

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

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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.

To support building informed citizenry, this project enabled Linn Benton community college the ability 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 offered the 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

Project Description and Results

The one-year IWW grant to the Environmental Health Science Center Community Outreach and Education Core (COEC) allowed Ron Sharman, an instructor at Linn-Benton Community College in Albany, Oregon, transform the water quality scenario of the Hydroville Curriculum into an introductory environmental science course for the Water and Wastewater Technology professional certification program. The course prepares technicians for employment in municipal drinking water and waste-water facilities.

Ron Sharman piloted the new course to 22 students in the fall of 2008. The course incorporates concepts of environmental chemistry, hydrology, toxicology, human health exposure, risk assessment and communication, and environmental engineering.

Student evaluations indicated that they found the course valuable for their careers and that they would recommend it to others (see attached survey and questionnaire results). Non-traditional students returning to school after many years in the workforce especially appreciated the problem-based, real-world aspects of the water quality curriculum. The instructor stated that after 30 years of teaching, this course has shown him the value of problem-based activities for his students, and he is now rethinking how to teach other courses. Linn-Benton Community College will offer the course again in the fall of 2009. The COEC staff will explore the possibility of replicating the course for the Water and Wastewater Technology program at Clackamas Community College, the only other Oregon community college to offer this professional program.

As a direct result of this successful collaboration with Linn-Benton Community College, OSU's Western Center for Community College Development invited the COEC staff to participate in science training institutes for community college instructors. The 2009 training institute occurred April 29 – May 1, 2009 at Oregon State University. The institute, entitled Ocean Science and Math Collaborative (OSMC), integrates ocean sciences with science, math, and critical thinking curricula. COEC staff added an environmental health component for the instructors using the HCP water quality curricula. These are the goals of the OSMC project:

- Support and facilitate the professional development of community college instructors.
- Support instructors in disseminating curriculum that links science with technology, reading, writing, and critical thinking.
- Prepare instructors to engage students in learning that relates directly to real-life environmental and economic concerns, facilitating the transition to post-secondary education and employment.
- Promote collaboration with community partners.

Hydroville Water Quality Curriculum Evaluation Survey

Summary: LBCC 12.4.08

1. Please indicate how you feel about the following statements as they relate to this course.

| | Strongly Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Strongly Agree | Average |
|--|-------------------|-------------------|---------|----------------|----------------|---------|
| a) The learning objectives for the course were accomplished. | 1 | 2 | 3 (1) | 4(13) | 5(8) | 4.3 |
| b) The information presented in this course was useful to my academic and professional goals. | 1 | 2 | 3 (1) | 4 (8) | 5 (13) | 4.5 |
| c) I increased my knowledge about water related issues and their impact on health. | 1 | 2 | 3 (3) | 4 (9) | 5 (10) | 4.3 |
| d) I have a better understanding of toxicology and risk. | 1 | 2 | 3 (1) | 4 (10) | 5 (11) | 4.5 |
| e) I have a better understanding of environmental health and its importance to public health. | 1 | 2 | 3 (1) | 4 (16) | 5 (5) | 4.2 |
| f) I feel more comfortable working in a team environment. | 1 | 2 (2) | 3 (5) | 4 (4) | 5 (11) | 4.1 |
| g) This curriculum is appropriate for the Drinking Water and Wastewater Certification program. | 1 | 2 | 3 (8) | 4 (5) | 5 (9) | 4.0 |
| h) I would recommend this course to others. | 1 | 2 | 3 (3) | 4 (4) | 5 (15) | 4.5 |

2. What did you like best about the Hydroville Water Quality curriculum?

- Teaches thought process skills
- Wealth of information
- The mystery
- The information delivery, flow of the curriculum
- The team work and positive attitudes
- Learning the flow of the contaminants in groundwater and the toxicology
- It was fun being in groups and narrowing down where the contaminants were coming from
- They tried to make it as close to real life as possible
- Brings all of the learning concepts to one model
- Finding the contaminants and getting test data from wells and monitoring wells
- Teamwork and getting to know and be comfortable with working with others
- I liked the whole process of finding the problem.
- Learning how aquifers can become contaminated
- Structure
- Opened my awareness of how the water hydraulics work and contaminants enter the water.
- The “realness” of the program. The continuity of facts that build the “story”
- Seeing how people affect the environment
- I liked all the worksheets provided. They are helpful review.
- You work as a group. You all have your own inputs for what your recommendations are.

- Each component linked into the following section.

3. What did you like least about the Hydroville Water Quality curriculum?

- Would have liked more information
- Group projects
- Not enough graded points, no real way to measure my progress
- The team format
- It took forever. I think there could have been two Hydroville projects
- Maybe no enough time to be thorough with information for presentations
- The info coming slowly in pieces
- The conclusion analysis seemed rushed
- More hands on activities would be nice
- Nothing
- The PowerPoint
- Lack of time
- I liked it all
- Too large of groups
- The group project. It was slow and our “leader” became more of a dictator.
- Not enough study for the power point information
- Figuring out group dynamics was disorganized and confusing throughout

4. Suggestions for improvement

- More time
- A little more quantitative
- Go faster. It was too slow.
- Maybe some funding issues covered to help battle the city’s #1 concern, money.
- More possible contaminant sources
- More pizza
- More time
- A few more PowerPoint presentations
- 2-3 people per group
- More worksheets
- More time on curriculum, less time on group project
- Outline for presentation need to be handing out sooner
- The group portion is important and may need more development (group skills)

5. What else would you like to share regarding this course?

- Good Work

- Nothing
- I had fun. It was a great way to meet the other people in class.
- It requires serious effort
- Pay attention
- It is a fun course. A lot more to water than I ever realized.
- It was enjoyable.
- I enjoyed it and it was fun.
- I learned about a lot of aspects I didn't know before.



PARTICIPANT QUESTIONNAIRE Fall Term: WQ curriculum LBCC

1. **Your age:** 30,20,34,24,21,21,40,29,25,40,19,19,40,28,41,30,46,36,23,23,31,20
Average = 29 years old.

2. **Your gender:**

22 Male
 Female

3. **Your race:**

1 American Indian/Alaska Native
 Asian
 Black or African American
 21 Caucasian
 Hispanic
 Native Hawaiian or other Pacific Islander
 More than one race
 Unknown or not reported

4. **Highest level of education you have completed: (*Please choose one*).**

2 Less than high school
 12 High school
 8 College
 0 Post-Graduate

5. **Your anticipated professional field at the completion of this program:**

7 Wastewater
 5 Drinking water
 12 Undecided
 1 Other: Pump Gas _____

Note: Some checked two areas.