

Lesson Plan: Understanding Energy Use and Sustainability

Grade Level: 4

Subject: Science / Environmental Studies

Standards Reference:

- **CA NGSS 5-ESS3-1:** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
- **CA NGSS 5-PS3-1:** Use models to describe that energy in animals' food was once energy from the sun.
- **CA NGSS 5-ESS3-2:** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- **CA NGSS 5-PS3-4:** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Objectives:

- Students will understand the importance of saving energy.
- Students will learn about different sources of energy.
- Students will be able to read and interpret various energy reports.
- Students will compare and analyze energy usage data.

Materials:

- Access to the Sustainability Dashboard (projected on screen or on individual devices)
- Handouts with key terms and definitions (e.g., kWh, renewable energy)
- Graph paper and markers
- Interactive worksheets for data interpretation
- Internet access (for online dashboard)
- Whiteboard and markers
- Stickers for rewards
- Colored pens/pencils

Vocabulary:

*Students can take notes for this section

- **Energy:** The ability to do work or make things move. It's what makes things happen, like turning on a light or moving a car.
- **Sustainability:** Using resources in a way that doesn't use them up, so there will be enough for people in the future too.
- **Renewable Energy:** Energy that comes from natural sources that won't run out, like the sun, wind, and water.
- **kWh (Kilowatt-hour):** A way to measure how much electricity is used. If you keep a 1,000-watt appliance on for one hour, it uses one kilowatt-hour.

- **Electricity:** A type of energy that powers things like lights, computers, and TVs.
- **Natural Gas:** A gas found underground that is used to heat homes and cook food.

Procedure

*When the instructions say to open a specific tab on the dashboard, the instructions are meant for the teacher to project it to their students. It does not mean the student individually clicks on the tabs on their chromebooks. To learn more about using the dashboard, watch this video. - [Sustainability Dashboard Video Guide Link](#)

Introduction (15 minutes)

Energy Charades (10 minutes):

Step-by-Step Instructions:

1. Divide students into small groups.
2. Each group comes up with a way they use energy (e.g., turning on a light, using a computer, cooking) and decides how to act it out without speaking.
3. The teacher checks each group's act to ensure it's appropriate and clear.
4. Groups take turns acting out their scenarios while the other groups guess the activity.

Purpose: Engages students and introduces them to different ways energy is used in daily life.

Examples:

- Watching TV
- Riding a bike
- Charging a phone

Class Discussion (5 minutes):

Questions to Ask:

- Why is it important to save energy?
- What happens if we use too much energy?
- Can you think of ways we waste energy every day?

Discussion Points:

- Energy is essential for many activities, but using too much can harm the environment and lead to resource depletion.

Introduce Sustainability:

- **Definition:** Sustainability means meeting our own needs without compromising the ability of future generations to meet their needs. It's about finding a balance between using resources and preserving them for the future.
- **Example:** Using solar panels for energy instead of burning coal, which can run out and cause pollution.
- **Additional Example:** Turning off lights when not in use to save electricity and reduce bills.

Activity 1: Exploring the Sustainability Dashboard (20 minutes)

Navigate to the Energy Overview Tab (10 minutes):

Instructions:

1. Open the Sustainability Dashboard.
2. Click on the "Energy Overview" tab.
3. Have a student read the general overview section.
4. Discuss the main sources of energy for the district (e.g., solar, wind, fossil fuels).

Discussion Points:

- Have you ever heard of PG&E or Silicon Valley Power? What exactly do these companies do?
- Why is saving energy important? (Reduces pollution, saves money, conserves resources)
- Where does our district get its energy from? (Discuss different sources like solar, wind, fossil fuels).

Examples of Discussion Prompts:

- How do you think using more solar energy can help the environment?
- What might happen if we run out of fossil fuels?

Activity 2: Monthly Energy Report Analysis (20 minutes)

Navigate to the Monthly Energy Report Tab (5 minutes):

Instructions:

1. Open the "Monthly Energy Report" tab.
2. Show the energy usage for each school in the district.

Discussion Points:

- Compare energy usage between schools. Why might one school use more energy than another?

School 1: _____

School 2: _____

Additional Prompts:

- What factors might cause a school to use more energy in winter than in summer?
- How can schools reduce their monthly energy usage?

Examples:

- One school might have older, less efficient heating systems.
- Schools with more students might use more energy overall.

Worksheet and Graphing Activity (15 minutes):**Instructions:**

1. Distribute worksheets where students record the energy usage of their school for the past three months.
2. Students create a bar graph showing the monthly energy usage using colored markers.

Purpose: Encourages students to analyze data and understand trends in energy usage.

Examples:

- A graph showing energy usage spiking in January and February, possibly due to heating needs.

Energy Usage Worksheet

Name: _____

Date: _____

Part 1: Monthly Energy Report

Instructions: Use the SCUSD Monthly Energy Report tab to find the energy usage data for your school for the past three months. Fill in the table below with the energy usage (in kWh) for each month.

School Name: _____

Month	Energy Usage (kWh)
_____	_____
_____	_____
_____	_____

Graphing Activity

Instructions: Create a bar graph showing the energy usage for each month. Use different colors for each bar.

How a Bar Graph Works:

Bar Graph Explanation:

- A bar graph is a way to display data using rectangular bars. Each bar represents a different category of data.
- The height or length of the bar shows the value of the data for that category. In this case, each bar will show how much energy (in kWh) was used in a particular month.

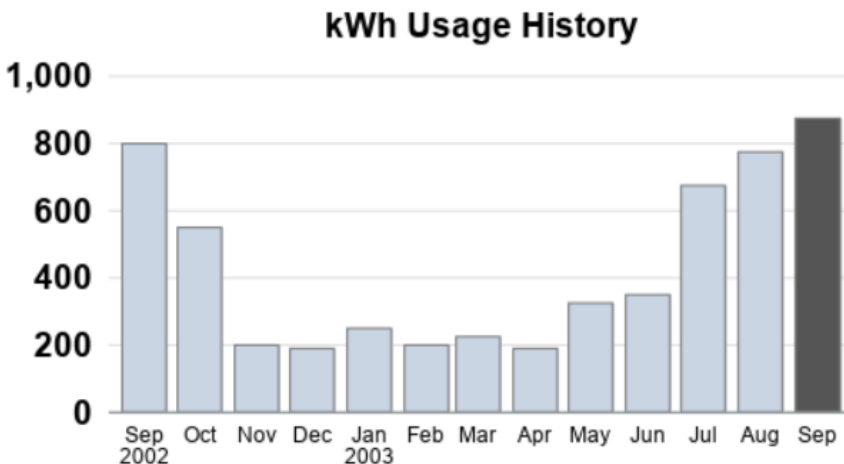
Parts of a Bar Graph:

- **Title:** The title tells you what the graph is about. For this graph, you could title it "Monthly Energy Usage".
- **X-Axis (Horizontal Axis):** This axis runs left to right. It will have the months (For example: January, February, March) labeled on it.
- **Y-Axis (Vertical Axis):** This axis runs up and down. It will show the amount of energy used in kWh.
- **Bars:** Each bar represents the energy usage for one month. The height of each bar will correspond to the amount of energy used that month.

Steps to Create Your Bar Graph:

1. **Title Your Graph:** Write "Monthly Energy Usage" at the top of your graph paper.
2. **Label the X-Axis:** At the bottom of your graph paper, write the names of the months evenly spaced.
3. **Label the Y-Axis:** Along the left side of your graph paper, write the numbers that represent the amount of energy used (kWh). You might use intervals like 0, 50, 100, 150, etc., depending on the data range.
4. **Draw the Bars:**
 - For each month, draw a bar that reaches up to the correct number on the Y-axis.
 - For example, if January's energy usage is 100 kWh, draw a bar that goes up to 100 on the Y-axis.
 - Color each bar a different color to easily see the differences between months.

Example Bar Graph Layout:



Now you are ready to create your own bar graph! Use the data you found in the table to draw and color your bars. You can use the template below to get started. Remember to label!

Template:



Activity 3: Annual Energy Report and Comparison (25 minutes)

Navigate to the Annual Energy Report Tab (10 minutes):

Instructions:

1. Open the "Annual Energy Report" tab.
2. Show the yearly energy usage for your school.

Discussion Points:

- Look at how energy usage changes from year to year.

Additional Prompts:

- Why might a school's energy usage increase from one year to the next?
- How can we use this data to help our school save energy?

Examples:

- New construction or additional students can lead to higher energy usage.

Energy Heroes Group Activity (15 minutes):

Instructions:

1. Divide students into groups. Each group is an "Energy Hero" team.
2. Assign each group a different school's data to analyze.
3. Groups compare the energy usage of their school over the past two years.
4. Each group presents their findings, highlighting any significant changes and suggesting ways to save energy.

Purpose: Teaches students to work collaboratively and present data.

Examples:

- A group might notice that their school used less energy last year due to the installation of energy-efficient lighting.

Conclusion (10 minutes)

Review and Recap (5 minutes):

Instructions:

1. Summarize key points with a quick quiz using flashcards.
2. Reward participation with stickers.

Purpose: Reinforces learning and encourages participation.

Example Quiz Questions:

- What is renewable energy? (Energy from sources that are naturally replenishing)
- Why is it important to save energy? (To reduce pollution, save resources, and lower costs)

Energy Pledge (5 minutes):

Instructions:

1. Have students take an "Energy Pledge" to save energy at school and home.
 - a. Example: I promise to use less energy and help protect the Earth. By doing this, I will make the world a better place for everyone.
2. Hand out drawing paper and materials for art to the students to make an energy certificate.
 - a. It can be decorated however the students like, but it should have in writing "Energy (your school mascot)"
 - i. Example: Energy Wolves

Purpose: Encourages students to apply what they've learned in their daily lives.

Q&A Session:

Instructions:

- Address any final questions.
- Encourage students to share what they've learned with their families.

Teacher Instructions:

- **Review Charades Acts:** Before the charades activity, check each group's act to ensure it's appropriate and clear.
- **Assist with Dashboard Navigation:** Guide students through using the Sustainability Dashboard to find the necessary data.
- **Monitor Graphing Activity:** Help students create their bar graphs and ensure they understand how to label axes and plot data.
- **Facilitate Discussions:** Use the provided discussion questions to prompt thoughtful conversations about energy usage and sustainability.
- **Encourage Participation:** Make sure all students participate in group activities and discussions.

Assessment:

- Participation in activities and discussions.
- Accuracy and creativity in worksheets and graphs.
- Group presentations on annual energy report analysis.
- Energy pledge participation.

*If you have any questions, feel free to email me at ashmitha@santaclaraschoolsfoundation.org