MINI-GRANT FINAL REPORTS

SCHOOL YEAR 2005-06

Snohomish County PUD
Public Utility District No. 1

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 2005-2006 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.

Middle School Girls Get To Know Electronics
by Marilyn Dauer

Grade Level:	7th and 8th grade
School District:	Edmonds
School Name:	College Place Middle School
School Address:	7501 208th S.W. Lynnwood, Washington 98036
E-mail Address at School:	dauerm@edmonds.wednet.edu
School phone:	425-670-7311 ext. 4219

Project Description

Middle school students (especially girls) know very little about electronics. Our hands-on project taught them about the basic components used in electronics. Then they used that knowledge to construct a "personal alarm".

Objectives of the Project

- Recognize the basic components used in electronics
- Learn to follow electronic schematic diagrams
- Learn how to soder
- Construct a useful "personal alarm device"
- Discuss possible careers involving electronics

Essential Learnings Covered

1. Science essential learning for grades 6-8: 1.2.1 Analyze how the parts of a system interconnect and influence each other. (7)Describe the flow of matter and energy through a system
2. Reading essential learning for grades 7-8: #3The student reads different materials for a variety of purposes. 3.2 Read to perform a task.

Materials Needed

1. Mr. Circuit kits—we borrowed these from another middle school (they're at least 10 years old.)
2. Personal Alarm kits
3. soder irons, soder, practice circuit boards so we could practice sodering

Method

We have an afterschool club for girls and technology. In March we began by showing the Mr. Circuit video—one small part at a time—and each student completed the experiment that was shown in the video. We had enough Mr. Circuit kits so that each student had their own kit. We kept track of which girls completed which experiments. When all of the necessary experiments were completed the girl "graduated" from the Mr. Circuit course. Then she received a "Personal Alarm Kit" in which she had to arrange the components in the correct order, and then soder the components. Then they were allowed to take their working alarm home.

Evaluation/Assessment

We completed all Mr. Circuit experiments together—we moved at the same pace and we checked off which girls finished which experiments, so we were sure that everyone completed all of the required learning. The Mr. Circuit kits were designed in a progressive order of complexity so knowledge was built on each week. We were able to complete approximately three lessons during each club meeting. As we were completing each experiment we would discuss how these components were used in electronics that they use on a daily basis (TV, computers, Ipods, etc.). In regards to learning how to soder, we practiced the week before sodering on the real personal alarm kit. The real test was: would the personal alarm work?

Challenges in Implementing Project

I didn't know that the "Personal alarm kit" required sodering. It did not say that sodering was required in any of the literature about the kit. This was a real shock. I didn't expect to have to teach girls how to soder. I was scared that they would burn themselves, but then I realized that a soder iron is very similar to a curling iron, and many girls have experience with that device!

Successes/Strength of Project

This was really a new learning experience for the girls—none of them had ever worked with electronic components and only one had ever sodered before! It was fun for them to see that the components that we used in the Mr. Circuit projects were the same ones used in the "Personal Alarm Kit". It was like, "Wow, these components are used in real life!"

Budget

- The Mr. Circuit kits were borrowed from another middle school.
- We purchased the Personal Alarm kits from PITSCO for $9.95 each.
- Each alarm kit needs a 9v battery for approx. $1.00 each.
- I purchased some used circuit boards, soder, and wire so we could practice sodering.
- We borrowed 12 solder guns from a local high school.

Raising Salmon
by Todd English

Grade Level:	Grade 2
School District:	Edmonds School District #15
School Name:	Brier Elementary
School Address:	3625 232nd st. SW
E-mail Address at School:	englisht@edmonds.wednet.edu
School Phone:	425-670-7311 ext.2095

Project Description

This year the second grade classes at Brier Elementary continued their tradition of raising salmon from eggs to fry and releasing them into a river. Every year this has been a very successful unit and a huge hit with the kids. This year, however, our PUD grant gave us the opportunity to buy an automatic feeder, top of the line filter, and new air pump which cut back considerably on the amount of time which the teachers had to invest in the project.

Objectives of the Project

The objectives of this project were to give he students an opportunity to witness first hand the lifecycle of a salmon and at the same time do our part to help the salmon runs stay healthy.

Essential Learnings Covered

- Understand characteristics of living organisms-
- Observe and describe characteristics of living organisms.
- Understand that plants and animals have life cycles-
- Observe and describe the life cycle of a plant or animal.

Materials Needed

Large aquarium, refrigeration device, air pumps, filter, automatic feeder egg hatching tray, water testing kit, salmon eggs, salmon food.

Method

Our aquarium was set up in the library. We started by watching the eggs hatch in the egg tray floating on top of the aquarium. After the salmon hatched, they were released into the aquarium where we were able to watch them grow into the fry stage.

Evaluation/Assessment

We kept daily journals which documented the growth of the salmon. At the end of the lesson we had a quiz to find out what we learned.

Challenge of Implementing Project

In the past the biggest challenges were keeping the water clean and feeding the salmon several times a day. Because of the equipment we received in this grant we were able to keep the water clean and the fish fed much easier.

Successes/Strength of Project

This was a very powerful way to teach kids about animal life cycles. The kids enjoyed watching the salmon change daily in the aquarium.

Budget

The aquarium and refrigeration device were bought several years ago by another teacher so I'm not sure what the cost of those items were. The items we bought with the funds from this grant were- automatic feeder $69.99, canister filter $79.99, air pump $54.99, air stones $31.96, air line tubing $2.91. The total was $239.84.

Building Model Hydoelectric Turbines
by Nancy Flowers & Brad Kernan

Grade Level:	Grade 9 Coordinated Science
School District:	Everett School District
School Name:	Everett High School
School Address:	2416 Colby Avenue, Everett, WA 98208
Email Address at School:	nflowers@everett.wednet.edu, bkernan@everett.wednet.edu
School Phone:	425-385-4583

Project Description

The plan was to build working models of a hydropower generator to complement our 9th grade science unit on energy resources. We located plans on the Internet, which involved spinning a magnet attached to a water wheel, causing an electric current to flow through a wire coil. Our goal was that students would be able to apply their understanding of this system to how hydroelectricity is generated in the Pacific Northwest.

Objectives of the Project

This project was designed to give students a hands-on experience in understanding where the electricity they use comes from. The primary objectives were for students to demonstrate understanding of:

- How the energy of moving water can be converted to electrical energy, then to apply this to a general understanding of other forms and transformations of energy.
- The ability to design controlled investigations and use models to represent systems.

Essential Learnings Covered

The project targeted three 10th-grade science standards:

- Systems 1.1.4: Analyze the forms of energy in a system, subsystems or parts of a system.
- Inquiry 2.1.2: Understand how to plan and conduct scientific investigations.
- Inquiry 2.1.4: Analyze how physical, conceptual and mathematical models represent and are used to investigate objects, events, systems, and processes.

Materials Needed for Each Turbine

2" x 4" x 12" wood base, 2 metal brackets, one set of Tinker Toys, one dowel, nails, screws, magnetic wire, compass, diode, magnet, Gorilla glue, wood glue, electrical tape, small piece of plywood to mount magnet, copper wire, paper cups, cardboard for construction of galvanometer base.

Method

In part 1, students in the EHS Robotics and Engineering club attempted to build a water wheel, hydropower generator (spinning magnet and wire-wrapped nail), and galvanometer (compass wrapped with wire). In part 2, students would design their own experiments to explore such things as how changing the water pressure affects current generated (relating to height of dam, outflow pipe diameter, volume of reservoir), or changing the size/strength of the magnet or how the wire is wrapped (relating to how generators work).

Evaluation/Assessment

Our goal was that students would write either a short report or produce a PowerPoint presentation explaining their understanding of:

- Hydroelectricity generation
- Variables affecting hydroelectricity production
- Forms and transformations of energy in a system
- Scientific modeling to study complex systems

Challenges in Implementing Project

After working on the turbines for approximately five 2 hour afternoon sessions, we concluded that flaws in the design resulted in no generation of electricity. We tried a variety of modifications to the original plan, including different types of wire (copper and magnetic steel), different amounts of wire wraps in the coil, several methods for wrapping the wire around the nail, two different compasses, two different magnets, variation in the attachment of wire leads, and two types of galvanometers. Unfortunately, our project was not successful. Despite our best efforts, we could not observe any deflection in the compass arrow when the turbine was spinning. I would like to compare our turbine model with the one provided by the PUD for their hydropower classroom presentation to see if further modifications could result in the generation of electric current.

Success/Strength of Project

Our robotics and engineering students had a great time building the turbines, and gained skills in using power tools and problem solving. One student in particular spent several hours trouble-shooting various parts of the turbine. Another student developed a unique way of quickly wrapping many turns of wire around a nail using a power drill.

I believe that even if we cannot eventually get these turbines to work, the materials we have will be put to good use in building models for the study of systems and energy.

Budget

Note—Jack McLeod and Sarah Dinnis were involved in the purchase of all supplies. This is the original budget, plus one can of Tinker Toys. The actual costs may be less than given below.

Quantity	Item	Source	Cost/Item	SubTotal	Total*
32	simple magnetic compass	American Sci. & Surplus	$1.25	$40.00	$52.95
16	spool wire (#28)	Lowes	$1.96	$31.36	$34.06
1 lb.	3/4″ roofing nails	Lowes	$1.73	$1.73	$1.88
2 lb.	6d finishing nails	Lowes	$2.23	$2.23	$2.42
3 lb.	16d finishing nails	Lowes	$1.78	$1.78	$1.93
8	3/8″ x 4′ dowels	Lowes	$0.68	$5.44	$5.91
64	Stimson "strong ties"				
	A24 L-shaped metal bracket	Lowes	$1.98	$126.72	$137.62
4	roll of electrical tape	Lowes	$2.47	$9.88	$10.73
8	bottles of white glue	Lowes	$2.57	$20.56	$22.33
4	bottles of "super glue"	Lowes	$1.28	$5.12	$5.56
3	2″x4″x 8′ lumber	Lowes	$2.33	$6.99	$7.59
6	1″x4″x8′ lumber	Lowes	$2.98	$17.88	$19.42
4	tub of bearing grease	Lowes	$2.59	$10.36	$11.25
1	Set of wooden Tinker Toys	Toys R Us	$29.99	$29.99	$32.50
16 x 2pk	germanium diode, 1N4004	Radio Shack	$0.63	$10.08	$10.95
4 x 64pk	paper cups	Safeway	$2.64	$10.56	$11.47
64	alligator clips	district matching	$0.00	$0.00	$0.00
32	round "hub" Kinex	district matching	$0.00	$0.00	$0.00
256	Kinex spokes	district matching	$0.00	$0.00	$0.00
32	1″ bar magnet	district matching	$0.00	$0.00	$0.00
TOTAL					**$368.56**

* With Tax & Shipping

Roller Coaster Conversions
by Michelle Markwardt

Grade Level:	Sixth Grade
School District:	Granite Falls School District
School Name:	Granite Falls Middle School
School Address:	205 North Alder Ave, Granite Falls, WA 98252
Email Address at School:	mmarkwar@gfalls.wednet.edu
School phone:	360-691-7710

Project Description

This project was to build on students understanding of everyday uses of energy, and create models to show real-world understanding and uses.

Objectives of the Project

Students illustrated the transfer of energy through the creation of a roller coaster. Students analyzed how models are used to investigate objects and systems.

Essential Learnings Covered

Students practiced and learned how various factors affect energy transfers and that energy can be transformed from one form of energy to another. (1.2.2) Students also used mathematical reasoning to analyze information from the use of models. (3.3.1)

Materials Needed

K'Nex Roller Coaster Physics (2 sets), CD ROM, Calculators

Method

Students viewed the CD to have a better understanding of the K'Nex roller coaster kits. They then chose a roller coaster model from the 4 main different design sets to make. Students worked in a group and built a working model of a rollercoaster. Along the way we discussed (at the end of each build session) the difficulties (reading the direction/diagram incorrectly, etc.). Once the roller coaster was finished being built, I then had them describe to me the many areas that had transfer of energy. Since there were never that many students we would just have informal discussions.

On their own they wanted to calculate the speed of the roller coaster as they thought it was going pretty fast, compared to what they had built with their own materials during the school year. Since it was done after school, but the students were so proud, they asked if they could show their particular classes during the day. I had them demonstrate how it worked and they each also showed how they calculated the formula for the speed of the roller coasters.

Evaluation/Assessment

Students met objectives when they created a working roller coaster and had demonstrated verbally, the conversions of energy. I also knew they were gaining knowledge when they asked to calculate the speed of the roller coaster. It was after this point we started talking about how creating roller coasters is a 'real' career for some people and that they think about the turns and loops and structure and how fast they can make a roller coaster go.

Challenges in Implementing Project

Some of the things I had originally decided on for this project I changed once I got the sets. Students did not have to make blueprints for their roller coasters as these were already supplied within the kit. This project also had to be worked on after school by volunteers. I only had 4 constant students stay for the durations, but 10 others came at times when convenient for them. Because of this fact I have more informal assessments (verbal conversations and discussion). Had it been in my full science classes, as it will be next school year, we would have had more written assessments, presentations of the models with explanations and drawings, etc.

Successes/Strength of Project

I am very excited to do this project will all my science groups next year. One of my personal frustrations is/was I would rely on the students in groups to bring in supplies to build roller coasters. Students would have to think of things that would work to make a track and supports (which is a great problem solving tool) but the logistics of it were too much. Kids would not bring things in or could not, due to financial constraints. So things needed sharp tool to cut which was dangerous and time consuming at time. With these new connects sets I'm looking forward to doing more math calculations and observations. More time will be spent on the math and science of it, rather than the logistics. Students will still get to build and assemble a roller coaster, they just wont have to worry about how or what they will use to make that roller coaster.

If it is any indication of the types of fun, problem solving, math and questioning that came about with just one group, I can't imagine what it will be like with all my science classes.

Budget

I received 2 K'Nex sets for a total of $433.39.

Electric Explorations — Inquiry science for the Multi-age Classroom by Anne Brown

Grade levels: Multi-age 4th, 5th, and 6th grades
School District: Granite Falls School District
School Name: Monte Cristo Elementary
School Address: 1201 - 100th Ave. NE, Granite Falls, WA 98252
Email Address at School: abrown@gfalls.wednet.edu
School Phone: (360) 691-7718

Project Description

Our class conducted several inquiry based experiments to learn about electricity, circuits and switches using key questions from the AIMS Electrical Connections materials. The final project was to construct homemade flashlights using simple materials.

Objectives of the Project

1. Students will learn about the scientific process from Alexander Graham Bell and Thomas Edison then use their own science notebooks to record their observations, collect data, and write about their discoveries.
2. Students will draw conclusions based on observations to answer the following question: How can you make a bulb light up using a bulb, a D cell, and wire?
3. Students will predict, observe, and collect data to answer the following question: How can you make a complete electric circuit that will light a bulb?
4. Students will predict, observe, and collect data to answer the following question: How can we turn the current on and off in an electrical circuit?
5. Students will problem solve, observe, and draw conclusions to answer the following question: How does the flow of electricity in a series circuit differ from the flow in a parallel circuit?
6. Students will problem solve, observe, and draw conclusions to answer the following question: How can we build an electric motor?
7. Students will use the scientific method to answer the following question: How can you use the materials and your knowledge of how electricity works to build a simple working flashlight?

Essential Learnings Covered

SCIENCE Essential Learning 2: The student knows and applies the skills, processes and nature of scientific inquiry.

Components:

2.1 Develop the knowledge and skills necessary to do scientific inquiry.

2.2 Understand the nature of scientific inquiry.

The students will gain skills and understanding about electricity and how the different components of it work together to create a system by using scientific inquiry. When using inquiry science, the object is to ask a guiding question then investigate the answer. In each of the labs the students have the opportunity to solve a problem as they observe, collect data, and record their observations.

READING Essential Learning 3: The student reads different materials for a variety of purposes.
Components:

3.1 Read to learn new information.
3.2 Read to perform a task.
3.3 Read for career application.
3.4 Read for literary/narrative experience in a variety of genres.

The students will use all of their reading skills for different purposes in this Electricity unit. They will be reading informational passages about Thomas Edison and Alexander Graham Bell and using the information to help them in their scientific explorations. Students will also be reading to follow direction for each of the hands-on labs. These hands-on experiences are a natural gateway for children to discuss career opportunities.

Materials Needed

Black composition notebooks, D-cells, battery holders, bulbs, bulb holders, aluminum foil, wires, wire strippers, magnet wire, ring magnets, assortment of switches, 3x5 note cards, jumbo paper clips, small and large Ziploc baggies (for storage of supplies).

Suggestions: Purchase extra bulbs since they are easily broken or burnt out when using multiple batteries in one circuit. Battery holders were helpful because they came with wires attached and reduced the need to cut and strip multiple wires. The lowest cost and easiest substitution for wires were strips of foil the width of a strip of cellophane tape. They were durable and easily manipulated by small hands. It is not necessary to purchase black composition notebooks as they are expensive. While students tended to keep them neater and not tear the paper out of them like they might from spiral notebooks, simple packets made from graph paper or copied sheets from the AIMS reproducibles could work just as easily.

Method

The objectives of the unit plan will be accomplished through guided inquiry. Students will be presented with background information for each concept prior to the lesson using the AIMS Electrical Connections book. Students will then make predictions, follow written procedures, observe and collect data by performing several hands-on activities. Finally, the student will draw conclusions and record their thinking. Each lesson will also include a scientific discussion about the concepts to ensure that every student is able to grasp the main ideas.

The unit will commence with the reading of a copy of a very famous scientific notebook—the notebook of Alexander Graham Bell discovering the first telephone. Discussion about the kinds of observations and writing that are in the notebook will lead the students to discover the author and see what a scientific notebook should contain. After students guess who the owner of the notebook is they will read a short biography about Alexander Graham Bell and answer WASL like questions to stimulate their higher level thinking skills. Students will also read a selection about Thomas Edison and his quest to invent the light bulb, as well as his life as an inventor. Students will get their own scientific notebooks to record observations and data in the following electricity labs.

Each of the guiding questions above involves introducing a concept through a guiding question. Student will use the material purchased with the grant monies to build and complete each of the hands-on labs with teacher support. Students will then be assessed on their ability to complete the tasks and write about their knowledge of the major science concept being explored in each guiding question. The objectives will be evaluated by assessing the students' scientific journals and through small group discussions following each lab. The final question, "How can you use the materials and your knowledge of how electricity works to build a simple working flashlight?" will be the final assessment to gauge the students' ability to apply the knowledge and skills that they gained through each of the labs.

This inquiry unit on electricity is interdisciplinary because it combines science, reading, writing, and communication. It is important for our students to be able to not only follow directions, but to be able to read research, write their observations and communicate their findings.

Evaluation/Assessment

Students completed the tasks and recorded their attempts in their journals and on worksheets provided by the AIMS Electrical Connections curriculum guide. Students were assessed on their participation in each lab and the work that they recorded in their journals. The students' level of understanding was determined by observing their work in small groups, checking their worksheets, and by reading their journals. Their final project of building their own flashlight was also a culminating assessment to show if they could apply the skills and knowledge they learned from the previous labs. Flashlight success was determined by two main criteria: Did the flashlight have a complete circuit? Did the flashlight have a working switch? Students also took a teacher created cumulative test that demonstrated their understanding of the major objectives. The test is attached at the end of the report.

Challenges in Implementing Project

The major challenge was assembling all the materials for 40 students to use at a time. It was a bigger job than expected and took longer to prepare than had been anticipated. Many students who had not been exposed to such things as wires, bulbs, and batteries or even simple building materials had a more difficult time in constructing the various models. It also took longer than anticipated for students to realize that they had to follow the written instructions and diagrams closely in order to be successful when building each model. This was eased by pairing students with "student experts" who could guide them through more complicated constructions. Inviting parent helpers would also have helped with classroom management.

Overall, lack of class time was the biggest challenge. One hour per day to build and observe was needed in addition to a follow up class period for students to reflect and write in their scientific notebooks. This was eased in a couple of cased by creating a teacher model and demonstrating for the entire class along with a discussion. The students did not prefer this method, but it did help focus their learning and ease frustration.

Successes/Strength of the Project

This month long science unit was definitely a favorite among all the students. They loved the hands on aspect and the fact that they were using "real life" materials. Even thought frustrations with the constructions were common, the satisfaction that came from creating a successful model to answer the key questions was clear on all the students' faces.

Using Ziploc baggies to keep batteries and bulbs separate from wires reduced the risk of fires and short circuits when all the materials were assembles. Larger baggies were helpful to keep supplies for larger projects organized such as building multiple circuits or an electric motor.

This high interest unit is a must for anyone who wants to teach scientific note booking, scientific process, inquiry science, or just give kids hands on experience!

Budget

AIMS Education Foundation www.aimsedu.org/aims_store

2	AIMS Electricity Lab	$79.95	$159.90	
3	Ring Magnets (15)	$3.95	$11.85	
1	Electrical Connections	$21.95	$21.95	
Shipping/Tax				$ 0.00
TOTAL:				$193.70

Office Max www.officemax.com

15	Black Composition Book	$4.99 /3PK	$74.85	
Shipping/Tax				$ 0.00
TOTAL:				$74.85

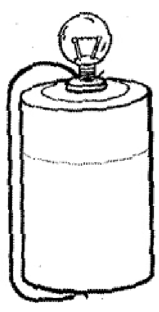
Radio Shack www.radioshack.om

6	8-Pack D Alkaline Batteries	$9.99 /8PK	$59.94	
1	225-Ft. Wire 22AWG	$5.49	$5.49	
12	DPDT 0.5-Amp Knife Switch	$2.99	$35.88	
25	3-Amp Slide Switch	$2.49 /2PK	$62.25	
10	E-10 Compact Threaded Light Base	$1.59	$15.90	
10	1.2V/250mA Incandescent Bulb	$1.59	$15.90	
25	D Battery Holder	$0.99	$24.75	
Shipping/Tax				$ 0.00
TOTAL:				$220.11

Name______________________(1 pt) Date________________ (1 pt)
(35 pts total)

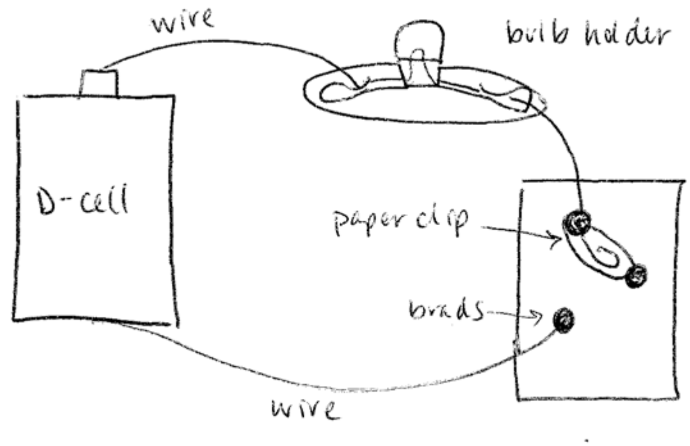
1. Draw and label a diagram that shows TWO ways to make a bulb light using a bulb, a D cell, and wire. (4 pts)

2. These circuits are incomplete. Draw a diagram to show how you would fix them. Explain the changes you made. (2 pts each)



3. How can we turn the current on and off in an electrical circuit? (2 pts)

4. Is this circuit opened or closed? Explain how you know. (2 pts)



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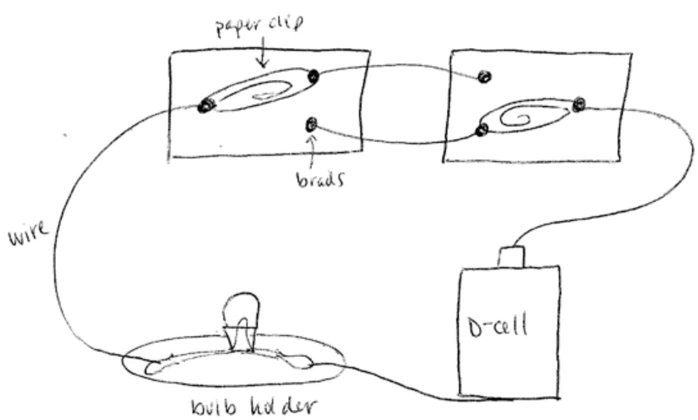
5. Draw a diagram that shows how you create a short circuit (and get burned!) by a D-cell, bulb and wire! Label your diagram. (2pts)

6. This is a picture of a double pole switch. Explain how you can turn the light off and on from two different switches. (4 pts)



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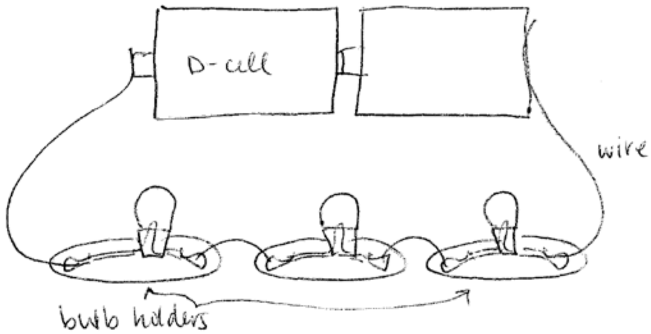
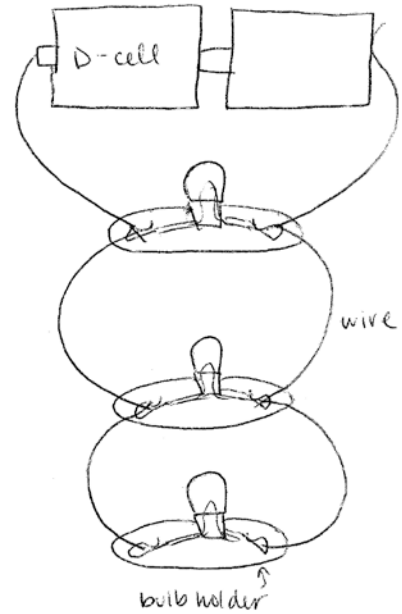
7. Circle the correct label for the circuits below. (1 pt each)

SERIES or PARALLEL



SERIES or PARALLEL



8. How does the flow of electricity (path of an electron) in a series circuit differ from the flow in a parallel circuit? What does each circuit look like when it is turned on? (4 pts)

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ENERGY & ATOMS

Write the letter in the blank that completes each sentence so it is true. (9 pts)

a. heat energy. . .
b. light energy. . .
c. mechanical energy. . .
d. electrical energy. . .

_____ makes a bulb glow
_____ creates a change in temperature that you can feel
_____ has a flow of electrons
_____ makes something move

e. alike charges. . .
f. opposite charges. . .
g. electrons have . . .
h. protons have . . .
i. neutrons have . . .

_____ no charge
_____ attract
_____ a positive charge
_____ repel
_____ a negative charge

Solar Powered Cars
By Irene Beazey

Grade Level:	Grade 4/5
School District:	Monroe School District
School Name:	Fryelands Elementary School
School Address:	15286 Fryelands BL SE, Monroe, WA 98272
Email Address at School:	beazleyi@monroe.wednet.edu
School Phone:	360-805-4700

Project Description

After researching solar energy uses students will build solar cars from kits. They will use journals to record materials used, procedures, hypotheses, and results; they will then use the data to graph the results as they test their vehicles. Students will use their research to create power point presentations.

Objectives of the Project

- Students will use and document the scientific method.
- They will build solar powered cars and record results.
- Students will investigate differing forms of energy and uses of solar energy.
- Students will create a power point presentation.

Essential Learnings Covered

Science 2.1 – Develop abilities necessary to do scientific inquiry.

Students will make predictions about their cars and test to answer their predictions. They will record and report using the scientific method.

Writing 2.2 – Write for different purposes

Students will write to convey technical information about their solar cars and their experiments with them. Students will also turn their research into a well organized power point presentation.

Reading 2.2 – Understand and apply knowledge of text components to comprehend text.

Reading 3.1 – read to learn new information.

Materials Needed

- Journals
- An assortment of books on energy (renewable and non-renewable)
- Videos on energy (Magic School House: Getting Energized and Solar Energy
- computers and access to power point
- solar car kits

Method

Students will research solar energy using the school library and the internet. They will then create a power point presentation on solar energy uses, which will include the pros and cons of using solar energy. Using solar car kits and science journals students will write up the procedure for building a solar car, they will write a hypothesis for what they think will happen. They will then build their car, carefully following all directions. Students will test their cars, using varying surfaces and light sources. Prior to each test, they will write a new hypothesis and record their results.

Parents will be invited to come and view our power point presentations. They will also be able to observe our car tests and share in our findings.

Interdisciplinary

Writing/technology – Students will need to record every step of the process of building a solar car. With a partner they will create a power point presentation on various solar energy uses, including the pros and cons of using solar energy.

Science – Students will learn about solar energy, the scientific method, and the effects of variables.

Reading – Students will read and follow directions for their car kits. They will read nonfiction looking for solar energy information.

Evaluation/Assessment

Students demonstrated their understanding of varying uses of solar energy through their power points. They demonstrated their ability to read and follow directions by completing a working solar car.

Challanges in Implementing Project

The number of books available on energy in our school library was limited. I accessed the King County Library where I was able to check out enough resource books for my class to share and the videos I needed. My students had not done power point presentations prior to this. We focused more on our research of energy and building our solar cars than on the scientific method due to time constraints. Weather was a problem, we had to wait for a perfect day to test our cars.

Successes/ Strength of Project

One of my fellow fifth grade teachers had previously done an excellent job with her class teaching how to create power points, those students helped my students. Her students learned about solar energy, mine learned how to complete a power point. It was a great cooperative learning experience. Students were excited about the various uses of solar energy. They were also excited about building their cars and seeing them successfully operate. Science came alive for these students.

Budget

SunnySide Up Classroom 10-pack	
(from SUNWIND) – 3 sets	$374.85
Shipping	20.00
	$394.85 total

Henry M. Jackson Hydroelectric Project
by Rosaleen Wilcox

Grade Level:	Field Trip 1 – February 2006, Special Needs Students, grades 9-12, Earth Science/Physical Science
	Field Trip 2 – May 2006, 11th grade, Physics Class
School District:	Sultan School District
School Name:	Sultan High School
School Address:	13715 310th Ave., Sultan, WA 98294

Project Description

Due to a grant from PUD, Sultan High School students were able to take two field trips to the Jackson Project. Over 40 students were able to see this impressive facility, and to learn relevant facts from the knowledgeable personnel conducting the tour.

Objectives of the Project

The first tour was made by students in the combined Earth Science/Physical Science curriculum. The second trip was made by students in Mr. Weller's physics program. The objective was to familiarize students with this invaluable resource located in their own community. With the assistance of informative walking tour, concepts learned in class could be visualized. Scale model reproductions throughout the facility provided clarification.

Method

In order to transport students, busses were contracted from the District. These buses and drivers were our main expense. Sack lunches were provided by the school. The Jackson facility provided a beautiful setting in which to eat them while discussing what we were learning and formulate further questions.

Successes/Strength of the Project

Both Mr. Weller and I were encouraged by the enthusiasm of the students and the discussions that followed in the classroom upon our return.

We are a small district with limited financial resources. These two field trips, which would not have been possible without the PUD grant, provided a valuable learning experience. It also brought a great deal of pride to our students that this magnificent project was located right here in our own community.

Thank you PUD.

Rosaleen Wilcox

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