IMPROVING ATTENDANCE, CHANGING ATTITUDES, AND AWARDING CREDITS: One Alternative School's Success Story

By Molly Bloomfield and Joe James

Improving the quality of high school science teaching and increasing the graduation rates of low-performing students are critical needs in the United States today. Only 68% of the nation's entering ninth-graders will graduate from high school in four years (NCES, 2004). The percentage of Hispanic students in the nation's schools is steadily increasing. However, these students are dropping out of high school at more than twice the rate of white, non-Hispanic students (NCES, 2004). Nationally, school districts are struggling to find ways to motivate these students to stay in school and to acquire the language proficiency and content knowledge to meet the more challenging standards of the No Child Left Behind Act. Over the past ten years there has been a large commitment of effort, research and funding for science education, but US students, regardless of race, still underperform students in other countries (NCES, 2005). In addition, significant gaps persist between the achievement of white students on science assessments and those of their black and Hispanic peers.

Children are innately curious, exploring the natural world from the time they can crawl. Sometime during their years in formal schooling, this excitement and interest is dampened or eliminated. One oft-cited reason for this declining interest is poor science instruction that presents scientific information as unconnected facts to be memorized and regurgitated on worksheets or multiple-choice tests. This method of teaching ignores the extensive research that shows for learning to be meaningful, the learner must be able to incorporate the new information into an existing conceptual framework (Bransford et al., 2000). Real-world problems are complicated and students who struggle with open-ended questions with no one right answer become more engaged and interested in the topics studied (Moreno, J.P. and B.Z. Tharp, 2006). In many schools, low-achieving students take courses where reading a book and answering a worksheet is the norm, and they never have the opportunity to take science courses where inquiry-based problems are presented. Recent studies by the Educational Trust (ET, 2005) show that one of the characteristics of high impact schools (those with higher performance from minority and low-income students) is that they have higher expectations for all students, regardless of prior academic performance. This is exemplified by the following quote from the Woodburn Success High School English Language Learner (ELL) Specialist:

> *I didn't think that several students would actually be able to complete this project, because at the other high school they never came to school or did their work. But to see them do the work, work in a team to complete this project and do a presentation in front of people, completely blew me and the other students away.*

HYDROVILLE CURRICULUM PROJECT

In the spring of 2005, teachers at the Woodburn Success High School in Woodburn, Oregon were looking for integrated curricula that would be relevant for their students. They were seeking a fully-developed, long-term project that might help students stay in school and obtain academic credit toward graduation. Just such problem-based curricula were being developed at Oregon State University under the auspices of a seven-year grant from the National Institutes of Environmental

Health Science. This grant established the Hydroville Curriculum Project that has created curricula based on a unique learning framework that reflects how scientists and experts solve real-world problems (Table 1). The nine-week curricula examine actual environmental problems that impact human health.

The curricula focus on three environmental health problems: a pesticide spill, an indoor air quality problem, and a water quality problem. The curricula are structured to help students understand the complexity of environmental health problems and to emphasize that real-world problems may have many acceptable solutions. In addition to specific scientific content and laboratory skills, each curriculum emphasizes critical teamwork, problem solving, and communication skills.

Emphasis is placed on reading scientific writings and using scientific vocabulary. Research shows that for English language learners to acquire academic language and understand the differences among content areas, they must be involved in *deep learning.* To learn "deeply," students must work with the brick (specialized content) and mortar (general academic) language while immersed in the authentic practices (Anstrom, 1998). In Hydroville, students demonstrate the mastery of academic language and scientific terms in their presentations and daily classroom interactions.

WOODBURN SUCCESS PROGRAM

The Woodburn Success High School is located in Woodburn, Oregon a farming community of 20,000 located in the Willamette Valley. Fifty percent of the population is Hispanic and 25% is from a community of Russian Orthodox Old Believers. During the 2005-2006 school year, the Woodburn Success Program (an alternative high school) served 130 students in grades 9-12 with the following characteristics:

- 100% of the students were on free and reduced lunch
- 33% of the students were English Language Learners
- 27% of the students were from the majority culture (white, non Hispanic)
- 69% of the students were Hispanic
- 4% of the students were Russian Orthodox Old Believers

The Woodburn Success staff implemented the Hydroville Water Quality Curriculum over an eight-week period between October and December 2006. The Hydroville Water Quality Scenario investigates the increase in cancer-causing contaminants in the groundwater supplying the drinking water in the town of Hydroville. The activities of the curriculum are graphically illustrated on the concept map in Figure 1. The scenario is presented to the students through a video. Students are organized into teams that represent the environmental consulting team that is hired by the city council to investigate the problem. The team consists of a site investigator, a drinking water specialist, a environmental chemist, a hydrogeologist, and a environmental engineer. Each student on the team picks an expert area and becomes knowledgeable about that career. For each expert area, content knowledge and skills are taught through two background activities (Figure 1). Then, students use those skills to investigate Hydroville's problem in team meetings lead by a student expert who reports the team findings in a memo to the city council. The culmination of the Hydroville curricula are the team presentations to the "city council" where teams are required to present the evidence that they gathered and their solution or remediation plan for Hydroville that includes specific recommendations and a budget.

The Hydroville Curricula can be taught by a single teacher or a team of teachers. At Woodburn Success High School, the staff agreed to work as a team to teach all the activities. Each teacher then became the leader for one expert group and the associated background activities. This distribution of responsibility modeled what the student teams do in the curriculum with one student taking the lead for each expert group. The lead teacher organized the activities and reviewed them with the rest of the staff. Each teacher took responsibility for mentoring one or two student teams through their presentations. Both teachers and students took ownership for the success of the learning.

MEASURES OF SUCCESS: ACADEMICS, ATTENDANCE, AND ATTITUDE

The Woodburn success program has as its mission statement: *Academics, Attendance and Attitude.* Data on these three measures of success were collected before and during the implementation of the Hydroville Curriculum. Two groups of students were engaged in the Hydroville Water Quality Scenario for three hours per day from mid-October to mid-December. This is a time of year when attendance is traditionally low and behavior problems tend to increase as the holidays approach.

The Hydroville curriculum was implemented between mid-October to mid-December, a time of the year when attendance is traditionally low and behavior problems tend to increase as the holidays approach. Because attendance plummets during this time, the pattern had been to award fewer credits to the students at this time of year than during other periods. In 2004, the 53 students enrolled received a total of 37.5 credits (0.7 credits/student). In contrast, in 2005 when students participated in the Hydroville Curriculum, 67 students received a total of 58.25 credits (0.87 credits/student) during the same period.

School-wide attendance rates increased when the students were involved with the Hydroville Curriculum (Table 2). Thirty six percent of the students reported on their debrief that they kept themselves involved by coming to school every day so that they would understand their part of the problem, help their team and not let their team down. Students and teachers reported that students found the project relevant and interesting so they liked coming to school.

> *I came to school everyday and studied the situation very closely. It was very interesting so it wasn't that hard to stay involved.*
> Woodburn Success Student

One example of the way in which the curriculum really engaged students was during the drinking water specialist activities. Students learn what contaminants can be found in drinking water and their health effects. They analyze their communities drinking water report using a scavenger hunt format. Woodburn students were shocked to find their water report listed arsenic in the drinking water. This really hit home with the kids because city water was something that they drank everyday. This discovery spurred a whole discussion about arsenic: What it can do to you? What is a safe level? Is there any safe level? And what can be done about the arsenic in the water? Several students even took the drinking water report home to discuss with parents and their families ended up buying bottled water or filters for their taps. This then lead to a discussion of where bottled water came from. Most kids were shocked to discover that many suppliers of bottled water use city tap water. The curriculum lent itself to many moments like this when the students were able to take lead in a discussion and really participate using their own stories and life experience.

In addition, disciplinary referrals decreased from 15 in 2004 to 6 during the same period in 2005. Those six referrals were all in the first two weeks of the curriculum. The teams took care of the attitude problems themselves. In most high school classes, students may work in teams for one or two days, but in Hydroville they work together for eight weeks which is more like the working world. The Hydroville Curriculum doesn't assume that students know how to work in team but emphasizes and practices key teamwork skills (Table 2). About two weeks into the curriculum, several Woodburn teams were having trouble functioning and decided to "fire" several members who were not coming to school and doing the work. The teachers and principal agreed to let this happen.

> *That message, being fired by your peers, sent a huge message, even greater than any of us as teachers and staff could send. Students hear it from us all the time: as in business, if you fail to do your part, you fail, you are fired, but to hear it from your peers is a very powerful message.*
> Woodburn Success Principal

Teachers reported that students were more motivated and asked more questions by identifying with the relevance of the environmental problem. They demonstrated their mastery of complex concepts by their questioning and use of scientific vocabulary in conversations and discussions. The students took pride in the quality of their presentations.

> *Students demonstrated their learning through their presentations and the proper usage of vocabulary. Where before, these students would never have been able to even say anything close or be able to use this type of terminology. They understood the concepts of hydrogeology and toxicology.*
> Woodburn Success Science Teacher

Data from the pre/post test evaluation instrument (MacGregor, 2007) showed that after participating in the Hydroville Curriculum, students approached problem-solving more in line with that of scientific or technical expert, saw themselves as more capable and qualified to assume a personal role in working with others to solve environmental health problems, and had increased value for science in their daily life and as a tool for improving their health and safety.

> *The students developed the awareness that they are a part of a community, and they need to be responsible about how their community is managed. Kids, at this age, that's the farthest from their minds, but I did notice that through these lessons, they asked more in depth questions about what they should and could do. They developed community awareness.*
> Woodburn Success Language Arts Teacher

Changes in teacher practices were observed by the principal and were self-reported in the teacher debrief interviews. Successful implementation of this team-taught curriculum required a commitment by teachers and principal for daily dedicated planning time. The curriculum required teachers to model teaming and organization skills for their students. Teachers reported that they were more open-minded, patient, flexible, and willing to help other teachers. They found that they were able to share the work and rely on each others' strength. The students benefited from teachers working together on integrated projects, not knowing about all the topics covered, and being learners along with the students. Using this curriculum required teachers to move into roles as learning coaches from roles of delivering learning. This change in pedagogy allowed students to

take more ownership for their learning and for the outcomes of their choices. The teachers had to move out of their comfort zone of their own classrooms and change their way of thinking about teaching.

> *I learned right along with the students. I learned at a different level than they did since I had a lot more leads to hook onto than they did. The collaboration of the staff helped me to learn to do things and different ways to teach the same thing.*
> Woodburn Success Language Arts Teacher

Teachers reported that they had doubts about the abilities of their at-risk students to successfully complete what appeared to be a high level and difficult curriculum. They commented that the students who they felt would not be successful were often the ones that rose to the top and became group leaders.

> *It opened our eyes to see that we shouldn't always think that certain students will be the leaders when others have the capacity.*
> Woodburn Success ELL Specialist

Success for the Woodburn Program students participating in the Hydroville problem-based curriculum can be measured in many ways. Students attended school more regularly, were interested in the academic material, and their attitude toward school and working with their peers improved. Students took ownership of their learning and pride in their accomplishments and earned more academic credits. In addition, students became more socially aware and began thinking more like scientists. They began to analyze issues using the facts and were more confident about their ability to work with others to solve environmental health problem. Both staff and students were excited about studying another Hydroville problem the following year.

> *We saw our students do wonderful things as we implemented the program. We have never seen our kids work so well together and put so much into their schooling. Our attendance rose during this time and I think it just opened a new way of teaching for us teachers. We were so used to teaching in our small little classroom that it really opened our eyes to how good we could be when we all worked together on a project like this. I will admit that we were hesitant to begin the Water Quality Scenario, but after seeing the results, we are jumping at the chance to teach another one.*
> Woodburn Success Social Studies Teacher

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TABLES AND FIGURES

Table 1. Comparison of the Hydroville Curriculum Framework with Other Learning Models

Steps	HCP Curriculum Framework	Problem-Based Learning Model[1]	Scientific Method[2]
1	• Define the problem	• Meet the problem	• Define problem
2	• Collect data • Develop hypothesis(es)	• KNK (know, need to know) • Define problem statement	• Derive hypothesis(es) • Review the literature
3	• Collect and analyze data to test hypothesis(es)	• Gather and share information	• Test hypothesis • Decide on a procedure • Develop methodology • Data collection and analysis
4	• Synthesize data • Generate solutions • Develop action plan	• Generate possible solutions • Evaluate fit of solutions	• Derive conclusion • Interpret results
5	• Present solutions	• Present findings	• Disseminate findings

[1] Problem-based learning model. Center for Problem-Based Learning, Illinois Mathematics and Science Academy, 1998-2001. http://www.imsa.edu/programs/pbln/

[2] Scientific method. http//www2.selu.edu/Academics/Education/EDF600/mod3/sld001.htm

Table 2. Comparison of Attendance and Behavior Referrals for October 24 – December 16

	Attendance Rate		Behavior Referrals	
Session	**2004**	**2005 (HCP)**	**2004**	**2005 (HCP)**
AM	89%	93%	7	3
PM	65%	76%	8	3
School wide	77%	85%	15	3

Figure 1. **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?

5) PRESENT SOLUTIONS

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