

Penstock Pals Extension Activity

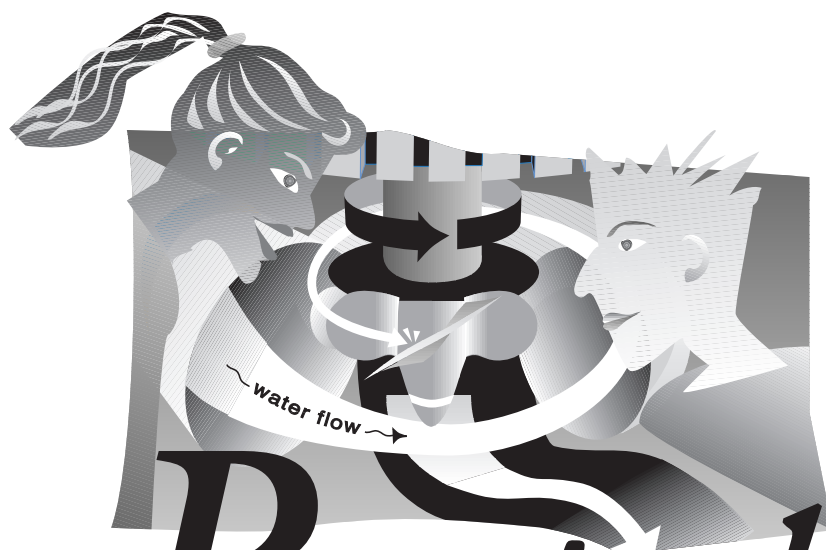
Overview

Penstock Pals activities will allow students and schools from diverse economic, social or geographic backgrounds to cooperatively explore social and environmental dimensions of hydropower as a resource to meet the Northwest's electricity needs.

To accomplish this goal, students will use the first three units of the Nature of Water Power curriculum to review the science and physics of generating hydroelectricity. As each unit is completed, teachers will lead students in the development of class projects as extension activities to the curriculum. These activities will provide students an opportunity to demonstrate their level of conceptual understanding within the context of learning about their own community.

Students will find it important to explore related social and environmental dynamics.

Each class will submit materials expressing their viewpoint to the Penstock Pals Kids page (class will need to reach a consensus before posting). At the discretion of teachers, some individual student work may also be submitted for posting on the Penstock Pals Kids page. Teachers may also create additional e-mail or face-to-face linkages between Penstock Pal classes to further enhance activities.



Penstock Pals

Procedure

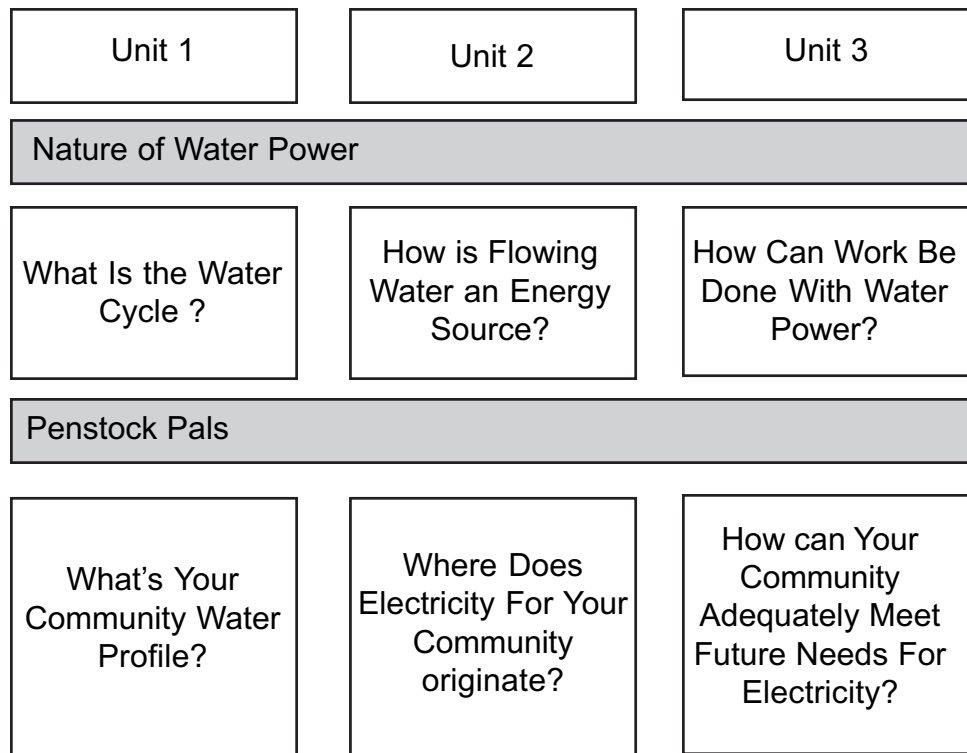
As shown in Figure A, each Penstock Pal question builds from, and is related to, the question that guides each Nature of Water Power unit. Based on the Penstock Pal question and resources provided, classes will submit responses. "Class" responses may be provided to FWEE for posting in the form of Word documents, PowerPoint presentations, PDF files, digital photos with description, or Inspiration files. FWEE can also accept work such as posters in non-digital form and prepare them to be posted on the web.

It will be up to each class to determine what the document(s) will include, and whether to include pictures, essays, poems, maps, etc. After submitting responses to all 3 questions, the class will have a web site that shows student

work and perspectives regarding these important issues.

FWEE will provide web based links and resource specialists to aid classes in researching questions.

Figure A



Procedure

Unit 1: What is the water cycle?

PENSTOCK PALS QUESTION 1:

What's your community water profile?

Apply what you learned about the water cycle to create a community water profile.

- Decide and define the geographic boundaries of your community, e.g.—city, county, watershed, etc.
- Collect information, pictures, maps, etc. that will help identify major waterways in your community, e.g.—lakes, streams and rivers.
- Describe and/or illustrate how these waters are replenished.
- How do the waters remain clean?
- List some facts related to your community and its waters that others should know.

Unit 2: How is flowing water a source of energy?

PENSTOCK PALS QUESTION 2:

Are river(s) or other waterways in your community used as an energy source?

- Cite evidence that your river(s) is doing work. (Remember, “energy is the ability to do work.”)
- Based on how the class defined the boundaries of the community, are there any hydroelectric generating facilities included? If so where?
- What variables affect the amount of energy the hydroelectric facilities in your community can produce?
- Are there electrical generation sources in your community other than hydropower?
 - If yes,
 - What type? (gas fired, coal, wind, solar, etc.)
 - Where are the sources located?

Procedure

- How much electricity can be produced?
- How many people or homes can be served?
- Does your community receive electricity from these facilities?
Why, why not?
- For these non hydropower electrical generation facilities:
 - Are they reliable now and into the future?
 - Are there environmental impacts that should be addressed?
 - Is the cost of receiving electricity from these sources likely to remain stable?
 - What are advantages and disadvantages of using them?

Unit 3: How Can Work Be Done with Water Power?

PENSTOCK PALS QUESTION 3:

How can your community adequately meet future needs for electricity?

- By 2015, the Northwest will need 15 to 25 percent more electricity to meet the needs of a growing population, business and industry. How do you propose that the community adequately meet its future electrical energy needs?
- What information will be needed to address this problem?
- How much more electrical generation do you think your community will need?
- Is your community likely to meet future needs by developing more generation facilities, importing electricity from facilities outside the community, or conservation?
- What are some possible choices to fill these needs and what are the implications of each of these choices?
- How are the needs for supplying electricity to your community different from another Penstock Pal community?
- How can information be collected? Would a sample survey of your community, via phone, power provider data, etc., be helpful?

Resource Sites

Renewable and Non-renewable Energy Resources

Energy Information Administration, Kids Corner

<http://www.eia.doe.gov/kids/kidscorner.html>

There are many excellent sites providing information for students on energy.

Energy Quest, Energy Story

<http://www.energyquest.ca.gov/story/index.html>

The Table of Contents (scroll down) provides students with in-depth information related to increasing their understanding of many of the different forms of energy for producing electricity. The “conclusion” contains a nice summary for the student.

Water/River Resources

Think Quest, All Along A River

http://www.thinkquest.org/library/lib/site_sum_outside.html?tname=28022&url=28022/

A different approach to providing information on rivers. Students may find some of the information helpful and it may give them some ideas of organization of information.

USGS, Water Science for Schools

<http://www.wga.usgs.gov/edu/>

Excellent site on the basic information students might seek on understanding water as a resource.

Foundation for Water and Energy Education

www.fwee.org

Good site for Hydropower information and Nature of Water Power Curriculum. Students may find many links helpful at this site.

Sources Of Electricity

www.Sourcesofelectricity.com

This site will provide many connections to the many different forms of electrical production and related information. Students should find some help at this site on electrical energy production.

Energy –

<http://www.soton.ac.uk/~engenvir/index/air~7.html>

Support for Question #3 Penstock Pals

Water Resources

<http://www.soton.ac.uk/~engenvir/index/air~3.html>

Resource Sites

The Hydrologic Cycle

<http://www.soton.ac.uk/~engenvir/index/air~3.html>

Support for Unit 1 in Nature of Water Power

Electric Power Grid

How Stuff Works, Power Transmission from plant to home

<http://www.howstuffworks.com/power.htm>

Good site for students to gain background of power distribution.

Bonneville Power Administration

www.bpa.gov

Nicely presented, but very generic and may not prove very helpful to students.

Northwest Power Planning Council.

<http://www.nwppc.org/energy/powersupply/Default.htm>

Scroll to the bottom right of page to **MAPS** Click on both Existing Generating Resources

Maps and Proposed and Temporary Generating Plants

(refer to printed maps handed out)

Student or Class Project Sites

Los Angeles River Connection

<http://www.laep.org/target/units/river/riverweb.html>

Butterflies In the City

http://www.laep.org/target/science/city_butterflies/index.html

Energy Quest Art Gallery

http://www.energyquest.ca.gov/art_gallery/index.html

Think Quest, All Along A River

http://www.thinkquest.org/library/lib/site_sum_outside.html?tname=28022&url=28022/

Onramp Arts

<http://www.onramparts.org/>

Earthnet.

<http://agc.bio.ns.ca/EarthNet/english/index.html>

Hydrology Page

<http://terrassa.pnl.gov:2080/hydroweb.html>

The Globe project

<http://www.globe.gov/>

Earth & Sky:

<http://www.earthsky.com/>

NIEHS-Kid Page,

<http://www.niehs.nih.gov/kids/home.htm>

National Geographic Kids

<http://www.nationalgeographic.com/kids/>

Optics For Kids

<http://www.opticalres.com/kidoptx.html>

HHS Pages For Kids

<http://www.hhs.gov/kids/>

Kids Did This In Science Page

<http://sln.fi.edu/tfi/hotlists/kid-sci.html>

Just For Kids

<http://www.nsf.gov/od/lpa/nstw/kids/start.htm>

Science & Technology Sites For Children

<http://www.nsf.gov/od/lpa/nstw/kids/start.htm>

Hong Lok Young Private School Web for Kids

<http://www.hlyis.edu.hk/>

Grand Coulee Dam Schools

<http://www.library.fullerton.edu/docslinks/kids.htm>

Educational Links??

Kangaroo Kids Page

<http://www.lemyreart.com/julia/kangaroo/contents.htm>

Kids Online K-12

<http://www.kidzonline.org/homepage/index.asp>

Contains Windows Media Pages for examples.

Surfing The Net With Kids

<http://www.surfnetkids.com/wind.htm>

Wind Generation

HHS for Kids

<http://www.os.dhhs.gov/kids/>

EIA Kids Pages

***** <http://www.eia.doe.gov/kids/Possibilities>

Theatre Of Electricity

** <http://www.mos.org/sln/toe/toe.html>

Some Possibilities

Brain Pop Science

<http://www.brainpop.com/science/seeall.weml>

Information

Student or Class Project Sites

Welcome To Science Explained – Dr Love

<http://www.synapses.co.uk/science/index.html>

Virginia's Science & Math Links

<http://www.ace-lynchburg.com/business/kids/SCIENCE.html>

Huge resource of kids science – Not any kids postings?

Kids Pages

<http://www.bcplonline.org/kidspage/kidspage.html>

CSU Fullerton Kids Pages

<http://www.library.fullerton.edu/docslinks/kids.htm>