

HOW CAN PEOPLE CONSERVE RESOURCES?



Overview

In this lesson students will use an energy monitoring device to investigate which appliances in their school use the most electricity.

Objectives

On successful completion of this lesson, students will be able to:

- define conservation;
- identify the amount of electricity used by six different appliances; and
- generate ideas for conserving electricity.

Alaska Standards

Alaska Science Standards / Grade Level Expectations

[4, 5] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.

[4,5] SB2 Student develop an understanding that energy appears in different forms, can be transformed from one form to another, can be transferred or moved from one place or system to another, maybe unavailable for use, and is ultimately conserved.

[4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict and communicate.

[4] SA2.1 The student demonstrates an understanding of the attitudes and approaches to scientific inquiry by supporting the student's own ideas with observations and peer review.

[5] SA1.2 The student demonstrates an understanding of the processes of science by using quantitative and qualitative observations to create inferences and predictions.

Alaska Cultural Standards

[A] Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community. Students who meet this cultural standard are able to:

[A6] live a life in accordance with the cultural values and traditions of the local community and integrate them into their everyday behavior.



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[B] Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life. Students who meet this cultural standard are able to:

[B3] make appropriate choices regarding the long-term consequences of their actions.

[B4] identify appropriate forms of technology and anticipate the consequences of their use for improving the quality of life in the community.

Bering Strait School District Scope & Sequence

4th Grade Sequence #2: Making & Using Electricity

A. Understands what electricity is

E. Use scientific processes and inquiry to directly support concepts on conserving natural resources

5th Grade Sequence #10: Conserving Natural Resources

A. Understand how people conserve natural resources

C. Use scientific processes and inquiry to explore conserving natural resources

Materials

- “Kill-a-Watt” meters (one per group)
- Electrical appliances to test
- Student Information Sheet: Understanding Energy Use
- STUDENT WORKSHEET: Kill-a-Watt

Multimedia

REACH Multimedia 4-6: “Conserving Fuel”

Available at: www.k12reach.org

Additional Resources

HSP IV: Ch. 5, Lesson 3

HSP IV: Ch. 15, Lesson 1-4

HSP V: Ch. 6, Lesson 3; Ch. 10, Lessons 1-2; Ch. 15, Lesson 1-4

HSP V: Ch. 16, Lessons 1-3



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Activity Preparations

1. Read through the entire lesson, including the Whole Picture for background information.
2. Decide how students will be grouped.
3. Decide if you will have students complete the activity within your classroom, or if you will allow them to visit other areas of the building, such as the teachers lounge. If students will be traveling, obtain permission ahead of time for the areas they will be allowed to use.
4. Make copies of the Student Information Sheet and STUDENT WORKSHEET.

Whole Picture

Natural resources include things like plants, soil, sunshine, water, fossil fuels, wildlife, metals, and minerals. Every day, people depend on natural resources. They are important for the cash economy, for creating energy, for providing shelter, for food and medicine, and for spiritual well being. By protecting and conserving natural resources we help to ensure that they are available for use not only today, but in the future as well. Alaska Native wisdom teaches that everything is connected; human life is intricately connected to the natural resources around us. Preserving resources helps ensure the health and wellness of the entire system.

Why Protect Natural Resources?

There are many reasons to protect natural resources. Some reasons are simple: when resources are finite (or nonrenewable), an overuse can mean they will not be available in the future; once nonrenewable resources have been depleted, they will be gone forever. In Alaska, nonrenewable resources include things like oil and coal, as well as certain metals like aluminum and copper. In addition to being nonrenewable, extracting some of these resources can take a toll on the local landscape and ecosystems. As such, conserving nonrenewable resources ensures their availability for future use and also helps to protect other resources in the area.

Many natural resources are renewable, however, but reasons for protecting them are more complicated, and involve consideration of the ecosystem as a whole. According to Alaska Native wisdom, all things are connected and people hold a responsibility to respect and protect them in order to help maintain the delicate balance. The spiritual well being of the whole system depends on the health and wellness of each component (Kawagley, 2006). When this balance is upset, resources make themselves scarce and the system begins to change (Fienup-Riordan and Rearden, 2012; Kawagley, 2006; and Kawagley et al., 2010). As a result, exercising prudence when using resources helps to ensure the health and continuation of the entire system, and importantly, is a matter of traditional practice and a way of living in harmony with one's surroundings.



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How Can Resources Be Protected and Conserved?

Embodied within Alaska Native values for daily living are a variety of ways that natural resources can be protected. These include: “showing respect,” “sharing what you have (taking only what you need),” “living carefully,” “taking care of others,” and “seeing connections” (ANKN, 2006).

These values represent the belief that the environment is sentient — it is capable of feeling and perceiving. As such, it does not merely provide resources available for taking; rather, “it is responsive to careful [human] action and attention” (Fienup-Riordan, 1994, p.14). As a result, the future availability of resources depends on careful attention to one’s own actions and the maintenance of good relations with the spirits of all things.

The Iñupiat and Yup’ik, like other Alaska Native peoples, believe in the recycling of plant and animal spirits. When a plant or animal is taken for harvest, its spirit watches carefully to see that its body is respected and well taken care of. If it likes what it sees, it will tell others of its kind that the people treated it well and they should continue to give themselves. However, if the spirit does not like the way it is treated, it will tell others to avoid these people, and future harvests will be less successful (Barnhardt and Kawagley, 2005; Fienup-Riordan and Rearden, 2012). As such, one way to preserve natural resources is to treat them with honor and respect — this means being judicious in how they are taken, not taking more than is needed, sharing what has been taken, not wasting any part of the harvest, and acting peacefully (Fienup-Riordan, 1994).

These traditional values and ways of living can also be summed up in the concept of the “3Rs — Reduce, Reuse, Recycle.”

Reduce

By making choices in the products we buy and reducing the amount we consume, we can reduce our environmental impact. For example, by borrowing from friends and neighbors, renting, or sharing, instead of buying or harvesting something we will only use infrequently, we can reduce the physical amount we consume. By powering down our electronics when not in use, we can reduce the amount of energy we consume. By walking or riding a bike or skateboard, we can reduce the amount of fuel we need. By choosing not to have a bag, or bringing our own bag to the store, we can reduce the amount of plastic that ends up in our landfills.

Reuse

Many times, people choose to dispose of items that could be reused, or up-cycled (made into something else). Coffee tins, shoe boxes, and other plastic food containers can be repurposed into storage containers for beading supplies, tools, and machine parts. Torn clothes can be repaired or turned into other items, like pillowcases, bags, and baskets. Broken machines can be saved, and their parts salvaged for repairing other items.



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Recycle

Where facilities exist, many things can be recycled: paper bags, soda cans, and plastic bottles. In remote areas, however, recycling facilities do not exist, and it can be expensive to export collected items for recycling. In these cases, it is important to make wise decisions in the purchases we make; choose to purchase items that are made from recycled materials. Rather than purchasing tissue paper that is made from first generation trees, for example, purchase tissue that is made from recycled papers.

Conserving and protecting our natural resources is important not only so that the resources will be available in the future, but also for reasons of cultural value and spiritual importance. Learn from elders and culture bearers in your community what resources are most valuable and what you can do to help preserve them.

Vocabulary

conservation – the use of less of a resource to make the supply last longer

Activity Procedure

1. Read through the INFORMATION SHEET with the class and discuss. Have students look up the definition of conservation in the HSP V textbook or another source. Ask students if they believe conserving electricity is aligned with their traditional Iñupiat or Yup'ik values. Why or why not?
2. Divide students into groups, pass out the STUDENT WORKSHEETS, and give directions for the investigation. Demonstrate how to use the Kill-a-Watt. Explain that they can choose their six devices; suggestions include the projector or SMART Board, pencil sharpener, laptop or tablet, the cart that charges the laptops or tablets, the television, and a cellphone charger. You may also allow students to test the microwave, refrigerator, and other appliances found in other areas of the school.
3. Allow students approximately 30 minutes to complete the activity and worksheet.
4. Discuss their findings, especially the question about their ideas for how the school could conserve electricity.

Extension Activities

- Have students graph their findings.
- Have students calculate the kilowatts per hour and the average number of hours per day the device is plugged in. They could also research the price per kWh charged by your local utility, and calculate how much the device costs the school per day or per year.

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Answers

Answers may vary.

References

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- National Wildlife Federation. (2014). Eco-Schools USA lesson plan, "Understanding and Measuring School Electronics". Accessed from: <http://www.nwf.org/Eco-Schools-USA/Become-an-Eco-School/Pathways/Energy/Curriculum/Measuring-Electricity-Lesson.aspx>



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UNIT 8: Natural Resources Lesson 21— Grade 4-5 STUDENT WORK



Student Information Sheet: Understanding Energy Use

The United States is home to just five percent of the world's population but consumes more than 20 percent of its energy. On average, a person in America uses 10 times more energy than a person in China and nearly 20 times more than a person in India.

U.S. energy needs are met primarily by nonrenewable sources including, gas, oil, and coal. Access to abundant and inexpensive energy contributes to our high standard of living, but burning large quantities of fossil fuels also has serious environmental and health consequences. These range from smog and acid rain to, most critically, the release of greenhouse gases leading to global climate change.

The nation's school districts spend more than \$7.5 billion a year on energy. Schools are the largest energy consumer in many municipalities. But up to 30 percent of that energy is used inefficiently or unnecessarily. By implementing energy-conservation measures and using energy-efficient technologies, schools can significantly cut their energy use. The result is financial savings as well as a reduced environmental impact.

Power plants make electricity out of other forms of energy. Most electricity in the U.S. today comes from converting the heat energy released from burning fossil fuels: coal, natural gas and oil. The rest is generated from nuclear reactors and from renewable sources, such as sunlight, wind, falling water and geothermal heat. In a typical power plant, a primary energy source like coal is burned to create heat, which is converted in a boiler to mechanical energy in the form of superheated, high-pressure steam. The steam is directed into a turbine, where it pushes on blades attached to a central shaft or rotor. The rapidly spinning rotor powers a generator.

We burn fossil fuels to create energy. From keeping warm in our house, to fueling our cars, to growing our food, to manufacturing our MP3 players, energy is used. It is either burned directly (gas is burned in your boiler, for example, and gasoline is burned in your car) or it is burned in a power station to drive turbines which generate electricity. Fossil fuels are also burned at various stages in the process of creating food, products and services for our consumption. The total carbon which we as individuals are responsible for is called our carbon footprint.

- From Eco-Schools USA



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Student Worksheet: Kill-a-Watt

Name _____

A watt is a metric unit of power, used in electric measurements, to give the rate at which energy is used. A greater number means that the energy is being used faster.

$$1,000 \text{ watts (W)} = 1 \text{ kilowatt (kWh)}$$

1. Look around your classroom and school for items that use electricity. Choose six devices to test with the Kill-a-Watt meter. Make a hypothesis, or prediction, about which item uses the most electricity.

Electronic devices to be tested:

- | | |
|----------|----------|
| 1) _____ | 4) _____ |
| 2) _____ | 5) _____ |
| 3) _____ | 6) _____ |

I think the _____ uses the most electricity.

2. Test each device by plugging the Kill-a-Watt meter into the outlet, and plugging the device into the Kill-a-Watt meter. Some devices use electricity even when they are turned off, as long as they are plugged in. This is called a “phantom load”. Take a reading with the device turned on, and another reading with the device turned off. If the device does not have a power switch (for example, an electric pencil sharpener), the OFF column should be the reading when the device is not in use, and the ON column is the reading during the use of the device (when a pencil is being sharpened).

Device	Watts ON	Watts OFF

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3. If you chose a battery-charging device (such as a cellphone charger or laptop charger) as one of your items, do some further investigating. What if the charger is plugged into the outlet, but no device is connected? Does it still draw electricity? What if the phone or laptop is at a 100% charge and still plugged in? Does the unit continue to use electricity? Record your observations below:

4. Was your hypothesis correct? Which device used the most electricity?

5. Write your suggestions for how the school could save electricity.

