
Community-based Education: Model Programs

By:

Jon Yoder, Mike Weddle, Larry Callister,
Tim Whitley, William Lemos, Robert Jamgochian



Northwest Center for
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GUIDE DESCRIPTION

This educator's guide is part of a series on community-based education. Each previous manual attempted to fill a specific niche in assisting educators in establishing this type of approach to the way in which school is conducted. Readers would be well-served to access earlier educator guides (*Educator's Guide to Program Development in Natural Resources*, *Community as a Context for Learning*, *Community-based Natural Resources for Biology*, and the final guide (published July 2012) *Connecting Classrooms to the Community* in order to provide the support and resources necessary to begin or enhance their work with students.

Previous educator guides describe a process that educators can follow to connect schools to their communities. They explain the philosophical basis for community-based education. The community-based approach engages students in the public domain, involves them in the information-gathering that is needed, and then provides feedback to enhance the community's policy and decision-making capacity. However, teachers who embrace this philosophy often struggle with how to implement the community-based approach into their classroom. So the previous guides also offer specific community-based lessons and activities that educators could use in a typical biology course to get students out in the community. They provide specific lessons for the information-gathering phase of their community-based efforts and address concerns regarding content and content standards as students participate in authentic educational opportunities in the community.

Some educators still struggle with knowing how to connect to their communities or even how to identify the community and its needs. Many teachers are eager to go, but unsure of how to take the first step. Previous educator guides provide lessons, tools, resources, and forms that will offer yet more guidance to assist educators and students in entering the public domain and connecting to their community for the first time. They provide needed support and valuable resources for those already out there in the community conducting community-based projects as well. In fact, many educators and students currently involved in outstanding community-based programs and projects often lack a thorough knowledge or understanding of what their community is. There is often a gap between the students' participation in a community project and their understanding of the community context in which it is occurring. We hope these educator guides will help educators put the "community" into community-based programs.

Those looking for ways to expand their work with natural resources or environmental education should also read *An Educator's Guide to American Indian Perspectives in Natural Resources*. This will provide information that can be used to expand field studies to incorporate historical or cultural aspects.

This educator's guide will provide a glimpse at what is possible when teachers and their students embrace the community-based approach. It is important to note that everyone starts out with small projects and it is only over time and with relationships built up in the community that larger programs result. I hope the stories included here will provide both inspiration and ideas on how to take your students and school on this journey.

ACKNOWLEDGEMENTS

This educator's guide is a cooperative effort involving major contributions from five primary sources. This represents the work and efforts of these individuals and the community organizations they are affiliated with. I would like to thank all of them for their work on this project and more importantly for all the work they do with their students and their community. This educator's guide is a story of their efforts.

Mike Weddle was one of the founding teachers at the Jane Goodall Environmental Middle School (JGEMS) in

Salem, Oregon. Mike taught conservation biology and technology as well as served as executive director. He also organized the community-based research and restoration projects that were an integral part of the JGEMS experience earning him the prestigious Millican Award. Mike retired in 2007, but continues to lead research projects and serves on the school's Board of Directors.

Tim Whitley has been a science teacher in the Eugene, Oregon, 4J District since 1990. As co-founder of the Rachel Carson Center for Natural Resources in 1999, he teaches *Environmental Science*, *AP Environmental Science*, *Field Studies*, *Ecology* and *Botany*. Prior to teaching at the Rachel Carson Center, he taught high school biology and oceanography as well as five years as a middle school science teacher.

William Lemos taught English for thirty-five years. During his teaching career William's passions included incorporating outdoor activities in the humanities so as to enhance student awareness through active participation in nature, history, and literature. His advanced degrees are in English, psychology, and education. His teaching partner Robert Jamgochian's background includes teaching biology and natural sciences for twenty-seven years. His interests include teaching outdoor and experiential educational courses and leading field studies in his discipline. He holds a degree in biological science from Humboldt State University.

Larry Callister has taught science at Reynolds High School in Troutdale, Oregon for 30 years. In 1998 he developed a plan for teaching *Environmental Science* that would team science, social studies and English teachers. Out of that plan came the Natural Resources Academy (NRA) of Reynolds High School, and this is where Larry has taught the past ten years.

I was a biology teacher at North Salem High School for 23 years and in collaboration with other teachers in the department, established a Natural Resources Academy. The community-based classes that I taught were *Field Biology* and *Natural Resources: Community Applications*. I recently left the classroom to become the Science Specialist for the Salem-Keizer School District.

Another role I fill is as the Secondary Education Coordinator for the Northwest Center for Sustainable Resources (NCSR) for the past 15 years. It is in this role that I conduct teacher-community summer institutes and put together these educator guides. It has been gratifying work and I have benefited greatly from the many collaborations and support of the NCSR staff.

Additional acknowledgements go to the NCSR staff. Wynn Cudmore, NCSR's co-PI, graciously offered his skills to review and edit this educators guide. Wynn has developed a national reputation for his work with curriculum development and the writing of numerous NCSR materials for community college programs around the country. Liz Traver, NCSR's Administrative Assistant, added her magic to this work with all of the layout, organization, and graphics needed to make this an outstanding product. Lastly, Lester Reed, NCSR Director, provided the encouragement and support that made this work an enjoyable and rewarding experience.

Thank you!

Jon Yoder
NCSR Co-PI
Chemeketa Community College
PO Box 14007
Salem, OR 97309
Phone: 503-399-5270
Email: ncsradm@chemeketa.edu

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INTRODUCTION

As education attempts to meet the needs of society in the 21st century, the need for greater alignment between community goals and educational goals becomes critical. In the past there has been too large of a gap between what takes place in schools and what is important to a community; and the resulting preparation and involvement that takes place within an educational system. Making real and authentic connections between schools and communities is essential if either is to fully realize their common mission of productive citizenry. The request from both communities and schools to achieve this common mission is something that is already in place in every community. It becomes a matter of finding ways to link the two groups together.

The process best able to link schools and communities together and to achieve common goals is a community-based approach to education. This approach uses the needs and opportunities of the community to drive educational instruction. In every community there are agencies and public bodies with limited budgets that work and deliberate on public issues and policies. They have a need and often a requirement for citizen involvement. For too long, students have not had the opportunity to take on their rightful role as citizens and members in the community. Combining the needs of the community with corresponding educational opportunities and experiences for students, is a central feature of community-based education. Students need to be engaged in the work of the community and thus there will be an authentic context to their learning.

The support for this approach to education is already in place and can be found in numerous agency, community, and school documents. A community-based approach to education is asked for in United Nations resolution for a *Decade of Education for Sustainable Development*, national teaching standards, state's goals, agencies' goals, community goals, and school district mission statements. All of these documents mention the importance of citizenry and citizen involvement and so it seems that our educational practices need to support this.

There are many barriers that can deter communities and schools from undertaking this approach. From the community side there are concerns with staff time, effort and money and unfamiliarity with schools and what human resources they can provide. Where else are there hundreds of citizens in one place with the ability to help community efforts to raise awareness and the capacity for decision-making? Students are an unused asset and resource, and communities need to learn how to connect and tap in to this. Very few places in the community have citizens that have a working knowledge of trigonometry and other content information that can be used for a variety of community projects.

There are barriers in schools as well, with lack of knowledge and information about community opportunities that fit their educational objectives, as well as money and transportation concerns. However, the biggest barrier that looms for most educational institutions is the emphasis on content standards and standardized testing. Many schools continue to focus on test scores and traditional methods of instruction. It is important to note that in a community-based approach, content standards

are indeed addressed but now it is within the context of an authentic experience connecting to community needs. There is evidence that students will perform just as well or better on standardized tests from this contextual learning.

The benefits of a community-based approach for schools go beyond content standards and standardized tests. Student-citizens become connected to their communities rather than disconnected and alienated. There is a greater chance for continued involvement in years following their formal education. In addition, student motivation and engagement are high as they see a relevant connection to what they are learning. For communities there are both short term and long term benefits. More of the work of the community can be accomplished by engaging younger citizens, and with educational products from their efforts the community can become more aware of what is occurring in their community. As a result, there is a greater capacity for making community decisions.

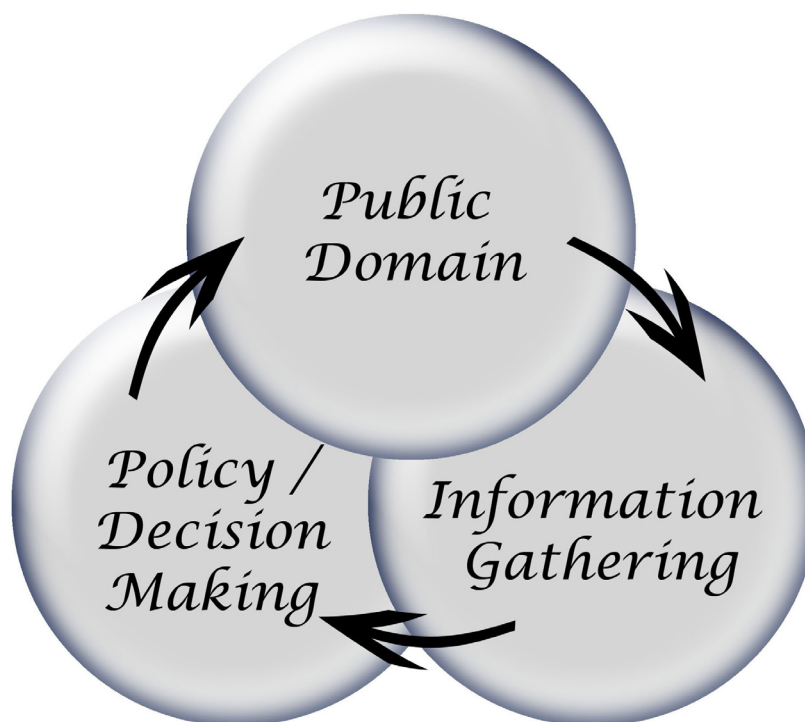
To get a better understanding of what community-based education may look like in schools, five outstanding examples are highlighted in this educator's guide. Note that, although each has unique characteristics, there are numerous components that all share. They are: an authentic community context for student work, numerous community partners, strong curricular connections, valued student-community products, and most of all, committed and passionate educators.

COMMUNITY-BASED FRAMEWORK

There are many ways that community-based education can be carried out in schools and community. The Northwest Center for Sustainable Resources (NCSR) has developed a framework or process that can help guide the implementation of a project or program. This can be helpful for those just starting out or for those who are looking to better organize and formalize their current work with the community. Each school and community will have unique characteristics and circumstances but the following process can guide the work in almost any school-community.

Public domain

This section will describe a process to access the community that can be used to identify student opportunities and in the selection of student experiences. The focus is on the authentic participation of the student-citizen in the work of the community. Students and schools will then be viewed as a valuable resource for the community



In this arena, the community uses and manages resources in a variety of ways. Numerous agencies—city, county, state and federal—are responsible for carrying out mandates and laws regarding the use and management of these resources. Businesses, industry, and other community groups are also interested and involved in the use and management of resources.

For the educator, here is the entry point in developing experiences and opportunities for students that are community-based. The goal is to find a task or project the students have been invited to participate in by the community. However, as educators participate in the public domain and the policy decision-making arenas, they will need to form community partnerships since these are generally less familiar areas for them. A number of ways to have students enter this arena are showcased in the examples described in this educator's guide.

Information gathering

The next step in the community-based process, after arranging authentic, developmentally-appropriate student experiences in the community, is to conduct the research, survey or inventory, monitoring, or other tasks necessary to complete their work. It is in this way that the teacher can “show off” the educator skills they know so well.

It is using these scientific processes that the educator is most comfortable and familiar. This is where the necessary skills, knowledge, and attitudes are developed within the context of community participation. It is within this arena that the district, state, and national content standards are addressed. If these standards are important to our community, then schools should be able to find experiences in the community where these standards are needed or used. The selection of student experiences from the public domain needs to take these content standards into consideration. The content standards should be viewed as a means to an end and not the ends in themselves. Educators will need to use, modify, or create educational materials, activities, and labs that provide the information necessary to accomplish the task that has been selected. Traditional materials, texts, and labs may still be appropriate, but now are used in the context of solving a problem or completing a task in the community. In addition, educators will need to access community resources and expertise. This often means that the educator is truly a facilitator— lining up and arranging resources, materials, and experiences from a variety of sources. Forming partnerships with the experts in the community will help both the educator and the students develop the necessary skills and knowledge.

Students may still study a chapter in a text on ecosystems or populations and do classroom activities and labs, but learning activities take place in the context of a real problem or project which they are working on in the public domain. In addition, content standards can be addressed in the selection of an appropriate project in the community. In a recent publication, *Closing the Achievement Gap* (Lieberman and Hoody, 1998; www.seer.org), research has shown that students actually perform better when the environment is used as the integrating context.

Policy/decision-making

Upon completing the information-gathering phase, the next step is to produce products useful at the community level. Participation by the student-citizen in the public domain is most often the piece missing from natural resource programs. If projects are selected from public domain documents, then the policy/decision-making bodies, agencies, businesses, industries and the rest of the community should want to know how things are going. The school, serving as a resource, can raise the awareness and capacity of the community by sharing their findings and information. This may take the form of presentations to policy/decision-making bodies as well as a variety of other community groups and educational institutions. Having students consider social, economic and ecological factors is an important part of this information dissemination and community renewal. Developing public products allows students to develop a deeper and stronger connection to their community. There are numerous examples of this highlighted in this guide.

Summary

In this section, an educational approach has been proposed that is similar to the process that occurs in communities. By accessing public documents, or being invited directly by agencies that operate by these documents, students become connected and engaged in the authentic experiences of community.

The learning and work that students do now take place within the context of authentic community processes, and students now are viewed as a resource and as participants in these processes.

Finally, the products produced by the student-citizens can then be used to raise the awareness and capacity for change for the entire community. Modifications to current policy and decision-making can occur as students showcase their products.

THE JANE GOODALL ENVIRONMENTAL MIDDLE SCHOOL

By Mike Weddle

The Jane Goodall Environmental Middle School

Background

The Jane Goodall Environmental Middle School (JGEMS) is a public charter school located within Waldo Middle School in Salem, Oregon. The ten-year old school has an enrollment of 90 students in grades six to eight. JGEMS students have classes in all subject areas that are part of a regular middle school curriculum, but the overriding focus for all curriculum areas is the environment.

Introduction

Teachers are always looking for engaging and meaningful projects for their students. At the same time, government or non-government conservation organizations are seemingly always shorthanded when it comes to conducting all the research projects they would like to do. At the Jane Goodall Environmental Middle School (JGEMS) in Salem, Oregon we have been able to use student scientists to conduct these research projects, providing both the assistance needed by the organizations and the engaging and meaningful projects that students need. We have found that projects done in collaboration with non-school organizations provide an incentive and a relevance to research work that may be missing from research done in school. Additionally, collaborating with outside organizations can provide expertise, equipment and even funds that may not normally be available to the classroom teacher.

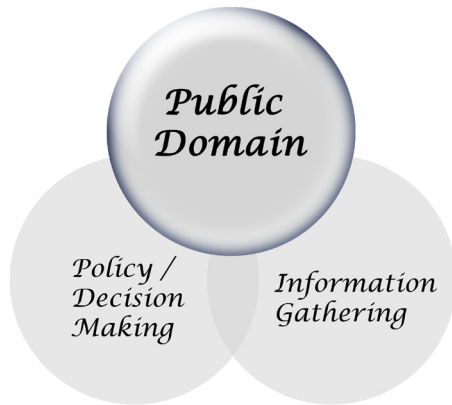
Students at JGEMS have been doing these field-based research projects for ten years and have established a reputation for thorough and careful research. Each year the number of requests for projects increases, giving the students more choices for projects and more opportunities to make connections and apply their skills and knowledge to engaging and meaningful “real life” projects. We do this as a year-long project, building our conservation biology curriculum around the various project topics. This is a great way to tie content to process.

In an era when schools are increasingly concerned with state and national test scores, taking precious classroom time to get students outside might seem wasteful. Yet, a number of studies support the idea that giving students experiences outside the classroom can benefit students whether it is measured in test scores, improved attendance or better classroom behavior. “Closing the Achievement Gap,” a report published by the State Environmental Education Roundtable in 2002, worked with 150 schools in 16 states for ten years examining the link between student achievement and environmental-based programs. The study found improvement in every core subject area, not just the sciences.

The Jane Goodall Environmental Middle School was featured in the “Closing the Achievement Gap” report because it uses the environment as a context for learning. JGEMS students take over seventy field trips a year for restoration and research projects. Yet, for all the time they are not in the classroom, they have managed to achieve the highest state test scores of all middle schools in the Salem/Keizer School District in every subject area tested. Teachers at the school attribute these high scores to the clear focus on conservation and science provided in the JGEMS program.

Exploring the community

When we first started doing collaborative field-based research projects, we had to search out community partners. Now, after ten years, community partners come to us. By providing useful and reliable data for our community partners, we have established a reputation as a school with focused, knowledgeable and well-behaved young scientists. This reputation cancels out any negative impressions that potential partners may have about working with middle-school students.



But it wasn't always like that. Ten years ago we actively sought organizations that would be willing to provide engaging and meaningful projects for students. Whenever teachers were attending conferences or meetings, they were always prospecting for potential projects. One teacher happened to be at a campsite next to a vacationing Oregon Department of Fish and Wildlife hatchery manager. While talking around the campfire, they came up with what turned out to be one of our most exciting collaborative projects, a stream survey of Gnat Creek.

Sometimes students would have a project in mind and then we would search for the appropriate organization that had an interest in or jurisdiction over the potential site. One group, for example, wanted to improve the riparian zone in a stream that flowed through two city parks. We contacted both the City of Salem Parks Department and two local neighborhood associations to work with them on the project. In 1998, while attending a conference in West Virginia, I met two staff from the Oregon Coast National Wildlife Refuge. During that conference we established a partnership that has resulted in at least a dozen research projects on subjects ranging from amphibian surveys to tidal movement of large-woody debris as well as yearly restoration projects for students, parents, and staff at the refuge.

Our experience is that most government and non-government organizations have been mandated to take part in some sort of community outreach or education projects. Once we establish ourselves as dependable and knowledgeable, organizations seem eager to work with us.

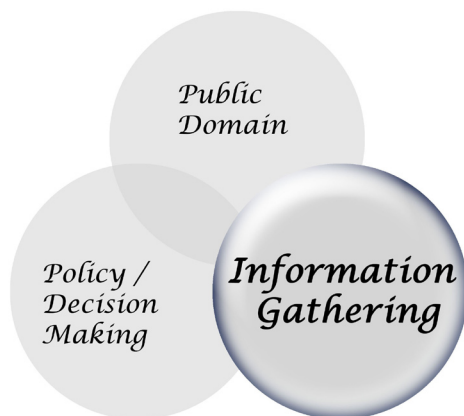
One of the principal goals of these project-based field experiences is to establish the link between the students' research and the community affected by the issues studied in their project. Students have to be able to answer the question, "So what? Who cares?" They learn this through their interaction with the community partners, their background research and the experiences they have in the field. Ultimately they become spokespersons for their issue, presenting the results of their study first to the panel of experts including representatives from their partner organization, and often at conferences and meetings in the broader community.

Conducting community-based projects

Getting students out

During the ten years that JGEMS has been conducting such intensive field-based projects, the teachers have developed a system that works well for our school. Because field experiences are so critical to our mission, the school's structure has been modified to allow flexibility in the student day. On average, students in JGEMS participate in about 20 field trips per year. Eighth grade students will do more because of the data gathering they will have to do for their research projects.

For field experiences that involve an entire class such as camping trips, restoration projects or trail maintenance at Silver Falls State Park (another of our partners) we always use school busses. For small group research trips for our 8th grade research projects, we either rent a van or use a teacher's car. Often it is less expensive to rent a van than to pay mileage for the use of a teacher's car.



Most JGEMS field experiences are during school. However, parents and students are told before they apply to the school that for JGEMS students, the school day does not always end at 2:30. For JGEMS students, school might end at 3:30 or 5:30 or 6:00 the next day, depending on the needs of the field experience. Occasionally trips take place on weekends. For the 8th grade expedition, the students are gone for ten days. It all depends on the needs of the project and the partnering organizations.

At the beginning of each school year, we have parents sign a permission slip for all one-day field trips for the year. We list the likely sites for the trips on the form and the possible methods of transportation and then file these signed forms. Staff pull the ones they need for each trip just in case there is a medical emergency and parent permission for treatment is needed. For extended camping trips and our expedition to Costa Rica, additional permission forms and waivers are required.

Parents are given a schedule of field trips scheduled for fall and spring each year. Occasionally, this list is altered, but for the most part the teachers are able to stay on schedule. Parents appreciate it very much when field trips return on time. Whenever we do full class field trips by bus, we allow for sufficient travel time so the students always arrive back at the school on time. For 8th grade research trips, where there is often some uncertainty about how long the data gathering will take, we give parents a window of time and then call each student's parents when we know our return time.

For JGEMS, field experiences are such a core component of our instructional model that appropriate behavior in the field is critical. We establish early in the students' 6th grade year that field experiences are a critical part of what we do and that good behavior is essential for safe and productive field experiences. The first field trip is on the third day of school in September. This trip begins the process

of training the students for work in the field. Teachers make sure that students understand that the work in the field is not a play-day, but an important part of their classes. By the time the students are in the eighth grade, they have participated in dozens of field experiences. For them, the 8th grade field-based research project is the culmination of their JGEMS experience. They know the behavior expectations and that the work they will do in the field will be valuable not only for their education, but also for the school and the partnering organization.

Content components and instructional approach

In September, we start with an introduction to scientific research. We begin by teaching or reviewing the scientific method with the students. We teach the difference between experimental, descriptive and historical research. A good resource for this is *Looking for Data in all the Right Places: A Guidebook for Conducting Original Research with Young Investigators* by Alane J. Starko.

JGEMS teachers compile a list of possible research projects and sites over the summer. Once the possible research projects have been collected, they are presented to the students. We establish research groups and have each group choose a project. Students generally choose a research topic for one of three reasons: 1) they like the topic; 2) they like the location of the research site; or 3) they want to do what their friends are doing. Once the groups choose their topics, we arrange for the groups to meet their collaborating partners in the field at the research project site to talk about the best way to set up the research design. By collaborating at the very beginning of the project, the students can design their research project in a way that will be most useful to the partnering organization and at the same time be realistic for them.

When eighth grade students first meet with the staff from their collaborating organization, they have been prepped ahead of time. They have started a review of the literature for their specific field-based project. Whenever possible, they learn to use the tools and acquire the knowledge they will need prior to their first meeting at their site. If, for example, they are working with the Audubon Society doing a bird census at a local wetland, they have already learned, in the classroom, the species of birds they are likely to encounter.

The motto for JGEMS in the 8th grade is, “Bring home the data.” We stress to the students that when they start collecting data in the field, they need to be thorough and accurate in collecting their data. We teach the importance of sample size and controlling variables – both important concepts in any research design. We have the students return to the site as many times as finances allow and the project demands. We have had projects that demanded monthly visits throughout the year and others that needed one visit in the fall and one in the spring.

Students need to design data sheets that work efficiently in the field and can easily be transferred to *Excel* spreadsheets back in the classroom. It is critical to transfer the data as soon as possible so students can remember the experience and the data.

The Jane Goodall Environmental Middle School

As the students are collecting their data, they should also be working on their formal research paper. For us, this starts with a review of the literature and an introduction. We provide several models for the students so they can see how this works. Students can search the web, the local university library or resources from their partnering organization. They need to know the background of their issue and what other scientists have learned about their issue in previous studies. The introduction should end with an explanation of their research project – what they are doing and why.

The methods section of the paper is pretty straightforward. The results section will include their analysis of the data. It should include well-labeled graphs to help in the interpretation of the data. Students might also use geographic information system (GIS) software to further analyze their results. GIS data sets are available from most of the organizations you are likely to partner with.

The discussion will be just that, a discussion of the results. Did the results meet their expectations? What surprises did they find? What problems did they discover as they were collecting their data? The conclusion will include the final thoughts from the students about the topic for the partnering organization. It should also include recommendations for further research. For many organizations, long-term studies are incredibly helpful. JGEMS students, for example, have been collecting data on red-legged frog egg clusters for seven years, and the data from the seven years shows a remarkable change that would not have been seen if we had stopped after one year.

The ultimate goal of any project is to share the research results with the partnering organization. We do this by:

- Presenting the students' formal research papers to the partnering organization.
- Preparing a scientific poster display to give to the organization.
- Inviting representatives from the organization to a presentation at our school or have the students present at the organization offices. Students use *PowerPoint* for the presentation. They prepare speeches explaining their work and they should be prepared for questions from the staff. We want students to be able to “defend” their results.
- Posting their research on the web, using either the school website or the website of the partnering organization.

Ultimately, the most important assessment is from the partner organization. If they are happy with the work the students do, the report they receive and the presentation by the students, they will ask for more the next year.

Students in our district are assessed on “work samples” that demonstrate their skills in certain curriculum areas. We use these research projects to satisfy those requirements for multiple areas: science inquiry, speaking, technology and writing.

Finally, whenever we see former students, we ask them what was the most important thing they learned in JGEMS. Overwhelmingly, “speaking skills” is the most common response. Students in JGEMS

The Jane Goodall Environmental Middle School

begin giving high-stakes speeches in the 6th grade and by the time they get before the panel of experts to defend their 8th grade research project, they are relaxed, confident and skilled.

Whether this research project is done in a month, a semester or a year, providing students with an opportunity to apply their skills and knowledge to engaging and meaningful real-life projects is a great way to not only make science exciting, but also to establish links with the broader community. The effort and resources you need for this, admittedly, are extensive, but the rewards in student achievement and respect from the community make it all worthwhile.

Challenges

Because field-experiences are such an integral part of our curriculum, we allocate funds for a sizable number of field trips each year when we construct our general fund budget. As a public charter school, we are allocated the same amount per student as any other public middle school in Oregon. Our “charter” is with the Salem-Keizer School District. They handle our personnel, facilities and the other costs that are normally incurred by all public schools. The District allows us to formulate our own budget for any money that remains from the general fund. A large percentage of this balance, what we call our operating budget, goes to fund field experiences. The entire JGEMS staff and the JGEMS School Board establish the operating budget.

Additionally, we are always pursuing grants. Because we have established the value of this approach to science education, grants seem to be fairly easy to obtain. When we receive a grant, we make sure to keep the funding organization informed about the progress of the project(s) they have funded. We always invite members of the funding organization to view the students’ final presentations and submit the students’ project reports to them. We want them to know how the students used their money. We also have a strong Parent Club that organizes fund-raising events. Our two most successful are the fall Work-a-Thon, where kids get pledges to do restoration work, and our Wine and Cheese Tasting Event in the spring.

The only trip that parents pay a portion of the expenses is our Costa Rica 8th grade expedition. Even on that trip, if there is a financial hardship, we provide scholarships for students.

Partners and projects

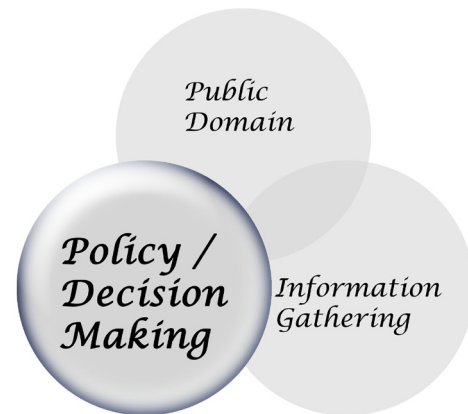
Here is a partial list of the partners we have worked with during the past ten years along with project titles.

- U.S. Fish and Wildlife Service - Oregon Coast National Wildlife Refuge: Amphibian surveys, camera trapping, invasive species control, large-woody debris study
- U.S. Forest Service: Burn severity in thinned and unthinned forests
- Oregon Department of Fish and Wildlife: Salmon stream habitat study, turtle habitat study
- Oregon Zoo: Stereotypic behavior in polar bears, activity budgets for new exhibits
- City of Salem Public Works Department: Riparian restoration, water quality, fish habitat

- Conservation and Research Center, National Zoo: Amphibian survey, plant association, lichenology
- Le Centre de Recherches sur les Ecosystèmes d'Altitude, Chamonix, France: Phenology study

Products

All research groups submit a formal research paper to their partner organization. This information is then used to broaden the knowledge base of the organization, to publicize community interactions or to build community support. Additionally, students prepare their formal project summaries that are presented to parents, younger students in the school, district administrators and staff from the partnering organizations.



Other products specific to individual studies include:

Sand Intrusion at Cannon Beach Tidepools

One group of students worked to determine the extent of sand encroachment in the Cannon Beach tide pool area for the Haystack Rock Awareness Project. They observed a significant change in sand encroachment during the year. This information will prove invaluable to the Friends of Haystack Rock by providing baseline data for their long-term study.

Invasive Species Study at Neskowin National Wildlife Refuge

The U.S. Fish and Wildlife Service asked a group to study the extent of infiltration of invasive species in Neskowin National Wildlife Refuge. The students identified the area with the greatest infiltration of English ivy, organized a community ivy pull and with the help of over 100 volunteers, pulled all the ivy in November 2006.

Stereotypic Behavior in Polar Bears at the Oregon Zoo

At the request of Dr. David Shepherdson, this group studied stereotypic behavior in the three polar bears at the Oregon Zoo. They followed the procedures for recording the target behaviors established by Dr. Shepherdson in his earlier study on polar bears.

Stream Survey of Gnat Creek

This project was done at the request of the Oregon Department of Fish & Wildlife. Staff at the Gnat Creek Fish Hatchery noticed a rise in stream temperature over the past three years and they wanted to determine the cause. Students collected data on shade cover, large woody debris, water temperature and streambed pebble size. They identified the lack of adequate streamside buffer after logging as the probable cause of the temperature rise.

Camera Trapping

Using five *Trailmaster* infrared camera traps, this group has been trying to record on film the larger animals at Opal Creek Ancient Forest Center. The center wants this information to help them educate visitors about the animals in this wilderness area. Opal Creek staff advised the students on camera placement for particular animals.

Prey Profile of Barn Owls

The U.S. Fish and Wildlife Service asked for a prey profile for barn owls nesting on the Nestucca Bay National Wildlife Refuge. Staff wanted to know the percent of diet that was introduced species. Students dissected owl pellets collected under and around the nest at various times during the year. Introduced and native species were both identified.

Barbed Wire Fences and Wildlife Movement

The barbed wire fencing research project was done at the request of one of the JGEMS teachers who owns property northeast of Klamath Falls, Oregon. He was concerned that the barbed-wire fence around his property may be a dangerous obstacle to deer, elk and antelope as they travel through his property in search of food. The students used infrared camera traps to record the number of deer that crossed the fence line before and after the fence section was taken down.

Phenology, Alpine Ecosystems and Climate Change

Working with the U.S. Forest Service, the Alpine Ecosystems Research Center in Chamonix, France, and the USA National Phenology Network, students are gathering baseline data on leaf-fall and bud-break on selected high altitude species in the Cascades. The Alpine Ecosystems Research Center has been conducting similar research in several European alpine countries for several years and they are eager to expand their data to include North America.

Western Pond Turtle Habitat at Luckiamute State Natural Area

Located just south of Independence, Luckiamute is a recently designated state natural area that also happens to have valuable western pond turtle habitat. Working with Oregon Wildlife Institute's Dave Vesely, the students observed turtles and collected habitat data such as ground cover percentage, canopy closure, average grass height, shrub cover percentage, and slope percentage. Their data will be incorporated into the management plan for the natural area.

Case studies

The following two case studies show how these collaborative field-based research projects can be a tremendous educational tool.

The effect of clear cutting on water quality in the Willamette National Forest

“Yes, I’m sure,” she said for the third time. “We took multiple samples both above and below the landslide and there was no difference in the turbidity. The water was crystal clear.”

The Jane Goodall Environmental Middle School

Salem Mayor Mike Swaim finally admitted defeat. Amanda, an 8th grade student at the Jane Goodall Environmental Middle School, had presented convincing evidence from her group's research. At this site at least, the landslide caused by the logging road was not causing erosion or increasing the turbidity in the stream. Mayor Swaim had been a strong supporter of minimizing logging road construction in our National Forests to protect Salem's pristine water supply. Amanda's group's study seemed to refute his argument.

Amanda continued. "We are not saying that landslides caused by logging road construction are never harmful. But in this case, we think that all the mud that was going to wash off the slope already has. The Forest Service gave us historical aerial photos of the area and from these we know that the slide happened sometime between 1987 and 1992."

I had taken this group of 8th graders to the research site on Hill Creek in the Willamette National



Students hike upstream to collect water quality samples.
Photo by Mike Weddle.

Forest on the rainiest Saturday of March, just to be sure that water would be running down the landslide. The group took several samples above and below the slide and then kicked some mud into the stream and remeasured to make sure their meters were working. They were very confident of their results. These results were written up as a formal research paper on the effects of logging on water quality and presented to the U.S. Forest Service and the Smithsonian Institution's Conservation and Research Center as part of their Forest Ecology Biodiversity Study. Now the students were presenting their study to a panel of experts, including Mayor Swaim.

Mayor Swaim congratulated the group on their perseverance, both in the field and in front of a doubting panel. The students were very proud – empowered by their efforts and their expertise. Mayor Swaim was so impressed that when he finished his second term as mayor, he joined the JGEMS Board of Directors.

Winter beach preference in Snowy Plovers

JGEMS was approached in 2004 by USFWS to undertake a research project on the threatened snowy plover. This species, first listed as threatened in 1993, has been very controversial in Oregon because the best solution to improving nesting habitat is to close public access to beaches. The students worked with the public to determine the nature of their concern and to search for compromises.

They began the project in November 2004 by assessing the wintering habitat of the snowy plovers at four beaches near Florence, Oregon. The five eighth grade girls traveled with their teacher and two parents to Florence for a weekend in November 2004. On Saturday morning they met with USFWS staff at the first target beach to establish the protocols for the project. Four beaches were studied. Plovers nest on all four of the beaches in the spring, but only over-winter on three of them. The USFWS wanted to know what was



Students examine beach sand to research snowy plover habitat.
Photo by Mike Weddle.

different about the fourth beach. Why didn't the plovers want to be on that beach during the winter? The students and the USFWS staff decided together to measure a number of factors at each beach, including the slope of the beach, the amount of driftwood, the amount of wrack (washed up grasses, sticks and other vegetation at the high-tide line) and the infiltration of dune grass on the dunes adjacent to the beach. Students gathered data at two sites on each beach. They returned to the sites two more times during the school year to collect data.

On their last visit, they conducted a survey of beach users to determine how much they knew about snowy plovers. They also wanted to know how the people felt about the closure of certain areas of the beaches during nesting season. They created an informational brochure that they gave to each of the people they surveyed.

Their data showed that the snowy plovers winter at flat beaches with lots of large driftwood, a small amount of wrack and almost no vegetation. These results matched their predictions for the slope and the amount of driftwood. They had predicted the plovers would require a flat beach to be able to see predators from farther away. The students thought the plovers would use driftwood for protection from winter storms. Their predictions were wrong for wrack and vegetation. They thought the plovers would require a large amount of wrack for food and that they would use the vegetation to hide from predators. One of the reasons wrack was not the ideal habitat variable was because it changes so often. There wasn't much native vegetation on the flat parts of the beaches at any of the sites because of the dunes created by the introduced European beach grass.

After analyzing their data, writing their research papers and creating their *PowerPoint* presentation, they presented their findings to staff from USFWS and other experts at the school in May, and to an international conference on environmental education at the Smithsonian Institute's Conservation and Research Center in Front Royal, Virginia.

Sustainability of program

JGEMS is in rather a unique position. The field-based projects that we do now were actually begun when I was still teaching for Waldo Middle School. In 1999 the Salem-Keizer School Board suggested that we start a magnet school at Waldo focusing on environmental science and technology. At the time Waldo was under-populated and the hope was that a magnet school would attract students from other neighborhoods to the school facility. So, JGEMS opened in 2000 as the Jane Goodall Environmental Magnet School. After three very successful years, we made the choice to apply for charter school status, hoping that this designation would provide more long-term security to JGEMS. The state and the district approved the application and we became the Jane Goodall Environmental Middle School.

The concept of field-based student research is such a part of the JGEMS culture that it actually forms the basis for our mission statement. One cannot imagine JGEMS without these projects. This is made clear to all the students, their parents, school administrators, district administrators and, most importantly, parents who are applying to get their students into the school. These projects define us. By becoming a magnet and then a charter school, we had a great degree of independence when setting up our class schedule. We plan our schedule in such a way that allows for the least disturbance when students miss class for field experiences. Since all the teachers are part of JGEMS (except band, orchestra and Spanish) students are never penalized in one class for being on a field trip for another class.

All the teachers are heavily invested in the school and its mission. Often one teacher drives this kind of program and when that teacher leaves, the program ends. That has not been the case with JGEMS. The school is ten years old and in that time three teachers have retired and been replaced. The recruiting for new teachers and the interview process focuses on the field-based project emphasis in the school. We have hired teachers that can help sustain the school and its mission.

Summary

In more than ten years of doing field-based research projects with students, I have learned a few valuable lessons. Hopefully, by listing them here, you will be able to learn more quickly and less painfully than I did.

1. Carefully select partnerships that can work. Can the students get the job done? Will it be interesting? Can they collect a large enough sample size to make the results meaningful? Will staff from the collaborating organization be able to visit your classroom? Work with your students in the field? Attend a final presentation?
2. Can the study be continued in future years? There is great value in ongoing studies that become a school tradition. Each year the project acquires a greater value.
3. Make the trips fun. Usually the students will be giving up something to take part in this field experience – missing classes, giving up a weekend day, or working late in the afternoon.
4. Feed the kids. My experience is that middle school students need to eat every two hours. Sitting around the table over ice cream is a great time to reflect on the day's data collection.
5. Fill out all the proper forms. All schools and districts have required forms for field trips. Our administration has always been supportive of our fieldwork – except for those times when we have failed to turn in the proper forms at the right time.
6. Don't surprise your administration. Be sure to let your administrators know ahead of time about your collaborations and fieldwork. Let them become part of the planning, even if it is only token participation. The last thing you want is for them to read about your exploits in the paper – exploits they know nothing about.
7. Scout the site ahead of time. A field experience can go bad in a hurry if the kids, once they arrive at their site, are not able to carry out the project they have spent weeks planning. Granted, that is part of the reality of doing field research, but with middle and high school students, you really want them to have a good experience, not to mention the cost of taking the field trip. You want a good experience for them.
8. Don't be deterred by bad weather. There is so much that has to be set up ahead of time for a field trip, you do not want to postpone because of rain or other inclement conditions. Invest in good rain gear or other weather appropriate attire. A little weather will make the experience more memorable for your students - and for you.

RACHEL CARSON CENTER

By Tim Whitley

Background

Churchill High School is a suburban school of 1150 students located in Eugene, Oregon which has a population of 140,000. With over 40 percent of students on free and reduced lunch and a very diverse student population, Churchill has served as a comprehensive neighborhood high school since 1966. The Rachel Carson Center offers a two-year program within Churchill designed to serve approximately 90 juniors and seniors. Rachel Carson students take one 85-minute class period every other day in the program, which combines field studies and environmental science. Students additionally take one on-line class each semester: *Ecology* and *Botany* junior year and *Technical Writing* and *Environmental Law* senior year. Many students take Rachel Carson classes to meet science or language arts graduation requirements. Rachel Carson students take a wide variety of other classes within the International High School or regular Churchill programs.

Introduction

On a full moon night, floating in a canoe on Waldo Lake, I overheard a student say, “This is the coolest thing I’ve ever done, it’s like riding on a magic carpet!” While watching a mink swimming along Amazon Creek within the city limits of Eugene, another student exclaimed, “I never thought I’d see such an amazing sight right here in town!” These students were participants in Churchill High School’s, Rachel Carson Center for Natural Resources. The Rachel Carson program is a high school, career academy that focuses on getting students out of the traditional classroom and into the urban natural areas scattered throughout the Eugene area. Open to all high school juniors and seniors in the area, this two-year program strives to make connections between the students and the greater community while studying natural resources and environmental science.

The Rachel Carson Center for Natural Resources is comprised of a community of learners working together to gain a balanced, in-depth understanding of the natural environment. Students learn experientially by applying knowledge and skills to real world situations. They are provided with the opportunity and the necessary tools to create positive change within the school and nearby environments. This program is dedicated to promoting partnerships with the community that result in a shared commitment to stewardship and a sense of responsibility to the world around us.

The Rachel Carson Center for Natural Resources is developed around the following core beliefs:

- The key to generating attitudes of civic responsibility, collaboration, and discovery lies in taking students into the world.
- The value, depth, and retention of learning increases when it is applied to real world situations that matter.
- Experience-based learning provides for the development of knowledge, skills, and attitudes necessary for successful and active participation as a world citizen.
- Non-traditional learning, whereby subject areas are integrated and arbitrary class times eliminated, facilitates active engagement for the students.

Students who have completed the program report that it produced benefits that have continued beyond their high school years. Many individuals reflect on acquiring a sense of connection to the community as a result of the classes' repeated forays outside the school walls. The connections include the natural world and the area's cultural history as well as present human society. They speak of feeling a sense of purpose created by the services they were able to provide while participating, as well as the sense that they were useful and valued members of the larger community around the school. The knowledge that their involvement was making a positive difference that could be directly observed is a common perception among the students. They learned that, even though they are "only high school students," their efforts are significant and recognized by others. Finally, many former students report that their experience in the Rachel Carson program led them to consider further educational opportunities and even career decisions that they hadn't seriously considered before.

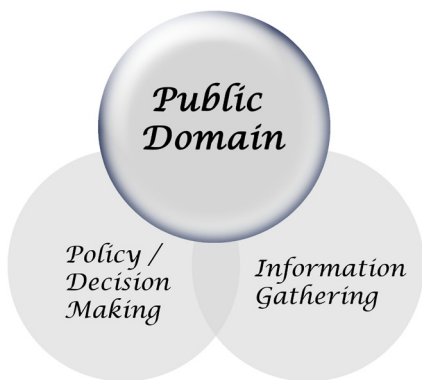
Within Rachel Carson the students have the opportunity to earn both high school and college credit. During the junior year, two credits in science (field studies and ecology/botany) and one credit in social studies (environmental studies) can be earned. Seniors participate in *Advanced Environmental Science* and semester-long *Technical Writing/Environmental Literature* courses for science and English credits. Students earning an A or B grade in *Advanced Environmental Science* also receive 12 college credits free of charge through the local community college's College Credit Now program.

The fulfillment and valuable experiences Rachel Carson teachers get from their work is worth noting. Facilitating the education of students who are motivated to learn and who choose to be involved in environmental education means a very compelling and constantly changing job that forges long-term relationships with students and their families. The fact that the same two teachers who created the program 12 years ago still work there now and that multiple siblings have participated in the program, are positive indicators that the program is successful. Our team-teaching arrangement allows for two teachers in the classroom at all times. This is a critical component and allows us to integrate multiple academic disciplines into our studies as well as sub-divide the class to accomplish separate activities when appropriate.

By far, the most memorable experiences created for students and teachers alike are the extended, overnight field trips that the majority of the Rachel Carson students participate in. These annual trips to the high desert region, California's redwoods and the canyon lands of Utah extend learning into areas not easily covered by a standard curriculum. Visiting new places and having new experiences helps students push their personal limits resulting in the forging of new relationships, creation of a sense of camaraderie and understanding of personal and group responsibilities. Our policy of insisting that students not wait around to be asked to help with camp duties or what we call, "flow to the work" reaps benefits throughout the school year.

Exploring the community

True community partnerships and meaningful projects do not happen by accident. Networking with local natural resource professionals, university professors, local businesses and non-profits helps create a list of potential partners. We are always open to considering some non-traditional partners such as nearby elementary schools, local granges or even day care or retirement centers. A concerted effort to research potential community partners begins before any students are involved. Consideration of the potential partners' mission, goals and values assures a relationship that will be mutually beneficial. Proximity to school, an adequate land base to work on and the organizational capacity to work with large numbers of teenagers are also priorities. Before a formal memorandum of understanding is reached, we advocate a "trial run," or "practice project" to assure both partners that the relationship will succeed. We avoid playing the "poor school" card, which usually leads to asking for handouts of money or equipment from partners without offering anything in return. Our most successful partnerships provide superb educational opportunities for the students and a tangible benefit such as data collection or restoration work to the partner.



Once a partnership is established, we work together to agree on parameters for the partnership. We clearly outline partner responsibilities, agree on a budget and discuss any deliverables (data, products, reports, student presentations, etc.) that are needed. We engage partners in a discussion of methods for monitoring student performance during project workdays and agreements are made regarding each partner's responsibilities. Most commonly, regular and ongoing evaluations are conducted throughout the year. A schedule for project workdays is established for the school year. Arrangements regarding delivery of educational components related to restoration projects are made and safety concerns are clearly identified. Finally, lines of communication

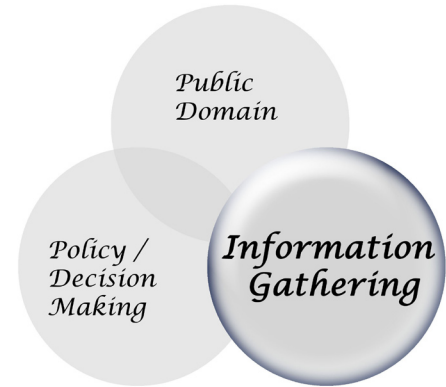
are established so that everyone involved knows how to get in touch with each other and who is responsible for what.

To help students prepare for experiences in the community, we created a series of activities designed to increase their awareness of local issues and an understanding of all aspects of the place we call home. Students study maps and learn how to interpret them during lessons on local geography and land use issues. Visits to local points of interest (natural, cultural, commercial, and governmental) are scheduled. Training in the use of web-based mapping programs, GPS units and compasses helps facilitate navigation around town and we even include some geocaching. Native plant seeds are collected, germinated and grown in our 30 x 60 foot greenhouse and then planted in various restoration areas. A transportation survey at busy intersections helps reveal traffic patterns and other issues related to urban transportation. Invitations for the community to visit us at school also help to increase our students' awareness of the local community. Regularly scheduled vegetable seedling and compost unit sales, used electronics collections and presentations to our *Master Recycler* class all involve local community members and provide additional enrichment for the students.

Conducting community-based projects

Getting students out

For the last 10 years the students and teachers at the Rachel Carson Center have worked closely with The Nature Conservancy at their Willow Creek Preserve, a 250-acre area less than a mile from campus. Our agreement allows us access to the property anytime to teach data collection techniques and explore the native flora and fauna. Twice a month we show up at a pre-arranged location with necessary tools and equipment (primarily hand tools including loppers, shovels, weed wrenches, etc.) for a 2-hour restoration project.



Transportation of students to the work site is an obvious and necessary element for a successful field studies experience. The school district provides each high school with two, 15-passenger activity busses, which are reserved on a first come, first-serve basis by qualified drivers. Alternative school bus transportation provided by the district can be used, but the cost of the bus and driver may be prohibitive. A strong emphasis on safety around the vehicles will help limit future problems.



Students work on stream restoration.
Photo by Tim Whitley.

To ensure that parents are fully aware of our activities, all students are required to submit signed field trip permission and liability release forms at the beginning of the school year. We have created permission forms designed to get formal parental permission for a multitude of trips all year long instead of getting permission each time we take students out.

Maintaining accurate records of field study sessions is an important and graded activity. Each student is given a waterproof field notebook for recording information on each trip taken. Students submit their field journal at the end of the session for grading.

Clear expectations for student behavior and rules for field studies projects are discussed in advance. Grading of students is based on participation and performance, and is explained and discussed. Typically all first-year Rachel Carson students spend one 85-minute class period plus their 35-minute lunch period outdoors each week. This two-hour block of time is adequate for restoration work sessions or other field study activities. In an effort to assure that each student is dry and comfortable during field study sessions, we provide



Students evaluate invertebrates in local stream.
Photo by Tim Whitley.

insulating layers, work gloves, full raingear, rubber boots and wool socks for all. We have learned that many high school-aged students assume that a t-shirt, shorts and flip-flops are appropriate and standard wear for any school activity. We try to show them otherwise as we have been known to collect data and work on restoration projects in all types of weather.

Content components and instructional approach

Over the years, we have refined the content and the teaching methods used in the field and in the community. We often use an experiential learning approach where students are allowed to investigate a topic or problem without excessive teacher direction. Cultivating the use of higher order thinking skills such as data analysis or the synthesis of gathered information helps prepare students for the real world challenges they will face in the future. Not to be neglected are the rigorous training and practice sessions necessary to operate the sophisticated equipment commonly used for data collection in the field. Multiple blocks of time during field studies sessions are devoted to assuring that high quality, reliable data are collected.

Since it is nearly impossible for the teachers to be experts in all the content areas we cover, local experts and professionals have become an important component of content delivery and field skills training. Through contracting or volunteering we make extensive use of natural resource professionals, university professors, non-profit organizations and members of the public with special expertise. Examples include city employees training our students on proper tree planting techniques, native plant walks guided by local botanists and forest field trips utilizing the expertise and equipment of government forestry workers.

An abundance of curricular materials is available covering many of the topics commonly found in a field studies class. We typically use commercial or government agency curriculums with a healthy dose of revisions to meet our specific needs. The training and materials provided by the Student Watershed Research Project (SWRP) are a primary component of our field studies curriculum. This program, created and run by a mixture of government agencies, educational institutions and non-profits is a perfect fit for our program. Following a one-week summer training for teachers, the SWRP program provides all the necessary background information, protocols, data sheets and even some equipment to conduct a professional-level watershed assessment. Our goal is to train the students to use equipment that is similar or identical to that used by professional natural resource workers. We have purchased and make heavy use of colorimeters, turbidity meters, multiple single-parameter water quality testing kits, flow meters, field guides, nets and trays for macroinvertebrate sampling and measuring devices of all sorts. The students are trained to collect and analyze the following data sets: basic water quality parameters (dissolved oxygen, pH, turbidity, conductivity, temperature, nitrate and phosphate levels), microbiology survey (fecal and total coliform counts), macroinvertebrate survey (including a calculation of stream quality using pollution tolerance levels of the organisms caught), vegetation inventory and habitat assessment. Other often-used curriculum resources include materials produced by *Project Learning Tree*, *Stream Scene*, *Oregon Atlas* and *Salmon Watch*.

Challenges

Funding for the Rachel Carson Center activities comes from a mixture of sources. The school district provides funds that cover many of the standard classroom expenses (\$1500/year). In addition, the district pays for fuel and maintenance of the activity busses. Money from the city of Eugene (\$750), raised through stormwater fees is awarded to programs such as ours that teach about water use and issues in our city. These funds are generally unrestricted and often are used to purchase equipment. As a licensed Professional Technical Educator, I am able to access federal funds through the Perkins program. This money is often several times larger than our school district budget and can be used to purchase classroom supplies, equipment and various other program needs. Several special projects come with their own dedicated budgets including a \$10,000 BLM cost share award to publish a field guide and curriculum for a local natural area and an \$8,000 grant from the local utility to build an electric car. Finally, an occasional grant award as well as unsolicited donations from parents or former students, maintain our program adequately.

Partners and projects

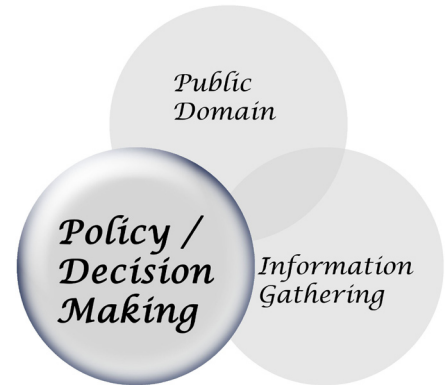
As the Rachel Carson program progresses through its 12th year we can look back on an impressive list of completed projects. A top ten list with brief descriptions follows:

- Native Plant Salvage: An activity where Rachel Carson students dig up and transplant valuable native plants from construction sites.
- White Oak Survey: A collaboration with the Oregon Forestry Department on a long-term study of acorn production.
- Redtail Marsh: Partnership with Lane County to perform work on a wetlands mitigation project. Including installation of wetlands plants, manipulation of topography to improve hydrology and monitoring of water flow and vegetation over several years.
- How To Water Your Lawn: A video produced for the Eugene Water and Electric Board illustrating proper lawn watering techniques.
- Cafeteria Recycling: A pilot program to recycle disposable polystyrene plates and utensils accomplished with help from *Sodexo* (the school district food services provider) and *The Recycling Professionals*. This project was eventually replicated at all secondary school buildings in the district.
- Shelton McMurphy Historic House: A project to restore the outdoor landscape at this historic house to that which existed there in the early 1900s. Involved research, design, propagation and installation of plant materials at the house. Collaboration with the Eugene Garden Club.
- Water Audit Project: Training and equipping of Rachel Carson students by Lane Community College students and staff to audit and retrofit sinks, showers and toilets for water conservation.
- Composting Projects: Internship students working with the City of Eugene's compost specialist to facilitate the collection of used coffee grounds and waste plant material from floral shops for composting through the city's yard debris collection service.
- Internships, job shadows and worksite interviews completed by seniors in our program at many locations including, but not limited to, Oregon Department of Fish and Wildlife, U.S. Forest Service, Bureau of Land Management, local landscape architecture firms, area non-profits [Cascade Raptor Center, Mt. Pisgah Arboretum, Food for Lane County, Willamette Resources and Educational Network (WREN), Sierra Club], City of Eugene, nearby elementary and middle schools, and Lane County Public Works.

Products

Students in the Rachel Carson program produce a variety of products over the course of the 2-year program. All products are submitted to teachers and peers for evaluation with certain products requiring submission and assessment by others as noted below. Student learning is generally assessed using scoring rubrics specifically created to assess each project type. A brief summary of some of these products follows:

- First-year students all work together on teams to create a final watershed assessment report and presentation using all of the data collection and analysis techniques taught and practiced during the field studies sessions. Reports and presentations are delivered to the class and teachers near the end of the year.
- Second-year students in the *Internship and Career Seminar* class research, write, edit and publish a *Field Guide to McGowan Creek* (local BLM managed Research and Educational Natural Area with old growth characteristics). A curriculum guide and toolbox of equipment accompany the field guide. This ongoing project is assessed by BLM employees and will be used to help guide field trip excursions to the site by other high school classes.
- Second-year students also have the opportunity to participate in the construction of a single-passenger fully electric car from a kit called a *BugE*. Experiments on efficiency and performance are conducted on the assembled vehicle. This product is perfectly designed for an authentic assessment, as it will only function properly if all parts of the vehicle have been assembled correctly. In addition, the students are responsible for organizing a culminating event during which the vehicle will be auctioned off to the highest bidder. Funds raised through the sale of the vehicle are used to purchase a new kit for the following year's class.



Case study

Hyundai wetland mitigation

In the spring of 2001, I received a phone call from the public relations manager at the Hyundai Semiconductor plant near the school. He was wondering if I would be interested in exploring some possible student projects involving issues they were having in their wetland mitigation area. He thought it would be a good opportunity to have students become involved in helping Hyundai environmental engineers solve some fairly difficult problems they were having. After meeting with them I could easily see the educational value of the opportunity they presented. The goal of the collaboration was for teams of students to submit formal proposals detailing solutions to the problems they studied. This would be done in a formal setting at the factory with school and industry representatives assessing the quality of the proposals. What followed became a strong partnership and an extremely valuable experience for a large number of students in the Rachel Carson program.

Through the spring, I worked with a couple of Hyundai employees on a framework for the student projects. It was decided that the students would be treated as if they were consultants brought in by the business to solve real problems. To prepare them for the job, they would be brought to the factory to receive the same safety training that all new employees were given. Students would take a comprehensive test at the end of the training and would be issued photo identification badges allowing them to access

the property. Teams of students would each choose one of the projects to work on and would be assigned a Hyundai environmental engineer as an advisor and mentor. A series of class periods during the school year would be devoted to work on the projects. Periodic written and verbal reports on their progress would be submitted to the Hyundai engineers.

At the beginning of the next school year, the process began with a visit to the classroom by the Hyundai mentors and a presentation of the proposed projects. The final list of projects

presented for consideration included: a study of nutria populations with a focus on the humane removal of the species from the stormwater pond area; a lichen survey to investigate levels of air pollutants emitted from the factory; an assessment of habitat in an area surrounding a fence that was slated for removal; a study on how to help an endangered turtle species safely cross a busy street that runs through the property; a vegetation inventory focusing on invasive plants; and a water quality study with proposals for improvement of the water quality in the outfall of the ponds. Students were then scheduled for safety training and site visits to examine the project areas and become familiar with the wetlands area.

During project workdays students were on-site collecting data, documenting their work, meeting with mentors and conducting research and laboratory analysis. Follow-up sessions were held in the classroom to review research and lab techniques as well as technical writing and communication skills. After spending twelve to fourteen class periods spread throughout the school year working on the projects, the teams of students were ready to present their proposals. Projects were evaluated using scoring guides jointly developed by teachers and Hyundai employees. Feedback from students and Hyundai employees regarding the project was very positive and work at the site continued for several years. Eventually, the facility changed ownership and the new owners chose not to continue the partnership.



Students evaluate invertebrates in wetlands at Hyundai plant.
Photo by Tim Whitley

Sustainability of program

For the Rachel Carson program to exist, at least 60 new students must be recruited each year. To assure the sustainability of the program, every attempt is made to provide information to sophomores as they begin selecting classes for their junior year. Recruitment begins each year with an introductory presentation to all sophomore classes before actual registration. Rachel Carson teachers and current seniors in the program deliver a 5-minute *PowerPoint* presentation with time allowed for questions. In addition, teachers and current Rachel Carson students staff information tables at the school's curriculum night and during visitation by eighth grade students and their parents. A website, promotional video and brochure have been developed to help disseminate information about the program. On occasion, personal letters inviting sophomores to enroll are sent to students who other teachers think would benefit from the experience. Information about the program is made available to students at all area high schools through the counseling departments and transfers are not uncommon.

Once a student is enrolled in the program, we work hard to establish a sense of community and a place for the students to have a home base. A bank of computers, a reference library, couches, a microwave and refrigerator are all provided for students to use anytime during the school day. Students enrolled in the program can expect personalized attention when they struggle academically and tutorial or study sessions are scheduled as needed. Communication between teachers and parents highlighting kudos as well as opportunities for improvement occur regularly. Current grades in all Rachel Carson classes are posted in the classroom and on-line, so both students and parents are aware if there are problems. Recommendation letters for college applications, help securing summer work and referrals to a variety of post high-school educational opportunities (Northwest Youth Corp, Youth Conservation Corps, etc.) are all services offered to our students. Community members with careers related to natural resources are invited to present information about what they do and what education, skills and knowledge are necessary to work in these fields. Our goal is to assure that all of our students are successful in the program and leave having some ideas about what next steps are necessary as they plan for the future.

Summary

Note that after twelve years of conducting field study activities with students out in the community, our program has continually evolved and changed. We never feel like we have reached the place where we have the perfect program. A brief summary of some key lessons learned follows:

1. Always keep a clear focus on safety. Driving to the project site is probably the most dangerous thing you will do. Avoid letting students drive themselves or each other and shy away from the use of power tools.
2. Let the students have a voice in selecting projects whenever possible. The power of choice is often underestimated.
3. Cultivate true partnerships with community organizations where benefits are realized by both the school and the outside partner.

4. It's amazing how much more effort you can get out of a group of students if you provide some food. Feed them good wholesome food and watch the results. Of course, feeding them after the work is done often provides incentive to do a good job.
5. Don't cancel outdoor sessions because of inclement weather. We provide full raingear, insulating layers, wool socks and rubber boots for all students.
6. Begin a partnership with small projects. It's easy to back away from a partnership that isn't working if you arrange a pilot project first. Testing the waters allows both partners to gauge the partnership's value before a major commitment is made.
7. Tackle the transportation issue early on. Be creative when searching for transportation options. If your district doesn't have vehicles available for you to use, look for ways to secure funding for a school bus or rental service. Consider getting certified to drive school district vehicles yourself.
8. Funding is often an issue. Don't let it become a "show stopper." Investigate grant opportunities, parent-teacher organizations and other community resources. I became certified as a Professional Technical Educator (PTE) and got access to funds through the federal Perkin's program.
9. Use community resources to provide your students with experts in subjects that you might not be knowledgeable in. I stopped trying to learn everything I wanted my students to know about and found others who were more than willing to share their expertise.
10. Bring back your graduates! Students who have successfully completed your program and gone on to do other things are a great resource. Try to find ways to use them to engage your current students in thinking about their futures. Students will often listen more closely to others near their age than an unfamiliar adult presenter.

SCHOOL OF NATURAL RESOURCES

By William Lemos and Robert Jamgochian

Background

Mendocino High School is a small rural high school located in Mendocino, on California's northern coast. Situated on a headlands overlooking the Pacific Ocean, the school is a nationally recognized Distinguished School with a population of approximately 200 students. The School of Natural Resources (SONAR) began as a combination *English* and *Marine Biology* course funded through a California Department of Education Specialized Secondary School grant. Its content is based on the philosophy that students learn best when engaged in real-world situations and projects that benefit the local community.

Introduction

The SONAR program provides opportunities for students to interact with their community and study global issues through meaningful interactive natural resource projects. This process establishes long-term partnerships between natural resource agencies and the school, and helps develop the students' knowledge, understanding, and appreciation for the environment, community, and natural surroundings of Mendocino County. For example, in one collaborative project SONAR students developed a network of river sampling stations in conjunction with participating government agencies, gathering information about water quality, riparian vegetation and wildlife, the status of aquatic organisms, the sedimentation and erosion factors in selected watersheds, and the effects of human uses and impacts on rivers and hillsides. Students then communicated their findings to their peers, natural resource agencies, policy makers, and the local and broader community through student-produced articles in the newspaper.

SONAR provides a unique opportunity for students to carry out scientific research projects with state agencies such as the California Department of Fish and Game and California Parks and Recreation. Local conservation organizations such as the Jughandle Farm Nature Center and the Mendocino Land Trust also provide opportunities for SONAR students to study resource management from a community perspective. Thus, students view first-hand the conditions in which specialists work. In this way students learn the practicality of doing detailed and systematic research and reporting their results using a variety of techniques. The issues studied relate to both local and global environmental conditions. Career and vocational opportunities are explored as students interact with federal, state, county, and local agencies. Advanced level course work—a part of the AP Environmental Science coursework option—is accomplished as students delve deeply into the interconnections of humans and nature. These inquiries are a natural stepping stone to college-level courses, or advancement to employment in selected fields of training as biologists, forest managers, photographers, writers, naturalists, or guides. The entire context of this unique learning opportunity is that each individual is free to use his or her own learning modality to reach SONAR goals. Students are then free to go beyond the program through an approach that centers on the student's artistic, linguistic, and/or scientific mode of self-expression. This allows students to approach career choices with an expanded perspective on how his or her selected field of study is structured.

Mischa Hedges is a SONAR student who achieved success beyond the program. In his senior year at Mendocino High, in 2001, his video-cinematography helped create public awareness for the purchase

of the Big River Estuary, near Mendocino, California. Since that time, Mischa has created several environmental films, including the award winning film, *Sustainable Table—What’s on Your Plate*.

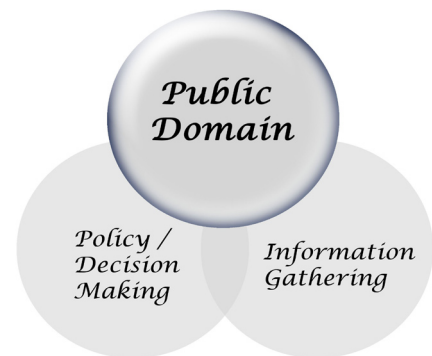
For the instructors who teach the program, this projected-based curriculum allows for great flexibility to teach within the context of relevancy. The instructors are free to use their areas of specialty and interest to spark discussions and research projects that relate to a broader understanding of resource management and stewardship issues. Community-based, project-driven curricula allow instructors to interact within the broader reach of the bio-region, providing a good sense of collaboration that serves as a modeling tool for students. Guest speakers and local organizations contribute to a fuller appreciation of the interconnectivity of people to their environmental setting. Furthermore, teachers participate in a variety of training sessions, conferences, and workshops in natural resource management and community conservation. On-going field training occurs through summer work and field studies with local organizations such as the Audubon Society, local land trusts, and timber companies. Site visitations of programs that study marine biology, ecology, and forest management in conjunction with communication arts are on-going. Training on presentation technologies, digital cameras, computers, and video are given throughout the year.

Exploring the community

In 1999, SONAR instructors received a grant from the California State Department of Education, Specialized Secondary Program, to establish an integrated program of environmental science and eco-literature at Mendocino High. Even before receiving this grant support from the state, both teachers had contacts with many organizations in the greater Mendocino community. For example, Jamgochian’s marine science program had created a brochure to educate the public on the fragility of marine tidepools. Lemos had been working for years as the group leader for students to explore wilderness settings. Together they had network connections to many conservation groups, timber industry representatives, and public agencies.

Once the community learned through exposure in local media that SONAR existed (2000) and had students who could help with projects, the requests for support came flooding in. We developed a partnership list that included groups, agencies, and organizations.

Typically, partners have on-going projects that they want help with, such as yearly fish counts for the State Fish and Game or monitoring a fairy shrimp vernal pool for State Parks and Recreation. These events lead to 1.) Classroom explorations of scientific method, history of species under study, and documentation theory; 2.) Actual field study and data collection; and 3.) Reporting to agencies. Other groups, such as the Jughandle Farm and Nature Center need help replanting conifer seedlings. SONAR students can provide these types of practical and positive resource enhancement. Additionally, they learn to work as a group, and document the results in a scientific format.

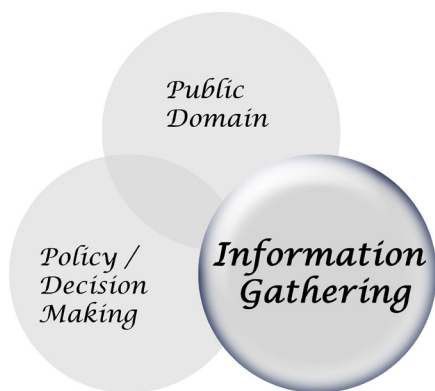


Projects are usually unsolicited due to the fact that so many partnerships have been created over the years. Initially, we contacted the resource agencies for information about what they wanted us to do to help them with projects, and over the years some of these projects became yearly commitments, such as salmonid surveys. Others, such as the conifer seedling out-planting, were dropped because SONAR did not have the capacity to accomplish every community need. Typically, natural resource agencies contact us at the beginning of the school year and we assess our curriculum and capacity to help. We then make a checklist of those projects that we believe we can accomplish in a given school year.

Conducting community-based projects

Getting students out

One of the greatest obstacles to any project-based field study program is having enough time to effectively go into the field and complete studies on a regular basis. This problem was solved within the SONAR program by creating a class that is team taught for two back-to-back 90-minute periods. Typically, this three-hour period allows us more than enough time to travel to the field site, do our studies and return back to school before the next class begins. Classes meet three times a week. Students are graded on their participation on a daily basis. Any lack of concentration during field studies (or in the classroom) affects students' grades. We assume that students are in our class to learn about natural systems and we expect that they respect the behavioral guidelines of mutual respect between humans that the instructors model in and out of the classroom.



A big obstacle in the entire configuration of getting students to projects is transportation. Initial grant funding through the California State Department of Education Specialized Secondary Program (SSP) allowed SONAR to purchase two nine-passenger vans for transporting our students. Having our “own” vans allows us the autonomy to travel to our study sites whenever deemed necessary. The location of a field project, and what we are doing, determines how often we leave campus to perform our field studies. Sometimes it is conceivable that we travel to our sites for an entire week or more if, for instance, the salmon are spawning and we need to be on the stream to gather data for our surveys.

In addition to vans, SONAR purchased two 14' Klamath aluminum skiffs. These boats are used on a regular basis to travel up the estuary to several of our study sites to conduct wood duck, plant, and crab surveys, and to do water sampling.

To eliminate paper work and time wasted in administrative duties, rather than have students fill out field trip permission slips before every field study, they complete a yearlong permission slip—with parental signatures—that enables students to participate in our field studies. Additionally, our district requires students and parents to complete and sign a Hold Harmless agreement that is valid for the entire school year.

Recent funding for the SONAR program has been continued through the Community Foundation of Mendocino County, a local non-profit that provides grant support for projects that protect and advance the unique sense of place and natural environment found in Mendocino County. It is our hope that this funding will continue into the future.

Content components and instructional approach

SONAR supports the Mendocino High School Site Plan because it encourages students to expand and explore at a deeper level the intent of our Expected School-Wide Learning Results (ESLRs): 1.) Apply Skills and Knowledge; 2.) Demonstrate Quality Work; 3) Demonstrate Effective Communication; and 4) Demonstrate Responsible Citizenship. We are currently working in compliance with state curricula standards in environmental science and English, the two areas that are integrated under this program. The intention is to maximize the potential for student work to demonstrate preparation for further study, or for entering the workforce via apprenticeship in the study of natural resource management. The current coursework foundation consists of course offerings that include components of the following subjects: marine biology, environmental science, creative writing, photography, drawing, computer, audio and video technologies, and world literature. Additionally, local and natural history units are part of courses offered at Mendocino High School.



Students conduct intertidal transect study.
Photo by Robert Jamgochian.

The curriculum hinges on the text material to act as the foundation for field study. In the AP Environmental Science section, the *Miller Living in the Environment, 12th Edition* is used, along with the *California Salmonid Stream Habitat Restoration Manual, Third Edition, Volume II*. These sources work to solidify the humanities components within the four major works read in the English section: Rachael Carson’s *Silent Spring*, John Muir’s *My First Summer in the Sierra*, Annie Dillard’s *Pilgrim at Tinker Creek*, and Daniel Quinn’s *Ishmael*. Besides these basic texts, we also include journals, field notebooks, and a variety of other collecting equipment in an effort to prepare students for advanced work in the field and in computer and library research techniques.

Student assessment follows both traditional and non-traditional methods in that specific skills tests are an on-going part of the instruction. Written work is also evaluated and critiqued for grammatical, syntactical, and continuity inconsistencies. Within the science component, regular weekly quizzes help focus student learning on curriculum modules. This traditional assessment is folded into the assessments for the project-based work students create for partners. In the non-traditional sense of evaluation, much of the curriculum involves fieldwork and collaborative peer review; students and instructors place a daily value (positive or negative) for productivity in the field. These participation marks, along with test scores and essay grades, are factored into the student's collective assessment eight times a year, at approximately four-week intervals. Thus, students, parents, and instructors know what progress is being made throughout the year.

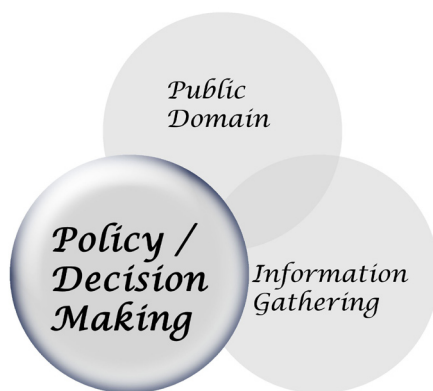
Partners and projects

The following are some of the partners and the projects that we did for them:

- California Parks and Recreation: Large woody debris data collection; Fairy shrimp survey
- Hawthorne/Campbell Timber Group: Salmonid study
- Mendocino Land Trust: Video production
- Jughandle Farm and Nature Center: Tree planting
- Mendocino County Fish and Game Commission: Coho salmon spawning survey
- The Trust for Wildland Communities: Stream restoration
- Save the Redwoods League: Stream survey
- California Department of Forestry: Habitat typing
- Mendocino Waterfowl Association: Wood duck box installation and monitoring

Products

Students produce a variety of products, including homework papers, essays, tests, film reviews, field study notebook/journals, and scientific reports for agencies.



One example is a student project which shows the results of a detailed research field project that was organized and developed by students. As such, it is a reminder that quality work can be created when students understand the specific need of any project. The need was defined by the community's wish to purchase a large tract of a watershed. Since there was limited data available on the specific fish species of concern (Coho salmon and steelhead) that might be present in the estuary, the students undertook a systematic approach to uncovering the facts regarding the presence of these listed species in the study area. Once this report was completed, the Department of Fish and Game was able to readily assess the presence of Coho and steelhead in the estuary

and eventually provide support funding for purchase of the habitat. The full report can be accessed at: www.whatkidscando.org/archives/images/studentwork/cohostudy.pdf.

SONAR students' work is viewed first by instructors and peers in the classroom. Then, once it is appropriately formatted and accurate, it is shared with agencies beyond the school setting. In one case, SONAR students created response to a *YouTube* video by Woodside Priory School Global Issues class (see: www.youtube.com/watch?v=JYsXbpY4vBM). This entailed watching Annie Leonard's, "Story of Stuff," doing the research on what "Chapter 8" of her film might contain, scripting the video and discussing its content, filming and editing the footage, and finally, posting the final video on *YouTube*: www.youtube.com/watch?v=6pqbCHuqLCs.

Case study

Big River estuary

The following is an example of a student-created project that affected the outcome of a major decision to protect the natural diversity of the Big River estuary.

In 2001, the community created a fund-raising campaign to purchase over 7300 acres of wetlands on Big River, just south of the town of Mendocino. SONAR students participated in



SONAR students participate in the Buy Big River rally.
Photo by William Lemos.

this effort by scripting, filming, editing, and distributing a ten-minute video overview of what the river estuary means to the people of the area. In conjunction with a professionally produced video, the SONAR student-directed and produced video to save Big River, helped raise over \$26,000,000 in less than two years. The results of this unprecedented community effort can be accessed at: www.mendocinolandtrust.org/index.php?Big_River>About_Big_River.

This example shows how a community need helps drive a student project. There was a need to have work done to protect the Big River estuary. The SONAR team had the time, experience, and equipment to gather the data. This dovetailed perfectly into the environmental texts and reading materials we were using to show how human-caused impacts affect local resources. We used the grant money we received from the State to purchase vans to transport students, filed "year-long" transportation releases and "Hold Harmless" contracts for each student at the beginning of the year, and entered into either verbal or written contracts with agencies for access and permission to enter properties to do research. Once the data had been collected, we used a variety of model research paper guides to help students accurately and professionally create and then share the results of their study with the public, agencies, and the organizations for which we were working.

Sustainability of program

Ongoing outreach to the community is an essential part of the program's sustainability. Videos such as the class project that can be seen on the *YouTube* video noted above, and brochures that explain the course sequence and requirements, are available to parents and students. A web site on the Mendocino High School student council page is available for more information about SONAR (see: www.mendocinohighschool.blogspot.com/2009/01/sonar.html). A new SONAR website is currently under construction.

SONAR continues to have ongoing discussions regarding the future of the program with school administrators and local grant agencies and organizations. The name "SONAR" has become synonymous with community-based projects, and we believe that the name recognition and the work we have accomplished will help ensure the success of this idea long into the future.

Summary

There are many things to consider as you enter the community and take on a variety of projects. The following are things that we think are important to a successful experience for students and instructors:

1. Limit how many projects you take on at once
2. Inventory all equipment and supplies at beginning and end of each year
3. Establish memorandums of understandings with partners to minimize access problems
4. Get the transportation you need, or work out schedules with the transportation supervisor
5. Have all paperwork completed and with you for all field trips
6. Carry a first aid kit at all times
7. Create checklists for on-going field studies kits
8. Create checklists for borrowing or using equipment
9. Take CPR and wilderness survival first aid courses
10. Balance academics with fieldwork
11. Submit articles and public service announcements to local media
12. Talk to people about the program
13. Showcase student work to the public at open house events
14. Build in shared prep time for team taught courses
15. Integrate interdisciplinary approach with colleagues
16. Design a system of credit for participation in field study
17. Develop protocol and equipment lists for activities

NATURAL RESOURCES ACADEMY

By Larry Callister

Background

The Reynolds High School Natural Resources Academy (NRA) is located in Troutdale, Oregon. Located a few miles from the main high school, this branch campus is housed in a former U.S. Forest Service ranger station in the western end of the Columbia Gorge National Scenic Area. Reynolds is a large (2500+ students) comprehensive high school serving a densely populated urban/suburban district. The student population is highly diverse ethnically and racially, and has greater than 50% of the students eligible for free and reduced price lunches. Juniors and seniors from the high school elect to attend the Academy every other day for a full day of *Environmental Science*, *English*, and *Social Studies* classes.

Introduction

Above all else, community-based education is engaging for both students and teachers involved. The assembly-line approach to education we have been following for the last century clearly does not work well for many of our students. The system holds them tightly in schools where they may not want to be, where they see little relevance, and where they are sometimes taught by teachers who have difficulty reaching them. Community-based education can help both students and teachers break out of this cycle. The pride and sense of accomplishment students get from doing relevant and meaningful work cannot be measured on a standardized test. As a classroom teacher I know there is more to education than test scores. When I taught standard science curricula, I often heard that dreaded refrain, “What is the point of learning this?” That is a question I have virtually never heard in my decade at the NRA.

The Reynolds School District has the second highest poverty rate of any district in the state of Oregon. A federal study just two years ago labeled Reynolds High School as a “dropout factory.” “Minority” students are in the majority. There were 59 seniors at the start last year at the NRA. Twelve dropped out, and just one went on to a 4-year college. That might sound like a bad year, but had those students not been attending the Academy, the statistics would have been much worse. Time and again, year after year, we hear from our current and past students who say that without the NRA they would not have stayed in school.

Community-based education gives relevance to our daily work at the NRA, and the allure of our extended overnight field trips helps keep our students interested. Since students with any combination of failing grades, poor attendance, or undesirable behavior are not eligible to go on overnight field trips, this is a powerful motivation to do well in our classes.

One of the reasons I got into teaching is that I have always loved to share with others things that I love myself. I love the outdoors and the natural world around us. I began taking my students on field trips early in my career so they would experience things first-hand rather than just read it in a book or view it from a flickering movie projector. Most of my students come from urban, socioeconomic and ethnic backgrounds that generally do not spend much time outdoors. I have been blessed with a lifetime of outdoor experiences. In order to care about environmental science, students must appreciate the natural environment.

Many years ago, on one of our first multi-day field trips, we had put in a long day planting thousands of willow stakes and bare root alder trees along the Deschutes River. That night after dinner the students completed some reading for their English class, barely making it through before falling asleep. As lights out time neared, the packed cabin was amazingly quiet and I noticed a few bodies were missing. I became aware that four students had slipped out and I too snuck out quietly to look for them. I spotted the group down by the river and approached them to see what they might be up to. We talked a bit, they all expressed gratitude at being able to have this experience, and said they had wanted to get out of the cabin so they could come down and enjoy the river view. As we walked back to the cabin, one girl stopped and told us all to look back over the scene with her. She said, “I had no idea that such beauty existed in the world.” Weeks later she presented me with a painting she did of that scene. Since then it has hung on the wall in my office, and in the years since has frequently affirmed for me that the work involved in setting up and carrying out the field trips is well worth it. This was not an isolated incident. My English teacher cohorts have regularly over the years shared with me samples of student poetry, essays, and other work telling of the natural beauty they have experienced on our extended field trips.

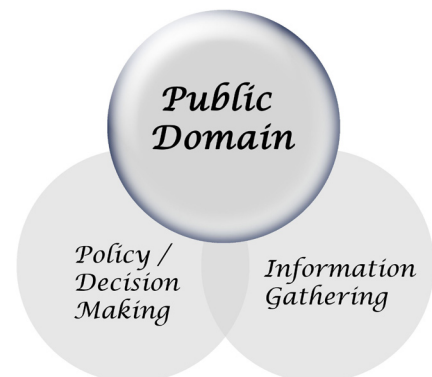
I often read reports about other programs and think, “Why can’t I do that?” Everything other teachers do sounds so great and well thought out. Their students accomplish amazing things. I, on the other hand, have way too many days where I am running around trying to throw together a last minute lesson plan. In addition, I constantly struggle to get many of my students to turn in even mediocre work. So, do not read this and think that you could never build such a program. It is possible, but know that there are plenty of ragged edges at the NRA.

Teaching is a tough job in most schools. A decade of budget cuts, increasing class sizes, and teaching to a more difficult student demographic have certainly made my job more challenging. If this sounds like your situation, these might seem like reasons not to even try to create such a program at your school. Actually, these are exactly the reasons you should. Book-based seat time learning in a closed classroom is not the path to success. Real-world learning will help your students far more. It will be good for you as well, because when students are engaged, your work will be much easier. Motivation and good teaching are still essential, but everyone in the classroom will benefit from real world experiences.

Exploring the community

Looking for ways to engage students has escalated from merely being part of my job to part of my lifestyle. I constantly think about and search for new curriculum possibilities. Throughout the events of the day, I often evaluate them in terms of program or field trip potential. To me this shows the power of engaging students in real world learning opportunities. Students, teachers, and community all benefit from the right kind of experiences.

Opportunities for particular projects come and go over the years. I once thought that I could establish a solid core of experiences



for my students, and then just repeat them year after year. But, the reality is that this is an impossible dream due to personal contacts, funding, administrative cooperation, business and agency personnel, and other factors, which fluctuate over the years. However, it really isn't difficult to come up with new opportunities.

Many agencies are not only willing to work with school groups, but they are often mandated to do some sort of community outreach and involvement. Once you have initial contact you will need to spell things out very specifically as to what you want from the partnership. If you can achieve your goals without causing any extra work for the agency their buy-in is ensured.

Community partnerships can provide your school with many opportunities and benefits. A few of these are:

- Projects: data gathering, restoration work, long term monitoring, and community outreach and education are just a few of the possibilities. Partners often have projects they would like to do themselves, but do not have the time, money and manpower to make it happen.
- Equipment: Partners will generally provide needed equipment, especially expensive tools that your school budget could not afford. In some cases, partners have donated to us earlier generation equipment they have not used since the last upgrade.
- Expertise: Environmental science is a big field, and students can greatly benefit from working with personnel who are experts. Also, it is great for your students to hear from someone else once in a while. Students are always impressed to hear from a "real" adult rather than their everyday teacher.
- Forums for student presentations: Few students are inspired at the thought of preparing for an oral presentation to their peers. But, if they are going to present information to someone out in the real world, they are much more motivated to do their best.

I use watershed studies to connect my students with the natural resources in their Northeast Portland metro area community. In most of our urban school district, there is little left of the natural world. For my students, the local world is a maze of new streets, expressways, light rail lines, older generations of suburban sprawl, strip malls, light industry and newer areas of high density housing, warehouses, and big box stores. City parks are few, natural areas nearly nonexistent, and most streams in the area were long ago entombed in pipes underground. But there are two little creeks, Beaver and Fairview, which flow for a few miles through our district that still have hidden natural areas around them. Children who have spent their whole life in the district often do not know these creeks exist, for the creeks are generally ditched or buried anywhere they might have been seen from a school bus window. We have a highly transient population, and few have lived in the local area long enough to even know about these creeks.

So, we tour, map, and visit these creeks frequently in the beginning of the year. We are involved in ongoing restoration projects on them. The students do a classroom assignment involving a large map of the state of Oregon, filling in its landforms such as rivers, lakes, mountains, cities, highways, and watersheds. Throughout their two years at the NRA, references are always made back to this mapping

project. Comparisons are made between the health and status of their local little creeks and other streams that we visit throughout the state and greater region. Virtually every major field trip involves using maps to locate where they are going or have been.

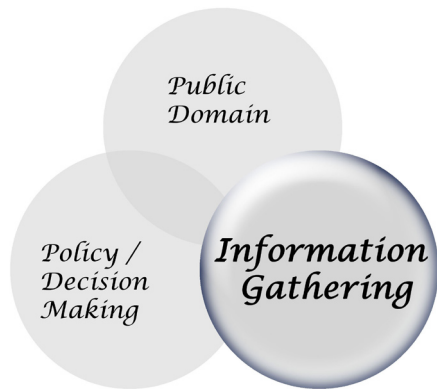
Conducting community-based programs

Getting students out

With 2800 students, Reynolds High School is one of the largest in the state. Like many high schools in our area, we operate on an “A/B” schedule with each day composed of four 90-minute class periods. Students attend one set of classes on the A day, and a different set on the B day. This works quite well for our situation at the NRA. Our students attend every other day, getting a double period (2.5 hours) and double credit of *Environmental Science*, as well as one period of *English* and one period of *Social Studies*. The NRA is attended only by juniors and seniors, but they do not attend on the same day. All juniors at Reynolds HS must take science, English, and social studies, so their day at the NRA fulfills most of their required class load. They can then take other required classes like math plus electives such as choir back at the main high school campus.

With the 2.5 hours of science class every-other-day, we have plenty of time to get out in the field for local projects, or plenty of time for extensive assignments in the classroom. When more time is needed, it is easy to arrange special schedules with the other teachers so that one group of science students can be out in the field for an entire day followed by days with extra time in English and social studies. Also

with the A/B schedule, we are able to load up the buses and take the entire NRA student body on an all-day field trip. This schedule gives us incredible flexibility and at the same time has absolutely no impact on the students’ schedules at the main campus on their non-NRA school days.



This schedule also works well for extended trips. Three- or five-day trips are always scheduled so the students will miss only one day of classes at the main campus for every two days they would have been at the NRA. This keeps the main campus teachers happy, and keeps the students from falling too far behind in their other classes.

Transportation is often an issue in getting students out. If possible, get your own bus. Small buses with a capacity of twenty or less are relatively inexpensive, easy for a teacher to be certified to drive, and easy to get around in. Such a little bus served us well for the first few years at the NRA. However, due to budget cuts, our class sizes grew and we needed bigger vehicles. Now we have two regular large yellow school buses capable of seating 50 students each. These are old but reliable buses from our district fleet, ones they kept in backup reserve. So, they cost the district nothing other than fuel and ongoing maintenance. Every teacher at the NRA has undergone the extensive training required by the state of Oregon to become certified to drive them.



Student examine streambed.
Photo by William Lemos.

Permission forms are another consideration when taking students off campus. At the beginning of the school year, each student and their parents fill out an extensive permission slip, which thoroughly details information, rules, and expectations for the class. It applies to all the trips we do for the entire year. Most organizations we worked with used to accept these permission slips as adequate for their legal coverage. However, over the years most organizations have come up with their own forms. Trying to get 150 students to take all of these forms home, ensuring that they are all signed, properly filled out, and returned in a timely manner is challenging. Some organizations require a separate new form for every trip. So, I finally reached the point where I chose not to work with most groups that would not accept our in-

district permission slip. The exceptions are several groups that we work with the entire year and who offer great learning opportunities for students.

Content components and instructional approach

Our environmental science curriculum is based on a study of ecology and learning about the local natural world. NRA students come from an urban environment. The vast majority of incoming juniors are uneducated about local native flora and fauna. Therefore, a big part of our curriculum is devoted to learning about nature so they know what they are seeing when we are out in the field. Focused major assignments on botany, birding, and watersheds are completed early in the year to establish a foundation of local knowledge.

At the NRA, students take English, science, and social studies. Ideally, everything we teach would be cross-curricular, thematically-based, hands-on, and fully integrated. In the real world of most schools however, there are many barriers. While we never achieved our ideal, we have managed to do some good thematic instruction on a regular basis. Students often could not tell what subject the project was for as it was a mixture of several.

One could easily fill entire bookshelves with all the three-ring binders full of curriculum materials produced by numerous organizations and public agencies over the past couple decades. Lack of materials is not a problem; finding the time to look through them all, picking and choosing what works for your program, and tying it all into a coherent package is the challenge. If you are just starting out,

it will take a few years to put it all together. Here are some materials that proved especially useful over the years.

- The Student Watershed Research Project (SWRP) currently based out of Portland State University. This program provides teacher training, equipment, and field support for student-based water quality testing. Late in the spring, SWRP puts on a large regional conference where students make presentations on their findings.
- The Oregon Department of Fish and Wildlife (ODFW) has a lot of curricular materials.
- Project WET, Project WILD, The Stream Scene, and Fish Eggs to Fry all have been very useful for providing background content information that can be taught in the classroom.
- Freshwater Trust (formerly Oregon Trout) and their outstanding “Salmon Watch” program provides materials, teacher training, and complete field trip support to help students learn about salmon.
- Both the Bureau of Land Management (BLM) and The Nature Conservancy (TNC) provide curricular materials about invasive species, and TNC will help coordinate field trips to give the students experience in invasive species removal.



Salmon carcass toss to enhance stream nutrients.
Photo by William Lemos.

Tools and equipment are another factor to consider in support of the curriculum that you are able to implement. Requirements will vary greatly depending on what projects your program is involved in. At the NRA, general categories include the following:

- Clothing – Cold, wet students cannot be expected to get a lot done. They are encouraged to bring their own work clothing and are given storage space to keep it. But everyone has access to classroom sets of umbrellas, gloves, full rain gear, overalls, rubber knee boots and waders. Adequate storage space with drying racks, heat, and ventilation fans must be provided for all gear.

- Invasive species removal, restoration work, trail maintenance – Common hand tools such as shovels, rakes, loppers, hand saws, picks, pulaskies, and more are needed. Very few of our students have experience with such tools, so we put in a lot of time training and give constant reminders on how to use tools properly.
- Water quality testing – Equipment is needed for testing parameters such as dissolved oxygen, turbidity, temperature, alkalinity, *E. coli*, nutrients, and more. Aquatic insects are useful indicators of water quality, and students are always fascinated to study them. To do so requires a collection of nets, tubs, trays, and identification guides.
- Miscellaneous – Maps, compasses, GPS units, binoculars, clinometers, clipboards, and tape measures all get used on a regular basis. With the proliferation of student cell phones, there is no longer a need to provide stop watches and calculators.

Challenges

As with any subject taught in our science department, Environmental Science is allotted money for buying supplies. From this, we mostly replace consumable items, and replace broken or lost equipment.

In the early years at the NRA, I wrote a number of grants that enabled us to purchase the majority of our equipment and clothing. It was fairly easy to find grant programs that would fund our efforts. However, writing grants and doing the required follow-up reporting and documentation is a time-consuming endeavor, and difficult to sustain. So, once we had enough equipment to get by, I have hoarded, saved, scrimped, and repaired to keep things going.

Transportation funds have always been provided by the school district. Our costs are low to begin with, especially when you consider that most of the cost is reimbursed from the state. Mileage and fuel costs have never been an impediment.

Another big item provided by our district is the cost of substitute teachers. In-class and all-day field trips are not an issue, as we can cover each others' classes through creative in-house scheduling. However, if two NRA teachers go on a multi-day trip at least one substitute is usually required, and the district must pick up the cost.

Funding for overnight and multi-day trips has never been a problem since we do them on an extremely low budget. We usually camp or stay in churches, grange halls, schools, and other organizations as they can often provide free or low cost indoor accommodations. Generally, we do our own cooking so the major expense for the trip for students is the cost of food. I always point out to students and parents alike that the kids would have had to have something to eat even if they didn't go on the trip, so it really isn't an extra expense for the family. There are sometimes additional expenses, but through scholarships, creative financing and even teacher support, there is always money available for students who cannot afford to pay their own way.

Partners and projects

There are a variety of community partners that are looking for ways to engage students in meaningful work. Some general categories are:

- Federal: The Bureau of Land Management, Forest Service, and the U.S. Fish and Wildlife Service all work with school groups.
- State: The Oregon Department of Fish and Wildlife and the State Parks and Recreation Department have been excellent partners.
- Local: Our school district includes portions of five municipal (Troutdale, Gresham, Wood Village, Fairview, and Portland) and one regional (Metro) government bodies. All have been willing partners over the years.
- Nonprofits: A great many such organizations are willing to cooperate with school groups, whether national groups such as The Nature Conservancy, statewide such as SOLV (Stop Oregon Litter and Vandalism), or the many local “Friends of Whatever” groups that exist in your area.
- Networking: Many of our field trips and some of our project work over the years have involved private landowners. These contacts came about by keeping an ear out for possibilities, following up on leads, and making cold calls to ones with potential. Many private landowners are leery of high school teenagers, but many are also thrilled to give the students a chance to see and hear about issues that are near and dear to the heart of that landowner.

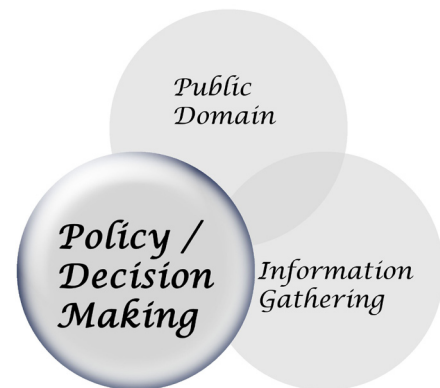
Over the years, there have been many partnerships and projects. Listed below are ones that we have done consistently year after year.

- Beaver Creek riparian restoration: In cooperation with SOLV and the City of Troutdale, we help to remove invasive species and replant sections of the stream.
- Deschutes River Restoration: In cooperation with the BLM, Oregon Trout, the Deschutes Club, and private land owners, we have planted thousands of trees and willows.
- Carcass toss: In cooperation with Oregon Department of Fish and Wildlife, we place salmon carcasses in nutrient-poor streams within the Sandy River watershed.
- Trail maintenance: In cooperation with the U.S. Forest Service, we maintain trails in the Columbia Gorge; with the City of Troutdale we maintain trails in the Beaver Creek Canyon Greenspaces area; and with The Nature Conservancy we have done trail work on their preserves.
- Invasive species removal: We have done this in a variety of locations in cooperation with private land owners, Oregon State Parks, the BLM, The Nature Conservancy, SOLV, and others.
- Dry Creek Restoration: In cooperation with private landowners and the Wasco County Soil and Water Conservation District, we have done extensive invasive species removal and plantings within this north central Oregon watershed.

Career and internship explorations are ongoing throughout our students' two years at the NRA. Nearly every outside person my students come in contact with gives a brief talk on their career. I ask these contacts to cover many aspects including what inspired them to pursue their chosen career, and what sort of training, experience, and education was required. From these people my students hear many things, but consistent topics that come up are the value of networking, the importance of volunteering or interning to get experience, and the value of getting even part-time or seasonal work in a chosen field to find out if it really is right for that individual.

Products

For the most part, students produce the same sort of products that they would in a regular classroom. As a culminating graduation requirement all seniors at Reynolds High School put together a "Senior Portfolio." They assemble and write reflections on a variety of work samples. Our students at the NRA find the work they do ready-made for their Senior Portfolio. Field trip reports and lab write-ups from hands-on projects are better material than standard school assignments.



During their senior year the students are required to do informational interviews with people in career fields they are interested in. Most of these are not natural resource related. Finally, every senior must complete the "90 Hour Project." Students set up, document in a report, and complete 90 hours of work outside the classroom. This is in lieu of 90 hours of in-class time from which they are released. The parameters are that they must be doing something that will benefit their future career or educational opportunities, the environment, the NRA, or some combination of all of these. Generally, they do a hands-on project of some kind, plus college or career research and visits, or internships and volunteer work. Many students over the years say this is the single most worthwhile assignment they completed in their entire high school career.

Every year, all juniors are involved in gathering water quality and aquatic insect population data on local Beaver Creek. They summarize, analyze, and write up the data. Some chose to work in small groups to develop poster board or *PowerPoint* presentations about our findings on the creek. These presentations are made at the annual spring Student Watershed Research Project conference. The audience is composed of students from other schools throughout the greater Portland Metro area, and of a panel of adults from a variety of natural resource backgrounds. The presenters are questioned, evaluated, and given written feedback on their efforts.

Case study

Charlie's Ranch

This case study will showcase the annual Charlie's Ranch field trip, which had its origins before the NRA existed. I was involved with a number of environmental organizations and worked on a variety of natural

resource issues on my own time. Thus, I already had a network of contacts in the field. I then started teaching *Environmental Science* as a stand alone science course, and established the “Ecology Club” as a way to take students on weekend field trips. Once the NRA was founded, I began looking for long term projects for my students. I especially wanted one that was located on the other side of the Cascade Mountains, in arid central Oregon, so my students could get an opportunity to experience an ecosystem different from their own on the wet side of western Oregon. Charlie’s Ranch became that place.

Through a contact at the Wasco County Soil and Water Conservation District we first went to Charlie’s on a long day trip to help an AmeriCorps crew plant willows along Dry Creek. Charlie manages a family-owned wheat ranch, which until recently also had cattle on it. In that first meeting with Charlie, it became clear that he had long term plans for restoration work on the ranch, that he had a good working relationship with local natural resource agencies and personnel, and that he was enthusiastic to have continued involvement with my students. So, we began a decade of trips to his ranch.



Students hear from a natural resource professional.
Photo by William Lemos.

Despite my ever diminishing hopes otherwise, no two field trips can be replicated exactly the same way. So, I will use a typical three-day, two-night trip to Charlie’s Ranch to demonstrate the general pattern. This is a powerful example of how much cross-curricular material, hands-on learning, and just plain fun can be had on an extended field trip.

Prior to the trip, students in each subject area study something related to the upcoming trip. In English they complete or are in the process of reading *Ricochet River*, a novel by local author Robin Cody set in a high school district near to ours. Mr. Cody visits the NRA each year to discuss his book with the students in English class. A coming-of-age story perfect for teenagers, it encompasses ties to the land as well as Native American, salmon, and natural resource issues. Many of the scenes and events from the book take place in the region around Charlie’s ranch. In social studies, the students study legal issues and laws relating to Native American fishing rights. In science class, they complete a unit on invasive species.

Day 1 – Thirty to thirty-five students arrive with all their luggage and camping gear for an early morning departure. The bus is loaded by veteran students and staff and we head east through the Columbia Gorge. An hour later we arrive in The Dalles, a town of 12,000 people where we tour the town to see a number of places set in the novel *Ricochet River*. It really helps bring the book to life and leads to a lot of discussion when they can compare their imagination to the real life setting. Many have never been this far east of Portland.

The next stop is across the river in Washington at Horsethief State Park. There we meet with a park ranger who tells the students about his career. He then serves as our interpretive guide in explaining the origin and significance of the Native American rock art, petroglyphs and pictographs on display there. The rock art was removed from its original setting when the Columbia River canyon was flooded after the completion of The Dalles dam. This flooding is an event that plays an important part in the novel the students read in English class. “She Who Watches,” perhaps the most famous piece of rock art in the Pacific Northwest, is situated nearby in its original site. She is not open for public viewing, but can be viewed by Native American tribal members and their guests. Every year we have had a least one student who is a tribal member, so they are the hero of the day when we are allowed access to view the rock art.

Next, we cross back into Oregon and roll on further east to view The Dalles dam and several more places set in the book including Celilo Falls. This most famous of all native fishing sites on the Columbia river was destroyed by flooding when the dam was constructed, and the mitigation for its loss still reverberates through salmon management issues. Students study these issues in their social studies class.

Finally, we climb up out of the Columbia Gorge and view some geologic formations that are evidence of the giant Missoula floods and volcanic eruptions that students studied while sophomores at the main high school, but never got to witness firsthand. Even though we do not officially study geology at the NRA, we frequently teach about it. Perhaps eight hours after leaving the NRA we reach Charlie’s Ranch where the accommodations are meager.

During the course of the day, students have taken notes on all they have seen and heard. After dinner we gather to discuss and review the lessons of the day. The students then have a little quiet time to write a reflective piece on some part of what they learned this day, a piece of writing that can later be taken back into the classroom for further discussion.

To cap off the day, we generally go for a night walk. The students can view the night sky without any city lights to dim the stars. For most, it is the first time they have seen the Milky Way or any of the constellations. The value of this experience will not likely be measured on any standardized test these students will ever take, nor can any administrator ever use it to justify a line item in a budget, but I feel it is still worthwhile.

Day 2 – In the morning, we meet with a natural resource professional to hear about their career and to

find out the work plan for the day. This often involves invasive species removal or native plantings. The rest of the morning is spent working and then in the afternoon we take a hike and observe the unique ecosystem. We also view the results of past planting projects.

Day 3 – Camp is broken, the bus loaded and we are on our way. Shortly we arrive in the town of Dufur (population 500) which provides us with an opportunity to get a glimpse of truly small town life. At some point a few years back one of my students mentioned that at our main campus we have five full-time security staff, plus two full-time police officers. The locals let on that their town did not have a single officer. Both groups were amazed at each other's news.

The next stop is Shears Falls on the Deschutes River. For millennia, this has been an important Native American fishing site, and there is rock art to be viewed on the cliffs nearby. It is a miniature of what Celilo Falls once looked like. From there, it is an hour drive to the U.S. Fish and Wildlife Service's Warm Springs Fish Hatchery. Along the way we stop a number of times to point out sites that appear in *Ricochet River*. Located in the heart of the Warm Springs Indian Reservation, the hatchery was built as mitigation to enhance salmon runs harmed by dams in other parts of the watershed. The manager and other employees talk of their careers, and the students hear a great deal about the vast amount of technology and data gathering that goes into managing the hatchery. As a special bonus some employees who are tribal members share personal stories as well as the historical importance of salmon to their tribe and their families. Finally, we make the two-hour drive back home. Students get to view the transition across the mountains from high desert to pine to subalpine to damp west-side forests.

The annual trip to Charlie's Ranch is just one of many multi-day trips we do each year. Below is a list and brief description of many other field trips we have done. Some are done annually, and some every other year. Most are three days, but some last as long as seven days. All involve hearing about careers from the natural resource personnel we meet and work with along the way.

- Yellowstone National Park: Fire ecology, wildlife management, wolf reintroduction, tourist industry
- Southern Oregon: Crater Lake alpine ecology, Klamath basin water issues, tour of Southern Oregon University
- Olympic Peninsula: Wildlife refuge management, natural park management, west-side private lands logging management, old growth forest hikes
- Central Oregon: Prineville region logging, range management, east-side forestry management, cattle ranching, invasive species invasions, fire ecology, wildlands fire fighting
- Central Oregon: Deschutes River riparian restoration, high desert botany
- Opal Creek: Old growth forest ecology
- Oregon Coast: Tsunami effects, disaster planning, tidepool investigations, salmon management
- Willamette Valley: Wildlife refuges, sustainable small-scale forestry products, tours of University of Oregon, Oregon State University, and Western Oregon University
- Mt Rainier: Lahar disaster planning, alpine ecology studies, *Wolfhaven* tour

Sustainability of program

At the time I was trying to establish a distinct natural resources program at the high school, a nearby U.S. Forest Service ranger station became available for free. All my district had to do was to move in and do a little maintenance. Since our high school was built for 900 students, and was then over 2000, the administration liked the idea of moving students off campus. So, off we went. Establishing a facility and a name can lead to sustainability of the program as staff move on.

This setting is a blessing in many ways. The beauty and isolation are great for setting the tone that this is a special place. Students bond with the place, their peers, and the staff in a way I would never have thought possible. However, the setting is also a curse. Attempts to improve things have waxed and waned. So, left on our own, we find ways to get by. Worst of all is that we are little known within our own high school. We are so far removed from the main campus that few faculty members and virtually no students have ever seen our campus. Our NRA students generally dislike the atmosphere of the overcrowded main campus and by their senior year rarely go there. Consequently, non-NRA students at the main campus generally know very little about our program.

Early on we made an effort at self-promotion. We brought the whole high school staff up for lunch during in-service days. We set up visits and tours for the school board and district administrators. We contacted the press and appeared in the local newspapers. All of this takes time and effort, which was unsustainable as running our program takes up more time than merely teaching in a standard classroom. Without any discernable payoff, we slowly let go of our efforts to keep in the public or district eye.

In order to recruit sophomores into our program as juniors, we send down teams of our students each year prior to forecasting. The science teachers at the high school kindly allow time for the presentations in their classrooms. Armed with a *PowerPoint* presentation heavy on pictures of field trips and full of tales of what they love about the NRA, our recruiters do a good job of spreading the word. We have kept our numbers up over the years despite recruitment of top students into other upper level classes.

While I conceived of the NRA and have been the only faculty member continuously present throughout, its decade of existence has not been a one man show. Our staff has usually been three or four teachers, and a total of eight different people have taught at the NRA. It is truly a team effort to keep such an enterprise going. Our lack of visibility in the community and our lack of self-promotion make the long term viability an ongoing concern. School boards, superintendents, district administrations, and building principals come and go at a blurring pace in our district. Sustainability is never assured as the NRA could disappear with the stroke of a budget pen, no matter what good we might think we are doing for the students. We have managed to get by with very little support. I have long joked that someday the NRA tombstone will read, "We never achieved greatness, but we did some pretty good stuff along the way."

Summary

There is no question in my mind that community-based education can be a powerful education tool. Unfortunately, it still exists outside the mainstream of the industrial education complex. As such, trying to establish such an alternative education model into a regular school district is challenging. I am afraid it will always be viewed as unorthodox, unproven, and dispensable even though it can produce better results than the industrial assembly-line model that schools have followed for the last century. Given this, it is worth the effort for dedicated educators to establish such learning opportunities, but there are some major “do’s” and “don’ts” that I would suggest.

Do:

1. Create your own space. Preferably located on the main school campus, but in a discrete building or wing separate from the main school population. There you can develop your own atmosphere without interference from the hubbub of the main student body. Your students will have ownership of space and an identity of their own. You can come and go as you please without disrupting others in your school. You will be visible, yet independent.
2. Get your own bus. To be able to hop in and go any time is so liberating and enables you to take advantage of so many opportunities that will come up, and it will prevent you from being locked into a schedule that may be less than ideal.
3. Work with an integrated curricular team. This is best for regular schools too, but is essential for community-based work.
4. Secure administrative support. An administration who considers themselves to be part of your team will make life much easier. Their support will let you focus on teaching.
5. Get a counselor assigned to your program. You will learn so much more about your students’ lives than you did as a regular classroom teacher. You are better able to know when they need help or guidance. Several teachers and a counselor all working with one student can make a real difference.

Don’t:

1. Completely separate your different age and classes of students. Your veteran students can serve as models and mentors for those new to the program, and will free you from explaining everything.
2. Let yourself be shut out of hiring and personnel decisions. Someone who doesn’t fit or doesn’t want to be in your program is at best an annoyance, at worst, a complete disaster.

I had a lot of reservations when it came time to actually leave the regular classroom and start up the Natural Resources Academy. But I talked to a number of teachers who had made just such a career move. They all said it wasn’t the easiest route, but that they would never go back to the regular classroom by choice. After a few years I knew what they meant, and now I have finished the final ten years of my thirty-year career at the NRA with no regrets about making the move.

STRAUB ENVIRONMENTAL LEARNING CENTER

By Jon Yoder

Background

North Salem is an urban school of 2000 students with over 70 percent of students on free and reduced lunch. The Straub Environmental Learning Center (SELC) is a facility built on school property that is a direct result of a community-based approach to education and the resulting partnerships and value seen by the community. The SELC is host to North Salem High School students who take *Field Biology* and an independent study *Community Applications* course there. These courses were taught simultaneously during a single class period of 85 minutes and a part of a school-wide Natural Resources Academy program.

Introduction

Community-based education has been defined and implemented differently in many classrooms throughout the country. However, one common thread is the notion that students should be connected to the community outside their classrooms in real and authentic ways. This methodology is also explicitly stated as a goal in the national teaching standards and can be found imbedded in most school district mission statements that refer to developing students into citizens. This support can be used to further justify the value of this approach.

For me, there are significant components and a process to community-based education that need to be present in order for it to provide students with the full experience of being immersed in and understanding the role of a student-citizen. I tried to follow this particular framework or process of instruction whenever possible. This work with students occurred in three domains: exploring the community, conducting the work of the community, and producing products for the community. The details of each of these will be described later as I discuss my work. Teachers and students find a variety of benefits and value in each of these domains and it is there I would like to begin.

As students are exposed to their community through explorations, mapping, surveys, needs and opportunity assessments and more, they begin to gain an awareness of their community and the agencies and organizations involved in supporting it. Unfortunately for many, this is the first time they have had the opportunity to actually get out in the community and gain an understanding of how a community looks and how one operates. If I am to call my program or instructional approach “community-based” it seems that the students should gain a clear understanding of what their community is and how it functions. This goal is at the center of my work with students, many of who have been disconnected from their communities, from adults who surround them, and even from each other. Community-based education can reconnect them, and to me, that is the great value of this work.

Once the community context has been identified and described and a project selected, the “school” work begins. The value for students is that they rarely ask, “Why do we need to know this?” since the work they do is directly related to the work of the community. In addition, often students will have a role in selecting their work or projects. For most, this is the first time they have control and ownership in constructing and determining their learning. The teacher’s role becomes one of a facilitator and also coordinator of the content and concepts connected to the projects that students need to know. Often a

community partner is involved as well. Student motivation and connection to their learning is high and they are deeply engaged in the work of the school-community.

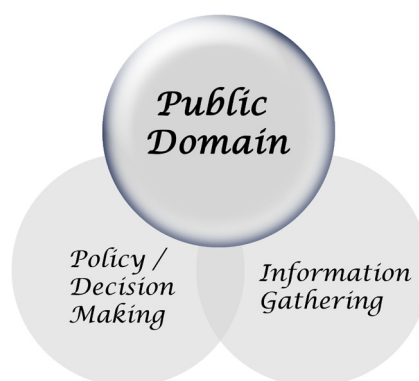
In the third domain, students produce products not only for the teacher but for the community partner who has requested they do work for them. Students are also required to do a second product either individually or as a class that involves educating the larger community. Since the work goes out to the community at large, the quality of the work needs to be of a higher standard. This raises the benchmark for students and they find that they are more capable and proficient than they previously thought. I have seen many students who have been unsuccessful in the regular classroom produce top quality work and take great pride in knowing what they can achieve. To see them come alive in the learning process is a great reward for both teacher and student.

Lastly, I see great value in community-based education through the development of community within the classroom. It is not just about connecting students to the community outside the classroom but also creating that sense of community inside the classroom. Students from a variety of academic and cultural backgrounds working together in this unique way, create a classroom culture and environment that is dynamic for both the teacher and students.

Exploring the community

If community-based education is to indeed be “community-based,” then what is done in the classroom needs to be based on what is out there in the community. For too long, schools and the communities have operated as separate entities. Schools should be viewed as an integral part and serve as a resource for the community. The question then becomes, how can schools and communities form these critical partnerships? It is the school’s responsibility to help students become aware of and engaged in the work of the community. The goal is to become a resource for the community.

There are a variety of activities that teachers can engage their students in to raise awareness, understanding and involvement in the work of the community. In my classes, we often start with the development of a natural resources directory. Students create and then divide up a list of all the agencies (state, county and city), nonprofits, businesses, and other groups that are connected to natural resource use and management. They find contact information, what the group does – its mission, what projects they have in the area, and if there are ways for students to be involved. We then begin to develop a clear understanding of the roles of the various community groups and how this plays out in the area of natural resource use and management. It also provides a list of possible projects and a directory for future reference on questions that develop from projects throughout the year. From this list of possible projects we often invite potential partners in who then present their request for work to the students. The students can then decide if and when we can do the work for them. We have even signed informal memorandums of understandings where we state what



we need and they state what their needs are in order to complete the work.

There are, of course, many other ways teachers can connect students to their communities. Early on in my work I would examine public documents from agencies, such as a county comprehensive plan, and find the citizen involvement component that was almost always there. I would call and tell them I had a class full of citizens waiting to be involved. The long pause at the other end was always amusing. Often the



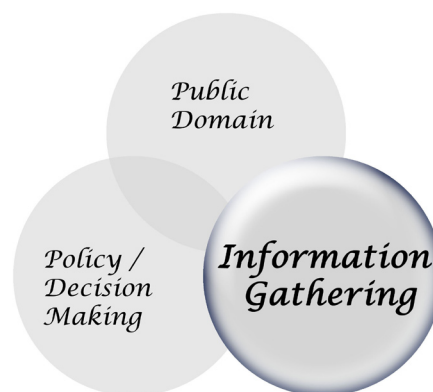
Students work on an interpretive trail.
Photo by Jon Yoder.

community is not very well equipped or prepared to partner with young citizens. As our students' work became more widely known, we began to have agencies and groups come to us and ask for our assistance. Community needs and opportunities assessment surveys are yet another way to solicit community project ideas and gain an understanding of what community is. There are more student activity ideas on connecting students to their communities and identifying possible projects of study in the NCSR Educator Guide: *Community as a Context for Learning*.

Conducting community-based projects

Getting students out

Once a project has been selected and students understand the purpose of the project, then the work begins. This also means that the teacher will need to organize a variety of instructional materials and activities related to the work. Over the years, I put together numerous notebooks and information folders with reading materials and activities on a variety of projects we undertook. Most projects we selected in later years were supported by previously collected curriculum materials. Many resource agencies have materials and the Internet can be a good source as well to add to project files. The content part of the instruction is important so students know it is not time to just go out and play. The content is based on the projects that are selected and what students need to know in order to complete their work.



There are many factors to consider when engaging students in this way. This is especially true as you take them out of the classroom. I would like to address some of those issues and how I handled them in my classroom. Not all will apply to your situations, but may provide you with some ideas to consider when doing community-based work.

Pre-site visit:

- Selecting a project (I referenced this in the previous section)
- Content and curriculum (I referenced this above)
- Planning work with a partner

This is a critical piece if you are to do this long term. It is necessary to develop positive relationships with community partners who feel that you and your students are capable of delivering work of high quality in a timely manner. This was central to any success we had in our program. You will want to discuss some of the following in your interaction with a partner, both in and out of the classroom:

- Define the purpose of partnership
 - Share the content to be covered
 - Exchange teacher and partner daily schedule and availability
 - Explain school rules with dress, language, etc. – partner is a role model
 - Describe how to access the school building – parking, reporting in, and finding the classroom (not between classes and students should escort guests to class).
 - Provide support and suggestions for any partner presentations to students.
 - Business and agency personnel are not always adept at classroom presentations or student interactions and may need guidance and suggestions.
 - Explain the background of the students –academic, cultural, etc.
 - Discuss student behavior - the teacher must supervise at all times
 - Visit study site with partner beforehand – where will you be meeting
 - List the equipment needs
 - Determine protocols to be used
 - Arrange any training necessary – do before going to the study site if possible
 - Research liability issues – are students covered as a class activity
 - Contingency plans – ideas for a plan B and phone information
- Transportation
 - Make sure you have made arrangements ahead of time for transporting students and you have notified the school office when you will be gone.
 - Paperwork
 - Complete all the necessary paperwork that is needed when taking students off campus. Medical forms and permission slips with emergency contacts are important to take along with you each time you are out of the classroom (I do one at the beginning of the year). In addition, schools sometime require paperwork each time you are gone or at least notification anytime you are not in your classroom.

- Rules and expectations
These need to be established immediately and referred to frequently. I often reviewed these before each class outing and even provided examples of what the expected behaviors look like. All students signed an agreement that allowed for dismissal from class if they violated these expectations. I dismissed only two students in over ten years of this program.
- Safety
Safety needs should be paramount in the teacher's mind at all times. Working with your community partner, you should try to anticipate tasks and duties that may need extra precautions and directions to ensure safety. I always had students working in groups, never alone. I circulated among the groups frequently. Take a first aid kit along with medical records and emergency contact numbers. In today's world, cell phones can provide an important link to help when needed.
- Publicity
Notify the newspaper as often as you can when going out. They are often looking for stories featuring students going good work. I built a close relationship with our paper and it has helped to publicize the program in the community. This is linked to funding that can follow this community recognition.
- Documentation
Teachers and students need digital cameras to document the work they do. Photos are used to document the projects they complete as well as show a study site over time when a number of classes work on the same project each year. Those baseline data are important to collect and store. Any documenting done can also be used in presentations that students give as part of their work.
- Equipment
Equipment must be cleaned, labeled and organized. I often assigned students to specific pieces of equipment they were responsible for. They were to make sure everything was ready to go. Students also need practice in the use of some equipment before they go out in the field. We used spectrophotometers, a Colilert machine (for fecal bacteria), GPS units, and other equipment that took special care and practice.
- Student roles/practice
Assign tasks and duties before heading out in the field. Make sure students all know their groups and roles so when they get to the site they are ready to go. Practicing helps.

On-site:

- Organizing work site
Visiting the site ahead of time with your community partner will help immeasurably. Also, go over procedures and tasks with students ahead of time.
- Monitoring behavior
Circulate frequently and give positive reinforcement pointing out good work. You are in charge of supervision and behavior; student management is not your community partner's responsibility.

- **Teachable moments**
Find opportunities to point out the community and content connections to students whenever possible. Students need to see their work in the context of the community and in the context of the content they are to learn. I sometimes verbally quizzed them to see at what level they understood.
- **Equipment check**
Before leaving the site double check that everyone has their assigned equipment and everyone is accounted for.

Post-site:

- **Check in equipment**
Once back at school make sure all equipment is cleaned and checked in. It makes it so much easier the next time out.
- **Reflection and feedback**
This is the time to review how things went, debrief about the information collected, field questions, make connections to community, make connections to content, and review next steps for either more field work or producing a product. These debriefing sessions help shape future outings and direct the next steps in the project. It is also important for your students to send a thank-you note to your community partner and for you to arrange feedback from your partner when the entire project is completed.

Content components and instructional approach

A common challenge in providing authentic educational experiences in the community is connecting this work to standards and content. However, this is often what teachers have been best prepared to do. It is a matter of deciding on what content and standards best fit the community experience, find appropriate curriculum materials, weave this throughout their work, and provide meaningful assessments along the way. There are numerous curricula materials out there produced by public agencies and other organizations that can be used to teach the concepts of the work being done. These are often tied to state or national standards as well. You should also consider a variety of materials that expand the learning into cultural, historical, and social features of your community work. A piece of this should be for students to know the community context of the work they are involved in. Other school disciplines can also be reinforced with journaling as a key feature for many of the projects my students were involved in. Assessment continues to be an important feature of the educational process and the products students develop and all the other traditional forms of assessment can be used to measure student learning. Once again, there needs to be some assessment component that reflects their understanding of the community context of their work.

Instructional approaches and strategies tend to take on creative and flexible features as this approach often requires a wide variety of instructional skills and practices. The classroom can be characterized by organized chaos at times and the instructor becomes a facilitator, guide, mentor, parent, and motivator. After an initial set of announcements and reminders, my students often worked independently on particular community projects and content assignments in the classroom, or traveled on their own

around campus to complete their work. I had a process and a system of accountability and expectations for this and would constantly monitor their work and their location. I rarely had any issues. They embraced this role of student as the determiner of the time and effort spent on their learning.

Challenges

I have tried to include a number of steps to consider when taking students out in the community to a study site with a community partner. This may serve as a checklist as you engage in this work. In addition there are some broad categories of need that programs sometimes face as barriers when doing community-based work. I consider many of these hurdles rather than barriers to getting students out in the community. I have included the hurdles most mentioned by teachers as preventing them from getting out. Be persistent, patient, and positive as you find ways to make community-based education happen. It is well worth it in the end for you, your students, your school, and your community.

- Transportation

This is often the number one issue preventing teachers from getting their students out of the classroom. There is no easy way to work around this, but there are some ways that my classes crossed this hurdle. Our high school has athletic mini-buses that are used to transport sports teams to games after school, but sit unused during the day. I got certified to drive and was then able to use them whenever I wanted during the school day. When there were too many students to fit in one vehicle, I would arrange another teacher on prep that period to drive as well. If there was another teacher who needed a driver during my prep, I helped them out in exchange for their help. I had an English teacher that enjoyed driving to study sites where they could enjoy the outdoors and do their school work while we were off doing our work. Don't allow transportation to be a barrier in getting students out. Be creative.

- Funding

Money was needed for equipment. I started the funding search by writing grants for the first five years. I was able to secure a variety of top-of-the-line equipment, but drew weary of the grant writing grind. So I found several other ways to secure funds. First, a partner asking students to do work can sometimes provide or even donate tools or needed equipment. I was able to get many of my field tools and gloves and other supplies in this way. Once we were viewed as a valuable asset for the community, this became even easier. One example is the state of the art gauging station built on our campus by our State Water Resources Department that feeds a variety of water quality data to a website every 15 minutes. The city of Salem now operates this and students use the data for studies asked of them. The fact that nearly one million dollars was spent by the school district, the city, and the community to build a LEED-certified Environmental Learning Center next to a creek on campus for community-based classes speaks to the funding potential when the school and community see value in this type of programming.

- Time

Your school schedule may be limiting, but again there are always ways that teachers find to get beyond these limitations. Our school is on a block schedule and has 85 minutes per class. I usually limit our selection of community work to a 20 minute distance. That gives us at least 40 minutes at the site to do our work. Finding partners with opportunities closer to your school may help with time issues. We did all of our work during the class period, but some teachers extend this to after-school hours.

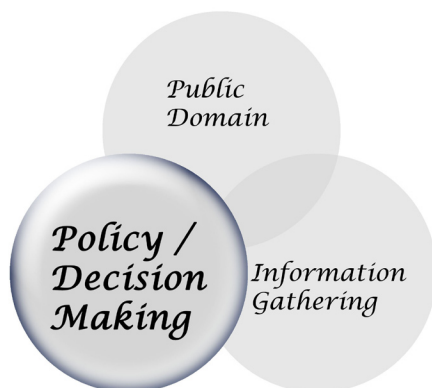
Partners and projects

It may be helpful to provide examples of community projects that were accomplished through the processes above. Just as important, the community partner we did the work for is listed with the project.

- City of Salem: Water quality monitoring
- Mill Creek Watershed Council: Stream channel profiling
- Oregon Department of Fish and Wildlife: Invasive crayfish study
- Audubon Society: Naturescaping project (design, implementation, monitoring)
- Willamette Mission State Park: Streamside buffer zone study
- Salem 4-H Center: Interpretive trail and platform construction with educational materials
- U.S. Fish and Wildlife: Wetlands assay
- Marion Soil and Water Conservation District: Invasive species study (Japanese Knotweed)
- Kettle Foods: Wetland mitigation monitoring
- Private land owner: Species survey connected to city annexation

Products

Once students have explored their community, have taken on a community project, and completed their investigation, it is time for them to produce products and be assessed. For my students, this would be two larger projects, classroom activities, readings and writings, and formal assessments.



Larger projects were dependent on what the community partner wanted from our work and could take a variety of forms. It could be a formal report with data that were collected, a presentation to the partner, interpretive materials, curriculum materials for others to use, or the completion of work projects related to invasive species, restoration work, naturescaping and more. These would be presented to our partner who asked us to work for them. A second type of larger project was an educational project, targeting some part of the larger community. This may take the form of working with an elementary school, creating brochures for the neighborhood, presentations to community groups, or signage for the public. These were most often done as

a class with students being responsible for various parts. This student product can raise the awareness of the community on particular resource issues and raise the capacity of the community to make more informed decisions.

There are other ways that students showcase their learning that follow a more traditional route. I expected students to read and write about topics we were engaged in, complete short activities related to the study, and take periodic exams (final exams were orally taken) testing their content knowledge, components of the project, and the community connections or context. My goal was to have students' possess a clear understanding of the learning targets and the expectations in the activities to get them there.

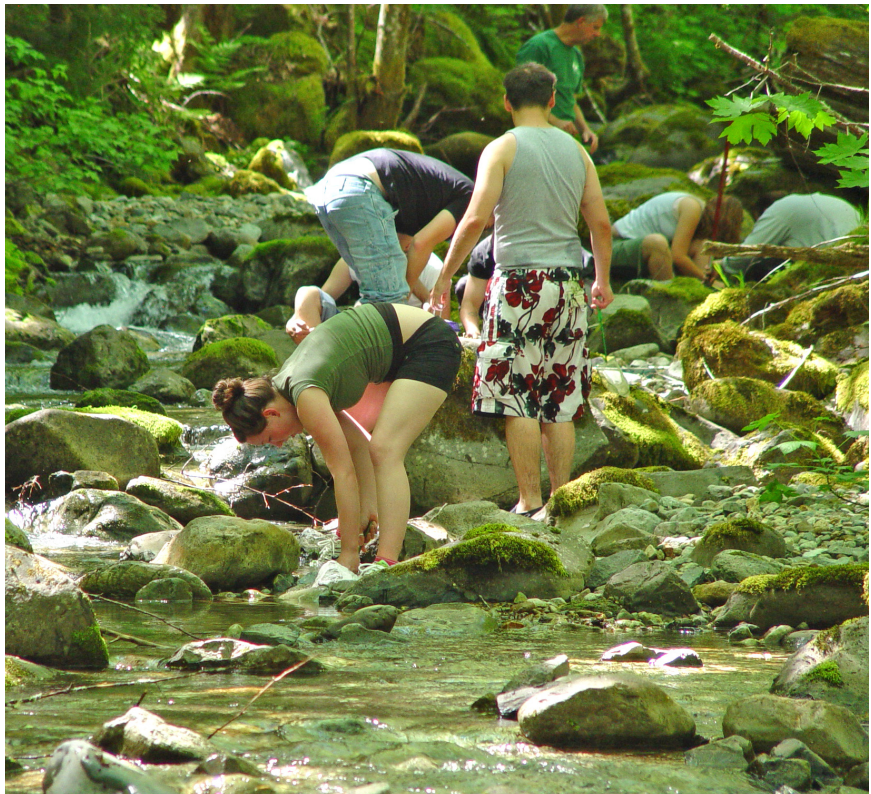
Case study

It may help to have an example that showcases this work to better explain how all of this fits together. A project on Mill Creek provides an idea of how community-based instruction can be applied to a real classroom experience. Remember this differs in every classroom with every teacher.

Mill Creek Watershed Council – stream channel profiling

Bob Roth, the coordinator for the Mill Creek Watershed Council, contacted me and asked if my students would be interested in conducting a stream channeling study for the watershed council as they had few funds or personnel to do so. I gave my standard answer, "You will have to come in and ask my students."

I made arrangements to meet with Bob before he came to my class and went over ideas for his pitch to the students. I gave him details of the class, expectations of both of us for the class and the project, and a time and process for coming to my class. I explained he needed to describe his work in the community and the reason he needed the data the students



Students collect invertebrates to study.
Photo by Gale Hann.

would be collecting. We decided on the particular information that needed to be gathered, the format for the end product from students, the field sites we would access (I went with him to look at these at a later date), and the training and protocols he needed to teach the students. He had no access to equipment, so the students needed to design any equipment that was required.

Bob made his presentation to the class asking for student assistance in the project. Students followed-up with the decision to help out within a few weeks as they were in the middle of another project. Sometimes students could be engaged with several projects simultaneously. Bob provided training on the protocols needed and several students designed some measuring devices out of PVC pipe that Bob was able to secure. These were used to measure water depth in Mill Creek when the depth was greater than they could access wearing waders. I organized the students into groups with various tasks and responsibilities from those measuring, to those entering data, and others assisting those in the water.

I made arrangements for transportation over a two-week period of time with weather determining some of our outings. I had students practice the protocol in the stream behind our classroom with Bob's help and I gathered the first aid kit, medical and emergency forms and we were ready to go. The next day they met me at the mini-buses with materials and equipment they were assigned and off we went. The trips to the site were filled with last minute task and behavioral reminders.

We spent four class periods over the next two weeks gathering data on stream depth and width at a number of sites. Students completed the forms and prepared the data in the forms that Bob provided. During the two weeks students also read about the significance of stream morphology and did curriculum activities related to streamflow and hydrology. The work went well and students completed the tasks easily.

When students were finished collecting the data, we called Bob and the students presented their work orally and handed him the forms he requested. They thanked Bob for allowing us to partner with him and fielded questions he had. I followed up later with him to provide feedback on the experience, and he thought it went very well and sent a thank-you to the class.

Students struggled with a community project for this, but settled on providing neighboring residents with information on impervious surfaces and flooding. They felt this was connected enough to the study on streamflow and so I let them move forward. They developed some information that was then included in a community publication. Students had a variety of roles from writing, to illustrating, to arranging the publication. At the end of all of this work, students were assessed on their two projects, the classroom activities, and questions on an essay exam.

Not all projects flow the same way. I start some with a journaling activity to connect them to a particular study site. They are required to write at least one journal entry per month. In other projects I sometimes like to bring in an American Indian component. No one project contains all the same elements, but most projects follow the same general processes described earlier.

Sustainability of program

One of the most difficult things about community-based instruction is that it is not a part of mainstream educational practice and instead an approach practiced by a few dedicated, passionate teachers. Very few schools or districts have made this a central and supported approach at the school or district level. They have not institutionalized it. That means that most often when a practitioner of community-based education leaves a school, the course or program they established disappears.

I would like to suggest several ways to increase the chances of program sustainability rather than being teacher dependent. The first is to develop an identity for the class or program. This can be accomplished by giving it a name, as a separate name begins to build that identity separate from the teacher's name. The next step is to make sure there is recognition of the work and the program in the community. This comes from media coverage of student work so there is real awareness of the value on the program. Greater support from the community can come from a community committee to help with the school programming or even establishing a nonprofit group to do the same. The last step for me was to have a facility built specifically for the program. There are others who have sought sustainability of a program by developing a school within a school program or establishing a charter school. All of this is an attempt to maintain a community-based effort after the program developer leaves.

The establishment of a named and recognized program embedded in the school system will go far in providing long term lasting power, but even that is no guarantee. Perhaps the most effective feature of program sustainability is an actual physical presence such as a separate facility especially built for program use. If this can also be leveraged with community support and use, then the program is set for long term effectiveness long after instructors come and go. The Straub Environmental Learning Center is such a facility.

The Center was built in 2004 after a seven-year effort I led. It was built only after I had engaged students over a number of years in community-based studies and established many relationships upon which this vision was built. Funding for the one million dollar, LEED-certified building came from the school district which owns the property, the City of Salem, and the community-at-large. It sits on the south end of the high school campus next to a stream and a restored riparian area that serves as a training and study site. The facility houses a large classroom, mud room, large community room, chemical and storage area, restrooms and an office. I was the only teacher housed here and students made the 5-minute trek from the main building each class period.

Simultaneously to the building of the SELC, I established a nonprofit organization the Friends of the Straub Environmental Learning Center (www.fselc.org) to begin community-wide educational programming. After six years we have now have a Board of Directors, an Advisory Board, Education Committee, and paid staff. Our programs target citizens of all ages and include: Nature Kids, Family Nature Night, Family Nature Retreat, summer nature camps, Green Awards Dinner, Amateur Naturalist classes, Issues Forum, Climate Masters class, Sustainable Holiday Fair, and an excellent Lecture Series that features well known speakers from around the Northwest and beyond.

In my time at North Salem High School, I was able to have a facility built for my classes and establish a nonprofit only because of the school and community relationships built over a long period of time. The courses continue to be taught even after I left the school. I continue my work at the SELC with the nonprofit even though I no longer teach in the classroom. The current teacher has his own spin on natural resource education and new courses have been added, but there are components of community-based education that remain. None of this would have occurred without the support of the school, district, media, and community who saw great value in what students were involved in doing. I can't imagine a more rewarding way to teach and work with our student-citizens.



Students work in community garden at their school.
Photo by Jon Yoder.

Summary

If you are beginning the process of trying out community-based education, you should know that it is always a work in progress. No one ever reaches a place where they have it all understood and under control. The best piece of advice is to start small with a single activity or experience and a foray into the community to find a partner. It will grow on you.

Perhaps a top ten list of advice for those starting out on this journey will help challenge and guide you on your way.

1. Start small and find other teachers interested in doing a community project. Support and collaboration are critical for success as you begin this work.
2. Don't let issues such as transportation and funding stand in your way. Be creative and persistent and employ the resources of your community.
3. Getting to know community partners is a must, so be prepared to make calls and meet with potential partners. They are often more than willing to work with you and may have resources you can use.
4. Make sure that your class does not become a work crew. The work you do should be the work of your partner. This is not a field trip or guest presentation, but joining the authentic work of your partner.
5. Be organized and plan ahead. You can never foresee all possibilities, but being organized helps you become more successful with students and partners.
6. Promote the program. It is not about you but about the students and their capacity to serve as a resource for their community.
7. Involve students in the selection of their work and in designing their products. This may be the first time they have some control over their learning. It can be empowering for them.
8. As your work expands, think of ways that the program can sustain itself when you are no longer there.
9. Do not worry about having to know the content or being in charge of direct instruction. You will become a facilitator and instruction comes from the community partner and the curriculum resources you organize. One of the great joys of this approach is that you often get to learn along with your students. Sometimes they can even teach you. The teacher is no longer the "sage on the stage," but instead is the "guide on the side."
10. Remember it is about community! The work students do needs to have a context to it. They should come out of their study with a clear understanding of what their community is, how it can function, and possible roles for them to participate. Do not forget that this approach also fosters community building within the classroom and students become reconnected to themselves and to each other.