NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
ACTIVITY : 2 HRS 40 MINS

Affordable Energy for Our Future

Students discuss affordable energy and create a working definition of the concept. They discuss factors that could affect future energy supplies, conduct research, and then debate the topic: Will there be enough affordable energy in the United States in the near future? They create a multimedia presentation to support their position.

GRADES

9 - 12+

SUBJECTS

English Language Arts

CONTENTS

16 Images, 3 PDFs, 5 Links

OVERVIEW

Students discuss affordable energy and create a working definition of the concept. They discuss factors that could affect future energy supplies, conduct research, and then debate the topic: Will there be enough affordable energy in the United States in the near future? They create a multimedia presentation to support their position.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/affordable-energy-our-future/

Program

DIRECTIONS

1. Activate prior knowledge by having students brainstorm factors that affect energy supplies.

Divide students into small groups. Have each group brainstorm and share some of their ideas with the class. Check to make sure students mention energy use and energy conservation, energy efficiency, and the types of energy resources being used. Encourage students to consider innovations such as building smarter cities that make more efficient use of resources, creating energy from resources such as biomass and waste, the invention of hybrid and electric cars, and using technology to modernize and increase the efficiency of our electrical grid, or power grid. Create a class list of factors affecting energy supply on the board. Discuss how these factors have affected supply in the past. Ask: *Based on these factors, what challenges might affect the U.S. supply of energy in the future? Which factors do you think will have the biggest impact on our future energy supply? Why?*

2. Introduce the central question and discuss the concept of affordable energy.

Write the following question on the board: Will there be enough affordable energy in the United States in the near future? Ask students what they think is meant by the term "affordable energy." Ask:

- *What makes something affordable? Can the same item be affordable to one person but not affordable to another?*
- *Can something be affordable at one point in time and not affordable under other circumstances? How might that apply to energy?*
- *How do supply and demand affect the affordability of energy resources?*
- *How do energy efficiency and conservation affect the affordability of energy?*
- *Are there other costs of energy use besides economic costs? What are they?*
- *Why might people or groups have different perceptions of what is affordable when it comes to energy?*

As a class, develop a working definition of affordable energy that takes into consideration factors such as economics, the environment, and societal factors such as ethics and human health.

3. Introduce the presentation and debate task to students.

Explain that students will be asked to take a position on the question, "Will there be enough affordable energy in the United States in the near future?" They will create a multimedia presentation supporting their position and then engage in a debate on the subject. Divide the class into two groups. Assign one group the "yes" position and the other group the "no" position. Distribute the Multimedia Presentation Rubric, Debate Rubric, and Moderator Questions. Review the documents with students, and answer any questions they might have.

4. Have students collaborate to create the multimedia presentation.

Allow time for the two groups to discuss their assigned position on the question and to brainstorm which factors will be most important in building their argument. Have students do some preliminary research using the provided websites. Then have each group write a one- or two-sentence position statement summarizing their argument. Have students create a list of tasks for completing the multimedia presentation. Tasks could include further research, planning and outlining, writing text, creating or gathering graphics, creating or gathering audio, and proofreading. Have students determine who will complete each task. Encourage students to take on more than one task and to spread out the workload equitably. Give students sufficient time to research and create their presentations. Establish checkpoints as students prepare their multimedia presentation; for example, ask students to check in with you when they finish their position statement, after they draft a plan, and after they draft their text.

5. Have students prepare for the debate.

Have each group identify five students who will participate in the debate. Explain the debate procedure to students. The moderator will ask five questions, and each student will respond to one question. Students will have four minutes to respond to each question, and there will be a five-minute break after the third question for students to prepare responses to the last two questions. Allow time for students to use the list of Moderator Questions to prepare. Students not directly participating in the debate should help to prepare their team members by listening to their arguments, proposing possible counter arguments, making suggestions, asking questions, and helping with additional research as needed.

6. Have each group share its multimedia presentation.

Following each presentation, allow audience members to ask any questions for clarification, but ask them to avoid questions that would lead to debate on the topic. Review the concept of constructive feedback with students, and give examples of the kinds of feedback you expect. Have each audience member use the Multimedia Presentation Rubric to peer review the presentation they viewed.

7. Conduct the debate.

Following the multimedia presentations, have the moderator open the debate by asking each side to describe their position. During the debate, have audience members use the Debate Rubric to review each argument. Make sure that students understand the difference between scientific evidence and value judgments. Have the teams who are debating take turns, with one student from each team responding to the question. Then have the moderator continue the debate by asking the next two questions from the list of Moderator Questions one at a time, and giving the speaker from each team four minutes to respond. Encourage team members to take notes and jot ideas during the responses to the first three questions. They can use these notes in response to the final two questions. Have the moderator call for a five-minute break after the first three round of questions so students can prepare their responses to the final two questions. Provide students with access to a computer during this break, if needed. Have the moderator finish the debate by asking the final two questions one at a time and giving the speaker from each team four minutes to respond to each question.

8. Reflect on the multimedia presentation and the debate.

Immediately following the debate, have students in the audience use their reviews to discuss the strengths and weaknesses of each argument and to offer suggestions for improvement. Have students return to their original groups and review and discuss the peer reviews of their presentation. Ask each student to write a brief statement explaining what he or she contributed to the presentation, what he or she felt were the strengths of their presentation, and how it could be improved. Finally, allow the class time for free discussion of the question:

Will there be enough affordable energy in the near future? Ask: *What, if any, actions do we need to take to ensure that we have enough affordable energy in the future? How might the energy resources that make up our energy supply look different in the future?*

Modification

For older students, assign a team leader to facilitate students volunteering for tasks they are interested in completing.

Modification

Rather than allowing students to select the tasks they do for the multimedia presentation, assign tasks to students based on their strengths and abilities.

Informal Assessment

Use the Multimedia Presentation Rubric and students' reflections on the process to assess the multimedia presentation. Use the Debate Rubrics to assess the student debate.

Extending the Learning

Divide students into small groups, and assign each group an energy resource. Have each group use the Energy.gov: Energy Sources website to research the energy resource and make a case for why emphasis should be placed on developing the resource as a component of any future energy plan.

OBJECTIVES

Subjects & Disciplines

- English Language Arts

Learning Objectives

Students will:

- explain and present their position on the future supply of affordable energy
- support their position on the future supply of affordable energy with research-based facts
- identify the factors that affect the future supply of affordable energy
- analyze the factors impacting the future supply of affordable energy

Teaching Approach

- Learning-for-use

Teaching Methods

- Brainstorming
- Cooperative learning
- Discussions
- Information organization
- Reflection
- Research

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information Literacy
    - Media Literacy
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
  - Life and Career Skills
    - Initiative and Self-Direction
    - Leadership and Responsibility
    - Productivity and Accountability
- Critical Thinking Skills
  - Creating

- Science and Engineering Practices
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

ENERGY LITERACY ESSENTIAL PRINCIPLES AND FUNDAMENTAL CONCEPTS

• **Fundamental Concept 5.2:**
Energy infrastructure has inertia.
• **Fundamental Concept 5.4:**
Energy decisions are influenced by economic factors.
• **Fundamental Concept 5.5:**
Energy decisions are influenced by political factors.
• **Fundamental Concept 5.6:**
Energy decisions are influenced by environmental factors.
• **Fundamental Concept 5.7:**
Energy decisions are influenced by social factors.

IRA/NCTE STANDARDS FOR THE ENGLISH LANGUAGE ARTS

• **Standard 7:**
Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
• **Standard 8:**
Students use a variety of technological and informational resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

NATIONAL COUNCIL FOR SOCIAL STUDIES CURRICULUM STANDARDS

• **Theme 8:**
Science, Technology, and Society

NATIONAL GEOGRAPHY STANDARDS

- **Standard 16:**

The changes that occur in the meaning, use, distribution, and importance of resources

NATIONAL SCIENCE EDUCATION STANDARDS

- **(9-12) Standard F-3:**

Natural resources

- **(9-12) Standard F-4:**

Environmental quality

- **(9-12) Standard F-6:**

Science and technology in local, national, and global challenges

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- **Speaking and Listening Standards 6-12:**

Presentation of Knowledge and Ideas, SL.9-10.5

- **Speaking and Listening Standards 6-12:**

Presentation of Knowledge and Ideas, SL.11-12.5

- **Speaking and Listening Standards 6-12:**

Presentation of Knowledge and Ideas, SL.11-12.4

- **Speaking and Listening Standards 6-12:**

Comprehension and Collaboration, SL.11-12.1

- **Speaking and Listening Standards 6-12:**

Comprehension and Collaboration, SL.9-10.1

- **Speaking and Listening Standards 6-12:**

Presentation of Knowledge and Ideas, SL.9-10.4

ISTE STANDARDS FOR STUDENTS (ISTE STANDARDS*S)

- **Standard 3:**

Research and Information Fluency

- **Standard 4:**

Critical Thinking, Problem Solving, and Decision Making

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Lined or ruled paper
- Pencils

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per learner, Audio recording device, Media production software, Microphone, Presentation software, Projector

PHYSICAL SPACE

- Classroom
- Computer lab

SETUP

For the debate, arrange a podium with five chairs off to each side for the debate teams. Provide a table and chair for the moderator in front of the podium.

GROUPING

- Large-group instruction

OTHER NOTES

This activity should be conducted over three sessions. Complete steps 1 through 4 in the first session; have students present their multimedia presentations in the second session; and conduct the debate in the third session.

BACKGROUND & VOCABULARY

Background Information

The majority of the energy used in the United States for electricity, heat, and to power our transportation systems comes from fossil fuels. Yet the supply of fossil fuels is limited, and methods of extracting fossil fuels from deeper and more inaccessible areas are costly. Environmental and health concerns linked to pollution from fossil fuels add another layer of cost. Affordable energy is vital to the U.S. economy and to the quality of life. Though most people acknowledge the limits of the fossil fuel supplies as well as health and environmental concerns, the extent of the effects of these issues on affordable energy in the United States is still a topic for debate. One reason for this is the complex nature of energy supply and demand. Many factors affect how much energy the United States will need in the future, as well as how much energy will be available. The amount of energy required for daily life can change based on factors such as industrialization, consumer and business conservation, and the efficiency of the system used to extract, convert, and deliver that energy to end users. At the same time, new ideas and new technologies continue to make it possible to reduce the pollution from fossil fuels and to develop renewable energy resources and make them a larger part of the U.S. energy portfolio. Innovations in energy conservation and efficiency will also have a significant impact on how much energy the country will need in the future. Conserving energy by planning cities with conservation in mind and improving the efficiency of energy use through better planning and technology will reduce the amount of energy needed. Any prediction of what the energy future will look like must try to account for the numerous social, political, environmental, and economic factors that affect this picture.

Prior Knowledge

["Energy Literacy Principle 1: Energy is a physical quantity that follows precise natural laws.","Energy Literacy Principle 2: Physical processes on Earth are the result of energy flow through the Earth system.","Energy Literacy Principle 3: Biological processes depend on energy flow through the Earth system."]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
argument	*noun*	reason or set of reasons given with the aim of persuading others that an action or idea is right or wrong.

Term	Part of Speech	Definition
biomass energy	*noun*	renewable energy derived from living or recently living organisms, mostly plants.
constructive feedback	*noun*	tool to enhance the teaching and learning process; highlighting strengths and achievements as well as areas for improvement.
debate	*noun*	instructional strategy that fosters the mastery of content and the development of critical thinking skills, empathy, and oral communication skills. The process of considering multiple viewpoints and arriving at a judgment. Applications range from an individual using debate to make a decision in his or her own mind to an individual or group using debate to convince others to agree with them.
electrical grid	*noun*	network of cables or other devices through which electricity is delivered to consumers. Also called a power grid.
energy	*noun*	capacity to do work.
energy conservation	*noun*	process of using less energy, or using it more efficiently and sustainably.
energy efficiency	*noun*	use of a relatively small amount of energy for a given task, purpose, or service; achieving a specific output with less energy input.
energy resource	*noun*	source of energy found in nature that has not been subject to any human-induced energy transfers or transformations; for example, oil, coal, gas, wind, or sunlight.
energy source	*noun*	location in which the energy resource (oil, coal, gas, wind, etc.) is converted into electrical energy.
energy use	*noun*	energy consumed during a specified time period for a specific purpose (usually expressed in kWh).
moderator	*noun*	individual that facilitates a debate or discussion, ensuring balanced participation and controlling the pace of the discussion.
non-renewable energy	*noun*	energy resources that are exhaustible relative to the human life span, such as gas, coal, or petroleum.
peer review	*noun*	the many ways in which students can share their creative work with peers for constructive feedback and then use this feedback to revise and improve their work.
position statement	*noun*	a thesis describing one side of an arguable viewpoint and supported by facts.

Term	Part of Speech	Definition
power grid	*noun*	network of cables or other devices through which electricity is delivered to consumers. Also called an electrical grid.
renewable energy	*noun*	energy obtained from sources that are virtually inexhaustible and replenish naturally over small time scales relative to the human life span.

For Further Exploration

Video

- Ted Talks: Alex Steffen—The Sharable Future of Cities

Websites

- National Geographic: The Great Energy Challenge
- Energy.gov: Energy Sources

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