.
- In their groups of four, have students complete the rest of the Energy Sources and Choices Student Handout, identifying the possible sources of energy for each category and completing the follow up questions.
- Show slide 3 of the Energy Sources and Choices Slideshow and have students identify the energy sources in the images (natural gas, hydroelectricity, oil, biomass).
- Review slides 4 and 5 showing a breakdown of energy sources for space heating and water heating.
 - The graphics show the breakdown of energy sources by PJ. A petajoule (PJ) is one quadrillion joules.

Activity 2: Energy and our choices (15 minutes)

- As a class, read and discuss the energy footprint section at the end of the student handout.
 - The energy we use every day comes from the Earth and the choices we make have an impact on the land, water and resources.
 - Include in the discussion the role of energy-efficient technologies on our carbon footprint, as well as energy conservation choices and behaviours.

Activity 3: Energy inquiry (time varies)

- Explain to students they'll have the opportunity to explore an area of interest related to energy, energy sources and the impacts of our energy use.
 - As a class, brainstorm possible questions for their inquiry to help students begin generating their own questions.
 - Use the Energy Inquiry Questions for ideas as needed.



- Review the Energy Inquiry Student Handout.
 - In pairs or small groups, have students generate questions and record them on the student handout.
 - Review the Website Evaluation Guide as a class, discussing sections in detail as needed. Depending on students' familiarity with evaluating websites, you may need an additional class to give students time to practice website evaluation.
 - Determine criteria and assessment for their inquiry before the students begin.
 - Decide on an appropriate presentation format to share findings.
 - Allow time for students to do their research and prepare their findings either to submit or to share with the class, depending on time available.

Assessment

- Circulate during the inquiry to answer questions and assess students' competency development.
- Collect student handouts to assess understanding of curriculum content.

Extensions

- Have students complete an online footprint calculator. Discuss the results.
- Renewable Natural Gas is an innovative energy source. Have students learn more about it, how it's created and how it's used.
- Give students a copy of the Curricular Competency Reflection Student Handout from the Energy Choices Module Overview. Review the curricular competencies and allow time for students to reflect on their development throughout the module.

