

Title: **Adapting a Problem-based Water Quality Curriculum Course for Community Colleges**
Project Type: Education
Focus Categories: Education (EDU), Groundwater (GW), Water Quality (WQL)
Key Words: Education, problem-based curriculum, community college, science literacy, drinking water, groundwater, career development, stewardship, hydrogeology, inquiry
Start Date: February 18, 2008
End Date: February 16, 2009
Principal Investigator: Naomi Hirsch, Ed.M., Professional Faculty, Oregon State University, naomi.hirsch@oregonstate.edu
Congressional District: Oregon 5th

Abstract

Across Oregon, the flow and cycle of water has shaped the lifestyles, livelihoods, and life histories of its inhabitants. Education on the protection of Oregon's groundwater resources is critical for the stewardship of this resource. As decisions about water issues continue to increase, all citizens need to have an understanding of groundwater, sources of drinking water, and drinking water regulation.

Hydrologic principles are not controversial. The more that is known about hydrology, the easier it is to judge alternative proposals and to compare their benefits and costs. Sound decisions require an informed citizenry. [Water--Our Common Pleasure and Our Common Responsibility by Luna B. Leopold, Water, Rivers, and Creeks (1997)]

To support building informed citizenry, this project will enable community colleges to create a water quality course using the Hydroville Water Quality (WQ) curriculum as a model. This curriculum, developed at Oregon State University, allows students to experience the nature of real-world science by solving a community drinking water problem based on a real-life occurrence. The WQ curriculum has been successfully used in high schools and has great potential to increase its range and impact through the project partnership with community colleges.

This project offers community college students the opportunity to:

- Be engaged in active learning, inquiry, problem solving, and teamwork through curriculum based on a real-life water quality community issue
- Be exposed to career options related to water science by taking on the role of experts to solve the problem
- Be scientifically literate to make informed decisions related to water issues

The project will create a partnership between Oregon State University's Environmental Health Sciences Center and Linn-Benton Community College (LBCC) and will progress in three steps.

1. Adapt and revise the curriculum to community college standards and needs (February – June 2007)
2. Pilot the Water Quality course (September – December 2008)
3. Evaluate the success, document best practices, and market to other community colleges (January 2009)

Budget Breakdown

Project Number:

Project Title: Adapting a Problem-based Water Quality Curriculum Course for
Community Colleges

Cost Category	USGS/Federal	OSU/Non-Federal	Total
1. Salaries and Wages .10 PI (Hirsch)		\$3,784.00	\$3,784.00
2. Fringe Benefits .10 PI (.58)		\$2,196.00	\$2,196.00
3. Supplies Teacher curriculum binders and resources Course materials	\$450.00 \$250.00		
4. Equipment			
5. Services or Consultants Instructor prep time and services (Sharman)	\$2,000.00		
6. Travel: PI travel to LBCC	\$55.00		
7. Other direct costs			
8. Total direct costs	\$2,755.00		\$5,980.00
9a. Indirect costs on federal share	XXXXX		
9b. Indirect costs on non-federal	XXXXX		
10. Total estimated costs	\$2,755.00		\$5,980.00
Total Costs at Oregon State Univ.			\$5,980.00

Budget Justification

Project Number:

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Salaries and Wages.

The PI, Naomi Hirsch, will cost-share her salary. Cost is estimated at .10 FTE for one year based on an annual salary of \$37,864/year for a total of \$3,784.

Fringe Benefits.

Fringe benefit rate for the PI is 58%. This totals to \$2,196 and is included in the cost-share.

Supplies.

Instruction and materials:

The teacher's binder packet is estimated at \$75/each and includes teacher sections and student worksheet, a DVD of the scenario for the students, an electronic version of materials on CD, and the Introduction to Groundwater DVD produced in collaboration with Institute for Water and Watersheds. There are three instructors within the Environmental Technology program at Linn-Benton. Additionally, we will provide packets to community colleges upon request. The budget includes an additional three binder packets. Six packets at \$75/each totals \$450.00 in curriculum. For the pilot course, the cost of materials for the activities of the 9-week course is estimated to be \$250.00.

Services or Consultants.

Ron Sharman, the Department Chair of the Environmental Technology program at Linn-Benton Community College (LBCC) will help us adapt the Water Quality Curriculum and pilot it next fall (See support letter, Attachment D). We are requesting \$2,000.00 as a stipend for the time and effort. The money will go directly to Linn-Benton. This was estimated for 80 hours at \$25/hour.

Travel:

Naomi Hirsch will travel 10 miles each way to LBCC approximately six times for meetings. This is a total of 120 miles. At 44.5 cents per mile, the total is \$53.40.

Indirect Costs: Indirect costs were not necessary for the 2:1 match.

Adapting a Problem-based Water Quality Curriculum Course for Community Colleges

Statement of Problem

Ground water resources are showing signs of overuse and are becoming unstable in many areas. Understanding of groundwater, sources of drinking water, and drinking water regulation is important for all Oregon citizens. There are two issues this proposal will help address:

- **Meaningful citizen groundwater education**
Many students and community members do not have an opportunity to learn about groundwater, although education is critical to the stewardship of this resource. Community colleges that are open to everyone are ideal locations for community groundwater education. Implementing a general science course that is structured on solving a real-life drinking water problem provides not just groundwater education, but life-long learning skills and responsible citizenry. Community colleges are ideal for this type of education because they are geared toward local students and local needs. Class sizes are smaller than universities and instructors are solely dedicated to teaching. Community colleges are pivotal in meeting our nation's expanding needs for postsecondary education and access to advanced training and lifelong learning opportunities, but these colleges need support.
- **Water science career development and opportunities for further advancement for students in community colleges**
Students studying in ground water-related programs, whether in a university, community college, or a drilling school, are the future of the industry. Many students are not aware of career opportunities in this field.

Results and Benefits

Through this project, a new science course for community colleges will be piloted. The course will make use of the Hydroville Water Quality (WQ) Curriculum, which was piloted, revised, and now published, for high school students. Quantitative evaluation measures show that students who participate in the Hydroville Curricula:

- understand the process of inquiry
- solve problems more like scientists, using data to make decisions
- demonstrate higher-order thinking and critical problem-solving skills
- believe they can take personal action to solve environmental problems

With the help of current community college instructors, the curriculum will be adapted to the needs of college-level students.

The benefits of creating a college-level course include:

1. **Water Science Career Development.** The Hydroville Curricula are built on a learning framework that focuses on the inquiry process providing real-life experience to four specific careers (hydrologist, environmental engineer, environmental chemist, and drinking water specialist). **See Attachment B and C which show the structure of the curriculum.**

LBCC is unique in that it is one of two community colleges in Oregon that have water and wastewater technology programs. For current water technology students at LBCC, the Hydroville Curriculum will provide real world application of the Environmental Technology field to which they are training. This will prepare them well for their jobs after graduation.

2. **A partnership and platform for future projects between Oregon State University and community colleges in relation to water science, groundwater education, and environmental health.** This project creates a new partnership between OSU and LBCC. Once this partnership is in place, the EHSC Community Outreach and Education Program will continue to provide curricula and support. There are two other Hydroville scenarios that would benefit both science and health students. This pilot with the WQ curriculum will provide a model for the future. Additionally, once we have expanded this curriculum to new audiences through community college instructors there are a number of opportunities and innovations that come from expanding the Hydroville web site, such as creating Hydroville citizen news for students to educate communities, creating and facilitating internships, and providing OSU graduate students opportunities to assist and be guest speakers within the community college courses.

3. **Improve Teaching and Learning.**

What drives many community college faculty members is knowing they have made a lasting impact on their students. Success of the Hydroville Curriculum Project in high schools has been documented. Student outcomes were summarized in many key areas that promote environmental science as a basis for learning problem-solving skills that have direct application to students' lives, both as life-long learners and as part of a science-literate society (see the Hydroville web site for publications and evaluation tools, www.hydroville.org). The curriculum is designed using a unique learning framework that reflects how scientists and experts solve real-world problems See the Table of Contents and the Concept Map of the curriculum in Appendix B and C). It is structured to help students and citizens understand the complexity of environmental issues that impact human health and to emphasize that many real-world problems have multiple solutions.

"This really is an entirely new approach to educating students about real-life problems," says SMILE director Eda Davis-Butts. "The students attack the problems as if they were real, using appropriate scientific methods and equipment. It not only gets them interested in environmental health sciences, it makes them much more aware of the world around them."

Nature, Scope, and Objectives

The proposed project has three objectives:

1. Adapt and revise the Hydroville Water Quality curriculum to community college standards and needs (**February – June 2007**)
2. Pilot a new Water Quality course at Linn Benton Community College through the Environmental Technology department (**September – December 2008**)
3. Evaluate the success, document best practices, and market to other community colleges (**January 2009**)

Methods, Procedures, and Facilities

The Hydroville Water Quality Curriculum was developed, piloted, and revised under a seven-year grant from the National Institute of Environmental Health Sciences (NIEHS,1R25ES10721). This project builds upon this highly successful curricula developed at Oregon State University. Learn more about the Hydroville Curriculum Project at www.hydroville.org.

Objective A: Adapt and revise the Hydroville Water Quality curriculum to community college standards and needs

Naomi Hirsch and Ron Sharman will meet in late winter 2008 to examine the curriculum and how best to adapt it to the needs of the college student. Four three-hour meetings will be scheduled to review the curriculum and activities prior to piloting the fall course. These meetings will take place at LBCC and will be open to other instructors and administrators who can contribute to an effective and innovative adaptation of the curriculum to positively impact student learning and outcomes. Naomi Hirsch will organize and manage the meetings, and assist in documenting the ways to adapt and revise the curriculum so other colleges and educators can make use of the information. Ron Sharman will use this input to create a new revision of the curriculum.

Objective B: Pilot a new Water Quality course at Linn Benton Community College through the Environmental Technology department

Ron Sharman is motivated to pilot this new course at LBCC (See support letter in Attachment D). The course is planned for Fall term of 2008. The course will be offered within the Environmental Technology program for water science students to fulfill the environmental science course requirement. Pending department credit approval, the course may also be offered as a general science class within the Science, Technology & Society program.

Objective C: Revise curriculum, document best practices, and market and distribute to other community colleges

Naomi Hirsch and others within the Environmental Health Sciences Center will observe the pilot course and track what is working and what can be improved upon. Check-ins with the instructor will take place throughout the course. An on-line journal to record observations and suggestions will be used for ease and efficient use of time. Ron Sharman has shared interest in marketing a revised curriculum to other community colleges to help recruit more students into the water sciences program. Naomi Hirsch and others within the Center will utilize publications and regional and national meetings to present and share course information with colleagues and administrators. The Hydroville website will be expanded as a college instructor resource.

Training Potential

Approximately 25 students will be enrolled in the pilot water quality course for Fall term 2008. There may be more students if a general science course is also offered. This pilot course has the potential of impacting many students in a multitude of colleges around the state, country and world.

Impact/Success Measures

Because this is a development grant, success will be measured by the end product of a revised problem-based water quality curriculum for use in water science programs and general science courses in community colleges throughout Oregon and the nation.

Investigator's Qualifications

Naomi Hirsch has been involved with the Hydroville Curriculum Project since 2003. Her role is to expand the use of Hydroville curricula by adapting it to community audiences. With a Masters degree in Adult Education and extensive coordination experience, she is highly qualified and motivated. See her resume in Appendix A.

Naomi R. Hirsch

Weniger Hall 219, Oregon State University, naomi.hirsch@oregonstate.edu, 541-737-8105

EDUCATION

2005 Ed.M., Adult Education. Oregon State University, Corvallis, Oregon.
1990 B.S., Forest Resource Management. Humboldt State University, Arcata, California.
1984 - 1986 Environmental Studies major, University of California, Santa Barbara, California.

SUMMARY OF QUALIFICATIONS

- Successfully adapted the Hydroville Curriculum Project to community audiences
- Educated in designing, delivery, and assessing learner-centered curriculum
- Skilled manager of the Hydroville website and new media projects
- Attends regional and national meetings for dissemination and networking
- Experienced project coordinator for collaborative grant-generated projects

PROFESSIONAL EXPERIENCE

9/05– present ■ **Program Coordinator.** Community Outreach and Education Programs for the Environmental Health Sciences Center and Marine and Freshwater Biomedical Sciences Center, Oregon State University, Corvallis, Oregon. Coordinate community forums and workshops. collaborate for dissemination and development of new projects, and train teachers in activities of the Hydroville Curriculum Project.

9/03– 8/05 ■ **Program Support.** Community Outreach and Education Programs for the Environmental Health Sciences Center and Marine and Freshwater Biomedical Sciences Center, Oregon State University, Corvallis, Oregon. Assist the staff with formatting and editing the Hydroville environmental health high school curriculum modules. Provide logistical and program support for teacher trainings and outreach to the public. Manage web site needs and design outreach materials for both science centers. Coordinated a collaborative Willamette River community forum.

7/01– 9/03 ■ **Program Assistant.** Extension Sea Grant, Oregon State University, Corvallis, Oregon. Coordinated and assisted within the community development program which included meeting logistics, newsletter creation, creating and maintaining web sites, presentations and other outreach and liaison support.

10/98–2/00 ■ **Licensing Associate.** University of California Office of the President, Office of Technology Transfer, Oakland, CA. Managed the licensing of a portfolio of strawberry cultivars, which included web site development, information dissemination, and patent prosecution. Interacted with researchers, patent attorneys, and related industry from around the world.

12/95–10/98 ■ **Coordinator.** Fruit & Nut Research & Information Center, Department of Pomology, UC Davis, Davis, CA. Initiated, developed, and maintained web sites. Created Internet discussion groups, educational handouts, and newsletters related to the Center activities for the benefit of internal communication and outreach to the public. Presented technical and educational information at numerous conferences and statewide meetings. Managed collaborative Internet projects for public education and outreach with affiliated University of California centers, Cooperative Extension, and related organizations.

2/94–11/95 ■ **Research Assistant.** Peach & Almond Breeding Program, Department of Pomology, UC Davis, Davis, CA. Supported field and lab research working with graduate students, visiting scientists, and affiliated faculty. Attended meetings with researchers and industry.

9/90–1/93 ■ **Agroforestry Extensionist.** U. S. Peace Corps, Paraguay. Promoted agroforestry systems, community development, and environmental education. Provided leadership and project support to individuals and community organizations.



WATER QUALITY SCENARIO TABLE OF CONTENTS

INTRODUCTION

- Acknowledgments
- Hydroville Curriculum Overview
- Scope and Sequence
- Hydroville Journal
- Teamwork Skills
- Career Information

CURRICULUM

Background Activities and Team Meetings

1. Welcome to Hydroville
2. Topographic Maps and Models
Environmental Solutions Team Meeting #1 – *Site Investigator*
3. Source to Sink
4. What's in Your Drinking Water?
5. Reading Water Quality Reports
Environmental Solutions Team Meeting #2 – *Drinking Water Specialist*
6. Solution Concentrations
7. Sampling and Monitoring
Environmental Solutions Team Meeting #3 – *Environmental Chemist*
8. Groundwater Basics
9. How Contaminants Move in Groundwater
Environmental Solutions Team Meeting #4 – *Hydrogeologist*
10. Water Treatment Solutions for Homes
11. Remediation Technologies for Contaminated Sites
Environmental Solutions Team Meeting #5 – *Environmental Engineer*

Solution Presentation

APPENDICES

- A. Materials List
- B. Glossary
- C. Scoring Guides
- D. National Education Standards

WATER QUALITY CONCEPT MAP

1) DEFINE PROBLEM: Welcome to Hydroville

What is causing the drinking water problem in Hydroville?

2-3) COLLECT AND ANALYZE DATA; DEVELOP HYPOTHESIS(ES)



Site Investigator

What historical events may have contributed to this problem? What are the potential contaminant sources in Hydroville?



Drinking Water Specialist

What contaminants have been detected in Hydroville's water supply and what are their health effects?



Environmental Chemist

Which raw water sources in Hydroville contain the detected contaminants?



Environmental Solutions, Inc.



Hydrogeologist

Based on the direction of the groundwater flow in Hydroville's aquifer, where are the contaminant sources?



Environmental Engineer

Which remediation technologies will remove the contaminants from the drinking water and clean up the contaminated site?

4) SYNTHESIZE DATA, GENERATE SOLUTIONS:

What combination of remediation technologies and monitoring plans are the best solutions for Hydroville's drinking water problem?

PRESENT SOLUTIONS

Teams present proposed solutions to the Hydroville City Council and concerned citizens.

Appendix D

Linn-Benton
COMMUNITY COLLEGE

6500 Pacific Boulevard SW
Albany, OR 97321
(541) 917-4999
<http://www.linnbenton.edu>

11/13/07

Naomi Hirsch, Program Coordinator
Community Outreach and Education Program
Environmental Health Sciences Center
Oregon State University
119 Weniger Hall
Corvallis, OR 97331

Naomi,

This letter is in support for your proposal to adapt the Environmental Science Curriculum to the community college level. I see many possibilities for these programs to fill multiple needs in basic science education and fulfill specific program requirements.

At Linn Benton Community College there is a special course requirement for students pursuing an Associate of Applied Science Degree. Science, Technology and Society (STS) is a course requirement that intends to provide students with an understanding of political, social and economic dimensions of scientific or technological change. It is in this niche that I see the possibilities of adapting the Hydroville Curriculum Project. http://www.linnbenton.edu/go/catalog/degrees_and_certificates

In the short term I would like to pursue the application of the Hydroville model in a required class for the students in the Water and Wastewater Technology Program. The target date for this project would be Fall term, 2008.

Sincerely,



Ron Sharman, Department Chairman
Environmental Technology

**Institute for Water and Watersheds (IWW)
2007-2008 Program Grant**

Summary of Cost Sharing

Principal Investigator: Naomi Hirsch

USGS Federal Funds: **\$2,755.00**

Non-Federal Funds: **\$5,980.00**

Titled: Adapting a Problem-based Water Quality Curriculum Course for Community Colleges

Cost Share provided by the Environmental Health Sciences Center (**\$5,980.00**).

Lisa M Shepard for Joe Beckman 11/15/07

Joe Beckman, Center Director
Environmental Health Sciences Center

Date