



GREEN TEAM

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School
Fortuna Union Elementary School District



Overview: We have developed an interactive education program for students to learn about energy and then share their knowledge with the rest of the school. Mr. Harder's 4th grade class heads the program called the "Green Team."

Objectives: The students learn about the relationship of static electricity to current electricity, circuits, electromagnets, electro generators, and public electrical utilities with an emphasis on energy produced from renewable resources.

Subjects: Science

Suggested Grade Level: 4th grade

California Standards Addressed:

- 4th Grade
 - Physical Science: Understanding electric charge, designing and building various electrical circuits, understanding magnetic fields, how to make an electromagnet, the construction of simple electrical devices, various uses for electrical energy, and a knowledge about electrical generators. (These standards are addressed through a hands-on science unit curriculum.)

Time: Prep and background: Done in class over six weeks
Green Team Presentations: 20-40 minutes per classroom presentation

Materials:

Prep and background (can have for each student or groups of students):

1. Balloon and piece of wool
2. Batteries
3. Alligator clips
4. Light bulb
5. One and two way switches
6. Simple motor
7. Iron filings
8. Magnets (Various Sizes)
9. Copper wire
10. Hand held crank generator

Funding for this lesson plan is provided by California utility ratepayers under the auspices of the California Public Utilities Commission.

Green Team Presentations:

1. Light meter
2. Watt meter
3. Thermometer
4. Worksheet for Green Team to record their findings
5. Worksheet for class to list major classroom energy users

PREPARATION AND BACKGROUND: Background information can be prepared and modified to meet the needs of your students.

In order to give students the background needed to participate in the "Green Team" the fourth grade class participates in a number of different hands-on activities. Students play with static charge with balloons rubbed with wool. They have batteries, alligator clip wires, lights, one and two-way switches, and simple motors to explore series, parallel, and complex circuits. We sprinkle iron filings over various magnets to see the sizes and shapes of different magnetic fields. Students use batteries and wires to experiment with how to build the most efficient electromagnet by counting how many paperclips each one can hold up. We look at doorbells, stereo speakers, lights, simple motors, and electric heaters to see how they work. Students learn that electricity can be converted into light, heat, sound, and motion. Finally, we complete our energy content standards unit with a look at how electricity is generated. We examine how a magnet that is moved inside a coil of wire will produce a small amount of electrical current. Next, we use simple hand-held cranking generators to produce up to 15 watts of electricity. Students learn that this is the same principle that power plants use to generate electricity by burning fossil fuels to turn giant turbines.

Students begin to explore the environmental impact of five methods of electrical generation: burning fossil fuels, nuclear, solar, hydroelectric, and wind generators. We look at the pros and cons of these methods as they relate to cost, efficiency, kilowatt output, and environmental impact.



Procedure: The culmination of the energy education program is the "Green Team." To be a member of the "Green Team" a student must pass a test to

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show they have a thorough understanding of the subjects studied, and be trained to become a team leader.

1. Students on the "Green Team" learn how to use different energy auditing tools such as a light meter, watt meter, and thermometer.
2. Then they perform an audit in their own classroom to gain confidence and experience using the new tools. After their own classroom, the "Green Team" members are divided into groups of three and go to other classrooms and perform audits in front of the students. The classroom audits consist of identifying electrical appliances used, measuring inside and outside temperatures, and checking lighting efficiency with the light meter to determine the potential for the use of daylight in the classroom.
3. Students record the temperature displayed on the thermostat, and use an infrared thermometer to measure outside temperature, and three different points in the room: in the open doorway, middle of room, and near windows. This demonstrates to students how the temperature changes throughout the room and the importance of making sure windows and doors are kept closed in order to conserve heat in the room.
4. Using the light meter, the "Green Team" measures the light levels (in foot candles) away from the windows, in the middle of the room, and near the windows. Measurements are taken with the lights off, with half the lights on, and with all the lights on. Assuming that 30fc is adequate and 75fc is overlit, students can determine if a possibility exists to use fewer lights, and ultimately less energy in the classroom, while still providing adequate lighting.
5. The "Green Team" then asks the students in the class to list the top five energy users in the classroom and predict the watts used. They use the watt meter to test the different classroom plug loads to give students an idea of how much a watt really is.

For Discussion: The "Green Team" leads the class in a guided discussion about energy use in the classroom and home, and they brainstorm different ways to conserve energy in our daily lives. Team members then share their knowledge of energy in our world, such as high energy costs, environmental impacts, depletion of fossil fuels, and using renewable resources. The team leaves the class with a light switch cover to remind them of the "Green Team" visit and to always try to conserve energy.

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Extensions: Have students take their knowledge home with them and perform an energy audit or assessment with their parents. Have them identify the main energy users and develop ways to conserve energy in their household.

Resources: South Fortuna Elementary School was able to purchase a light meter and watt meter through Green Schools funds. Locally, schools can borrow these items through the Redwood Coast Energy Authority "Energy Tool Bank" (<http://www.redwoodenergy.org/>).



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