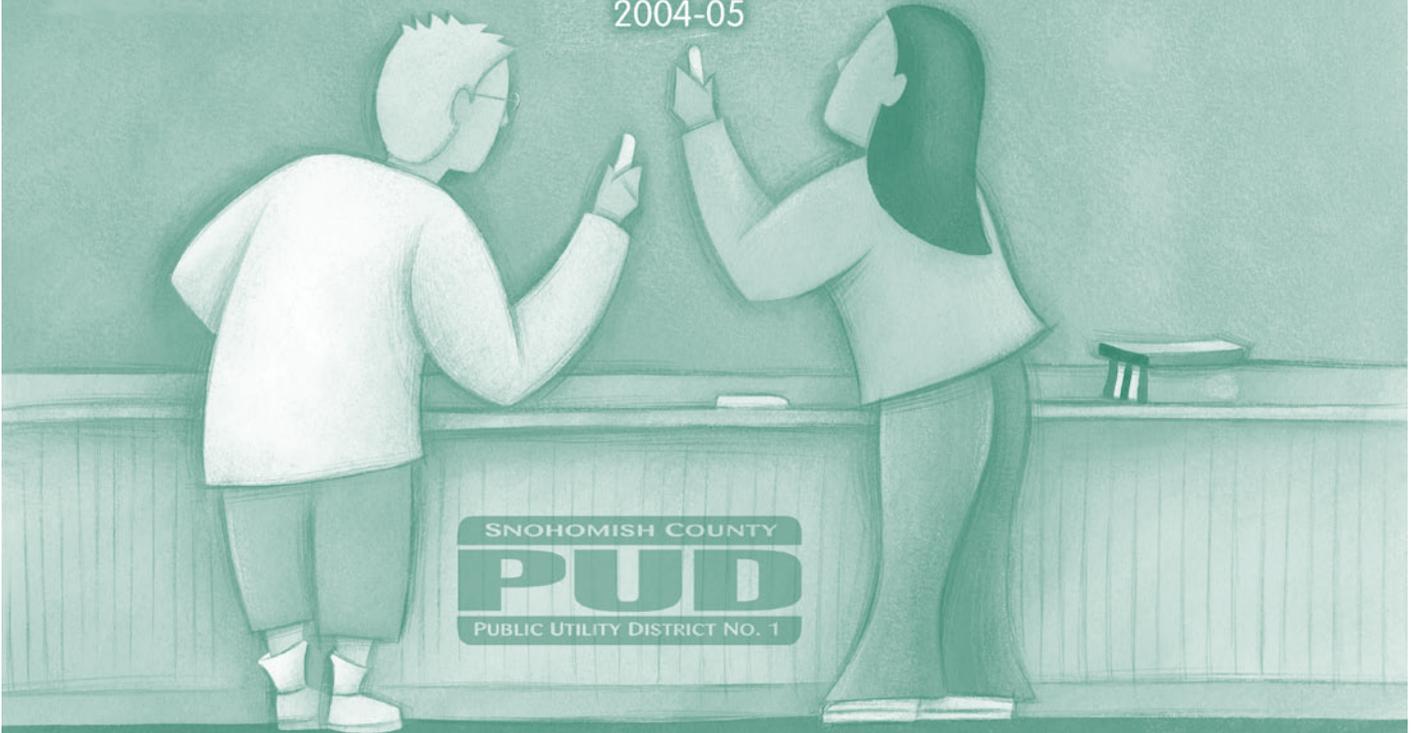


PUD Mini-Grant Program

UP TO \$500 FUNDING FOR
ENERGY & WATER EDUCATION PROJECTS

SCHOOL YEAR
2004-05



SCHOOL YEAR 2004-05



Energy Activities for the Classroom

Snohomish County PUD is committed to helping educators bring the world into individual classrooms or take the classroom out into the world.

We are excited to share with you the following success stories of our 2004-2005 mini-grant winners. Below are their stories - what they did and how their projects worked and what they'd do differently today. We provide these great teaching lessons in the hope that they will stimulate you to incorporate energy and/or water education into your curriculum.

Due to copyright laws, we are unable to produce all the materials provided to us; but you are welcome to contact the educators who developed and implemented the lessons.

The PUD thanks all the educators who brought their ideas forward for consideration as well as those individuals who gave their time to read the proposals.

Energy and Cultures by Mike Liles

Grade Level: 9th grade
School District: Arlington School District
School Name: Arlington High School
School Address: 18821 Crown Ridge Blvd Arlington, WA 98223
E-Mail Address at School: Mike_liles@asd.wednet.edu
School Phone: 360-618-6300

Project Description

Students will research an underdeveloped nation that does not rely on electricity. Create a PowerPoint presentation that depicts which alternative energy source(s) the students think would be beneficial to the country and the environment worldwide.

What are the objectives of the project?

This project is intended to emphasize the relevance of energy (science) to everyday life, and approaches science as one of the determining factors in shaping a civilization,

Objectives of the Project

SCIENCE EALR's

The student understands the nature and contexts of science and technology.

To meet this standard, upon completion of this project the student will:

- Understand the nature of scientific inquiry
- Know that science and technology are human endeavors, interrelated to each other, to society, and to the workplace

SOCIAL STUDIES EALR's :

1. The student uses maps, charts, and other geographic tools to understand the spatial arrangement of people, places, resources, and environments on Earth's surface.

To meet this standard, upon completion of this project the student will:

- Use and construct maps, charts, and other resources to gather and interpret geographic information
- Recognize spatial patterns on Earth's surface and understand the processes that create these patterns

Materials needed

computer with powerpoint and internet capabilities
Reference materials (encyclopedias, almanacs, atlas,etc)

Method

This is a very large and time-consuming project (1-2 weeks standard 55 min periods). Rather than give the students the whole project at once, I broke the project into smaller components. We then devoted 1 or 2 class periods per component. This made research easier for the students, and helps to keep the students and teacher organized. This project is best accomplished in student groups of 1 or 2. The following are the individual research components of the project.

1. Introduction: Students pick their country randomly out of a hat.
 - Introduce the people being studied, describe the location where the people reside, and explain their culture.
 - Information to research
 - World map with the country marked.
 - Close up map of the country or region detailing the location of the people.
 - The people (what is the population, birthrates, life expectancy, etc.).
 - Their culture (how do the people live, what's their history?)
 - Their economy (industries, what do the people do for money? etc.)

2. Geography, Geology, Climate & Natural Resources: Describe the geography, geology, climate & available resources of the country.
 - Information to include:
 - What's the land like?
 - What is the climate?
 - What are the country's natural resources? (What are the water resources or availability of water, what are their nonrenewable resources that are available, what renewable resources are available to them, what are their other natural resources?)

3. Current Energy Situation: Describe their current energy situation.
 - Information to include:
 - What do they use now?
 - How does the system in place work?
 - Explain the advantages/disadvantages to what they are using now.
 - What impact does the current energy situation have on the environment?
 - What impact does the current energy situation have on their economy and the health of the people?

4. Alternative Energy: Students Decide which type of alternate energy source/s is best for the people in this country.
 - Students must be able to defend the type of alternate energy they select.
 - Information to include:
 - Recommend an alternative energy source to be used in this country.
 - How would this alternative energy source you recommend work? (Where, specifically, could it be located? Will people have to move from their homes for it to be located there? How would it function?)
 - How would the recommended system impact the environment? (Include potential positive & negative impact. Are there pollution issues?)

5. Theorize Effects: Theorize how the culture of the people will change with the introduction of the alternate energy source. Include the advantages and disadvantages of supplying energy to the people.

Once these components are thoroughly researched, the students were then given computer lab time to complete their PowerPoint presentations. Allow for at least 3 days to complete the PowerPoint presentation. Once completed most classes took 3 class periods to finish the presentations. Average presentation length 10-15 minutes.

Once finished with the presentations, Each group was given a Solar powered car kit, to complete. Day one of the solar powered car lab was to compare the outputs of different solar panels. This allowed the students to decide which panel size would work best on their cars. Day 2 was devoted to testing their propulsion system on the solar powered cars. The options include Gear based, Fan based, or belt based propulsion. Students tested each option and decided which was most efficient. Day 3 and 4 were devoted to building and racing the solar powered cars. Students ended with a better understanding of how solar cell work, as well as the understanding all the many factors involved with building the fastest racer.

Evaluation

Students were evaluated using a rubric that assessed both the content, and the presentation component of this project.

Challenges

The greatest challenge implementing this project was obtaining adequate library time for research and computer lab use.

Successes/strength

Students increased their understanding of the great diversity of culture on this planet, as well as a better understanding of current world energy issues. Students also found great success in their understanding of Solar energy, and how solar energy can be harnessed to provide electricity

Budget for Solar powered car kits

Kelvin Solar Racer Kit: includes a 1000mA/.45V DC solar cell, DC solar motor, balsawood blank, pulleys, wheels, gears, axles, rubberbands, propeller and DesignGrid sheets.

\$9.95 x 30 kits = \$298.5

Solar Cells Project Pack

Contains several sizes and outputs; 50-700mA total output.

\$ 9.95 x 20 kits = \$199

Total = \$497.50

Solar Car Overhaul

By Britt Van Horne

Grade Level:	Fifth Grade
School District:	Monroe School District
School Name:	Monroe Middle School
School Address:	315 Short Columbia, Monroe, WA 98272
E-mail Address:	vanhorneb@monroe.wednet.edu
School Phone:	(360) 794-3020

Project Description

Students built a basic solar car, and then overhauled it to improve its speed. Extensive planning and testing took place before the modified cars were featured in a car show for parents and other classrooms.

Objectives

- Students will think scientifically as they generate and test ideas to increase the speed of their cars and record variables that may have affected the outcomes.
- Students will be able to time their cars and determine the speed of their cars in miles per hour.
- Students will be able to create tables and graphs on the computer as they organize their data.
- Students will be able to use the scientific method to write reports outlining the steps involved in overhauling their cars, and show the reports on display boards at the car show.

Key Washington State Essential Learnings

Science 2.1 = Develop abilities necessary to do scientific inquiry.

- Students will generate questions that can be answered through scientific investigations. They will also design and conduct investigations, record and report explanations, and communicate scientifically.

Math 4.3 = Represent and share information

- Students will share, explain, and defend mathematical ideas using terms, language, charts, and graphs that can be clearly understood by a variety of audiences.

Materials

The Solar Car Book by Klutz (one copy per student plus three more books for extra parts), a stopwatch, a video and books about solar energy, as well as presentation boards are needed. Extra materials needed for the modifications include: wire, various styles of lights, batteries, propellers, rubber bands, switches and buzzers.

Project Design

After each receiving their own copy of *The Solar Car Book*, published by Klutz, students read and took notes on the history and science of both solar cars and solar power. The class engaged in discussions and watched a video on the subject. They also read about how to build and troubleshoot possible problems in the assembly of the cars.

Students used the materials included in *The Solar Car Book* to create solar powered cars. Numerous tests were conducted and averaged to find the base speed in miles per hour for each car. Students then thought of additional ways to increase the speed of their cars. Propellers and various types of batteries, as well as extra wire, motors, and solar cells were provided for students to use on their overhauled cars. Students used their knowledge of parallel and series circuits to help them determine how to rewire their cars using the new parts. At least two new car models were created, tested, and timed by each student. Students also modified their cars with buzzers, lights, and switches to add more style to their cars.

After the experimenting phase of the project was finished, students worked on their reports. Students used the data collected to create computer generated tables and graphs to further organize and illustrate their findings. Each student created a display board showing their question (How can this solar powered car be overhauled to go faster?), hypothesis, materials used, procedure, results, variables, and conclusion. Information on the presentation board also included a drawing of the car, ideas for further testing, and facts about solar energy.

The presentation boards, along with the cars, were on display at a car show in the library. A car race took place at the end of the show. Trophies were given for the fastest car and the car with the most style (as voted on by attendees of the car show). Parents and other classes were invited to attend this celebration of learning.

Evaluation/Assessment

Students demonstrated their understanding of the history and science of solar energy and solar cars through their notes and discussion on the topic. Their ability to read and follow directions was shown by creating a working solar car. Math skills of students were assessed when the teacher examined their data and determined if the speeds were reasonable. An understanding of the scientific method, and the ability to create computer generated tables and graphs was demonstrated by students when they completed and their presentation boards. Students self-assessed their projects which were also later graded by the teacher.

Challenges

The project was relatively easy. The biggest challenge (other than the unpredictable weather) was keeping the cars in working order. Extra cars were purchased in case there were breakdowns- parts from all the extra cars needed to be used.

Budget

\$461 = 30 copies of Klutz's The Solar Car Book (2002)

\$39 = propellers, batteries, wire, lights, buzzers, switches

\$500 = total amount requested

Solar Powered Cars

by Irene Beazley

Grade Level: Grade 5
School District: Monroe School District
School Name: Monroe Middle School
School Address: 351 Short Columbia Street, Monroe, WA 98272
E-mail Address at School: beazleyi@monroe.wednet.edu
School Phone: 360-794-3020

Project description

After researching solar energy uses students built solar cars from Sunnyside-Up solar car kits. They used journals to record materials used, procedures, hypotheses, and results. They then tested cars for speed and recorded data on graphs.

Objectives of the Project

- Students used and documented the scientific method.
- Students built solar powered cars and recorded results.
- Students investigated differing forms of energy and uses of solar energy.

Major Essential Learnings Covered

- Science 2.1 – develop abilities necessary to do scientific method
- Writing 2.2 – write for different purposes
- Reading 2.2 – understand and apply knowledge of text components to comprehend text
- Reading 3.1 – read to learn new information

Materials Needed for the Project

SunnySide Up Classroom 10-pack (from SUNWIND) – 3 sets

Method or Design of the Project

- Watched 15 minute video (from PUD) on solar energy for background information
- Keith Larson presented a three-hour presentation on Solar Energy, students investigated various criteria for efficient solar cars
- Students followed (complicated) directions and built cars from kits
- Students read Science World article on solar cars and used guidelines for retelling expository text to summarize
- Students wrote hypotheses regarding their particular car (speed and distance)
- Tested cars

- Graphed results of their car and two others
- They then brainstormed reasons why some cars went faster or straighter and how they could modify their cars to create more speed

Evaluation/Assessment

Observation of building and testing of cars
Journals – how complete was their procedural write up
Summary of article

Challenges in Implementing

You need a sunny day for testing cars. We built our cars and then had to wait several days before we could test.

Successes

Seeing students become totally engaged in the building of their cars. Some students that are generally weak in areas such as reading were some of the most adept at building. It was great to see them as leaders in this project.

Budget

3 Classroom SunnySide Up Classroom 10-packs - \$345. + \$20 shipping.

Stewardship Learning Project on the Use of Native Plants to Conserve H₂O and Control Soil Erosion by Karen Reid, Ed.D., Principal

Grade Level: K-5
School District: Mukilteo School District NO. 6
School Name: Serene Lake Elementary School
School Address: 4709 Picnic Point Road, Edmonds, WA 98026
Email Address at School: reidka@mukilteo.wednet.edu
School Phone: 425-356-1307

Project Description

To create a classroom ready “gardening” cart system to support students in planting, caring for and replacing non-native vegetation in our outdoor learning center. Students will participate in planning for and monitoring drought resistant vegetation to enhance the local environment and promote water conservation and erosion control.

Objectives of Project

The objective of this project is to teach students about how native plants in our area are adapted to this climate zone and particular topography in such a way as to optimize the natural processes that use water and soil nutrients in a life system that affects our environment. This project will also serve to supplement our science curriculum with the earth/life sciences and enhance our 3 acre Outdoor Learning Center and to develop and maintain campus planting beds on the exterior of our existing greenhouse.

Major Essential Learnings Covered

Science – Interpretation and Clarification – Life Science –

- Interdependence of Life: Describe how an organism’s behavior and ability to survive is influenced by its environment, other life forms, and availability of food and/or other resources.
- Life Processes and the Flow of Matter and Energy: Recognize that living things need constant energy supplied from food or light, and that in ecosystems, substances such as air, water, nutrients, and the chemicals in food are continually recycled.
- Environmental and Resource Issues: Know that humans and other living things depend on the natural environment, and can cause changes in their environment that affect their ability to survive as resources can be conserved and their usable life extended through recycling and decreased use.

Communication – The student uses communication strategies and skills to work effectively with others.

- Use language to interact effectively and responsibly with others.
- Work cooperatively as a member of a group.
- Seek agreement and solutions through discussion.

Materials Needed for the Project

Gardening Tools, Potting Mix, Plants and Transportation for Field Trip to Emery's Nursery

Method or Design of Project

Students will learn about water conservation through the study of native plants in our best suited for our local school yard. Extensions will be communicated to households in our school neighborhoods to further promote the study of water conservation. This project will support student leadership and stewardship opportunities through the study of drought resistant trees and vegetation that will enhance our Outdoor Learning Center. We will work to replace alder trees and blackberry vines with native trees and ground cover to assist in the control of soil erosion and weed management, thereby promoting water conservation. Student council members will work cooperatively to produce a power point presentation and reference materials for classroom use to be shared with the school community.

Evaluation/Assessment

Students worked hard to clear away non-native plants in our Outdoor Learning Center. The trip to Emery's Garden Center was educational and students now know how to identify water resistant plants.

Challenges in Implementing Project

The weather and timing for the project was a bit challenging!

Successes/Strength of Project

Students worked hard and the new plantings look great in our Outdoor World of Learning! Students are talking about their new learning with the student body and are proud of their work to enhance the school grounds for our school and community to enjoy.

Budget

· Purchase rolling gardening cart	\$150.00
· Purchase small gardening tools/watering cans for student use	\$75.00
· Purchase seedling pots and dirt for planting	\$40.00
· Landscape lumber and soil to construct garden beds on the exterior of the existing greenhouse	\$75.00
· Purchase of native plants and seedlings	\$50.00
· Provide a field trip to a local garden center to learn from the local horticulturalists and view plants	\$100.00
Total Amount Requested	\$490.00



Corporate Communications & Marketing

PO Box 1107

Everett WA 98206-1107

425.783.8292

www.snopud.com