FIELDWORK
NOTES FROM EXPEDITIONARY LEARNING CLASSROOMS

SEPTEMBER 2005 VOLUME XIII, NUMBER 4

Close Observations of Water:

Tests, Data, and Poetry

By Scott Comstock and Luisa Martinez

IN THIS ISSUE:

Active Pedagogy and Science

Guiding Question:
How do we create inquiry-based science expeditions?

For more teacher tools related to this issue, visit our website at www.elob.org/publications/webarchive/v13n4tt.html.

I think the answer is very simple,
to save our river.
See it. Walk along its bank, like I did
with my class
Discover its beauty.
And how we need to improve that
beauty.

It doesn't take a lot.
It won't take long.
Walking is good for your heart.
Just 20 minutes.
I'll show you where, here's a map...

Seventh-grade student Eileen Hanley, speaking at the Riverworks culminating event.

That was the message we heard loud and clear as we finished our eight-week investigation of testing the waters at Minnow Brook along the Presumpscot River. Eileen was referring to the close relationship we developed with the river, the significance of scientific data collection, and the importance of close investigation.

During our expedition Riverworks, the 80 students of Windsor 7 at King Middle School in Portland, Maine, collected and investigated Minnow Brook's water. Minnow Brook is a tributary of the Presumpscot River, which flows 25 miles from its headwaters at Sebago Lake to Casco Bay. The study culminated in a multimedia presentation that outlined the story of our expedition. Within this presentation, the students created a video documentary of the expedition, PowerPoint presentations that represented their work from each class, and digital and hard copy water quality data that was donated to our community partners, The Presumpscot River Watch.

The students observed and collected many samples of one of Maine's most highly valued resources, water. They experienced water in many ways. They looked at it, felt it, smelled it, and tasted it. They quantified and qualified its properties. They researched, discussed it, and then wrote about it.

River of silent words
Telling us to listen, so
We stop and listen.

Thuy Nguyen, seventh grade
King Middle School, Portland, Maine

continued on next page

FIELDWORK
NOTES FROM EXPEDITIONARY LEARNING CLASSROOMS

EDITOR
Amy Mednick

LAYOUT AND PRODUCTION
Leslie Hansen

TEMPLATE DESIGN
Carroll Conquest,
Conquest Design

Fieldwork welcomes articles, letters, reviews, journal entries, and samples of student work. Please submit entries to amy_mednick@elob.org

Expeditionary Learning Outward Bound
National Office
100 Mystery Point Road
Garrison, NY 10524
845-424-4000

www.elob.org

Expeditionary Learning Outward Bound® is a New American Schools design for comprehensive school improvement that challenges K–12 students to meet rigorous academic and character standards. Our model is based on 10 principles that grow out of the experience and philosophy of Outward Bound.®

Close Observations, continued from page 1

They paddled on it and enjoyed its beauty. They played in it, stood in it, and fell in it. They held it up to the sun and measured it with their newly acquired intelligence and their innate familiarity.

COLLECTING DATA

Before our fieldwork on the river began, students needed to become experts with water and water testing. In science classes, we spent the approximately four weeks leading up to the fieldwork learning the significance of data collection. Specifically, we focused on the processes of data collection and gathering, hypothesizing, experimenting and concluding, accepting or rejecting an original hypothesis, and then, doing something meaningful with the results.

To further understanding and to illustrate the steps of the scientific method, students collected different water samples to test. They collected water from rain, ponds, the ocean, a river, streams, puddles, brooks, taps, and drinking fountains. They tested the water with four water quality parameters, temperature, pH, ecoli bacteria, and dissolved oxygen, outlined by our community partners, The Friends of Presumpscot River and Presumpscot River Watch.

It was important to show the students the value and significance of data collection. It was critical to have authentic, varied sets of data to compare and contrast. These varied sets of collected data easily led to inquiry-based lessons in science and math. The data helped frame trends in graphing variables with real numbers, and cultivated interesting and thoughtful questions from our students.

In social studies, the students had current information that lent itself to meaningful comparison with the historical and cultural data they learned about the river. In computer class, the data was graphically represented in PowerPoint presentations, which the students delivered at a statewide Maine Rivers conference. In language arts, the data and specifically the subject itself lent itself to many learning opportunities. The data generated discussions, prompted reflections, artwork, and poetry led by our guiding questions. It allowed students to interpret, understand, teach, and advocate for the beauty of the subject. We as crew, together in an authentic expedition, closely observed, collected, and investigated water.

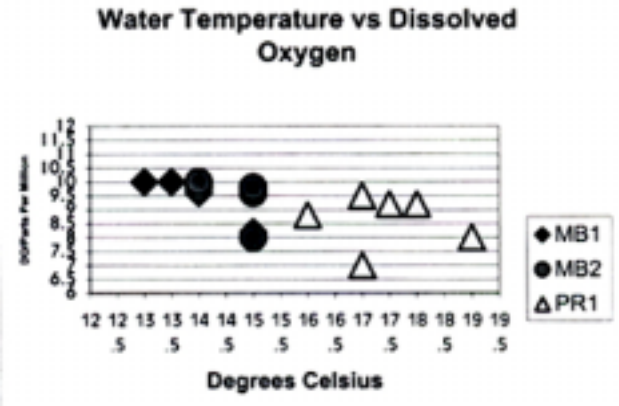
CLOSE OBSERVATION

Collecting water quality data dovetailed nicely into a wonderful and interesting scientific skill, close observation. Students love "doing science" in a lab and love it even more in a canoe on a river. It was not hard to generate interest for this theme/topic. In fact, it became more challenging to manage the energy and enthusiasm it generated, and at the end, to slow it down to complete closure.

This study demanded that students observe closely. They had to calculate and analyze accurate results. For example, they had to collect, process, incubate, and count sealed Quanti Tray cells of colonies of bacteria. They collected, investigated, mea-

continued on page 8

Proving what Mr. Comstock told us true, this scatter plot shows a negative trend telling us that the warmer the water, the less dissolved oxygen there is. I remember the section of the river that I tested as being pretty cold, so the fish must be pretty happy.



Kayla Cogle, a seventh grader at King Middle School in Portland, Maine, created this scatter plot of water temperature vs. dissolved oxygen. A more complete version is available on-line at www.elob.org/publications/webarchive/v13n4tt.html.

Embarking on a Science Expedition:

Inquiring Teachers Want to Know

By Catherine Saldutti

When I was asked to write this article, one intended to target a few aspects of developing, planning, and teaching a science expedition, I had quite a few questions. This is not surprising, since I spend most of my time with teachers and students helping them ask questions and pursue information that will lead to better questions. The process of scientific inquiry, as it is staged in classrooms, is a well-conceived and extensively planned endeavor. It makes sense that teachers need to ask many questions as they plan for an inquiry-based science expedition. In that spirit, this article presents some of the questions that I ask when considering a science expedition.

One of the most compelling reasons to teach inquiry-based science is that nature is so compelling. From water, to disease, to land use, students are easily grabbed by the subject matter and invited to explore without much fanfare or props. The more students gain direct exposure to natural phenomena, and to their impact on human society, the richer the inquiry will be.

COMPELLING SCIENCE?

Try asking the following questions to determine whether the topic will make a great science expedition:

Does the compelling topic relate to local issues and do those local issues take students to really rich science? Go through your state standards, the American Association of the Advancement of Science benchmarks, and the National Research Council science standards to see whether the local issue will lead to rich concepts and skills articulated in the standards. Often, local issues align with concepts and skills of the standards documents.

Is the compelling topic accessible to my students' developmental level? What may sound wonderfully relevant and science-rich may backfire if the students cannot access the information or perform the skills necessary to make the inquiry successful. For example, it may be exciting and relevant to consider the reintroduction of wolves to Yellowstone National Park. But I would not be able to sift through comparative population studies with fourth graders in the same ways I would with tenth graders. So, a related question is, What skills will students need to practice and refine during this expedition, and can I create learning experiences that use actual data and information appropriately?

This is a technical drawing of a duck at Hart Park by Iran Hills, a second grader at Academy of Learning and Leadership in Milwaukee, Wisconsin.

Are there local experts who can make the expedition more authentic? While it feels overwhelming to try to identify, contact, and plan with someone outside the school, it is worth the effort. For one, these people know where to find the great fieldwork sites, updated reading materials, primary scientific studies, and sometimes even equipment or materials that may be loaned to the classroom. They also find it rewarding to help schools, but do not know appropriate ways to connect with teachers. I feel a sense of responsibility to connect

continued on next page

Embarking on a Science, continued from page 3

with local experts who can steer the expedition in truly authentic directions.

Is the compelling topic rich enough to integrate a variety of skills sets and conceptual knowledge? Can my students practice literacy and math skills? Are there historical contexts that relate to the time periods studied in social studies? Do the political issues provide opportunities to learn about governmental processes? Are there artistic renderings or expressions of these natural phenomena or the issues that surround them? Can students find information about the compelling topic with some guidance? Can all of the above connections be made directly to the compelling topic, without having to leave the context of the expedition, in order to teach important concepts?

LITERACY AND SCIENCE

In planning for a science expedition, science teachers should take the opportunity to do scientific writing with the students. I outline below some components of the reading, writing, speaking, and listening skills sets that are particularly relevant to a science expedition.

How will nonfiction reading and viewing skills come into play during the science expedition? There are a variety of strategies for honing reading skills, and these can be applied to information sharing in the sciences as well. Have you considered the different genres of scientific reading materials you use in your classroom? Do you cull readings from textbooks, from science articles in news periodicals, from trade books, from encyclopedias, from government Web sites, video/television documentaries? Each of these genres serves different purposes and sometimes even different audiences. Do you take care in your science expedition to help students navigate them with this in mind?

What kinds of authentic scientific writing can students engage in during the expedition? We need to constantly remind ourselves what real scientists do to communicate their findings. Often, they follow formats set forth by the field to present journal articles. Due to space constraints, they are often forced to be succinct and judicious with their explanations. Do we set similar criteria for student writing? Scientists are often held to the scrutiny of the peer review process, which is a practice already used by literacy teachers on many grade levels. In science classes, do students have the opportunity to give feedback on the scientific writing of their peers? Are there other expressions of scientific understandings that can be created and *read*? What about diagrams and figures?

What kinds of accountable talk can students demonstrate in the science expedition? Students can be required to assume different roles and perspectives during the course of an expedition, not only in terms of how different fields approach the issues at hand, but also in terms of scientific interpretation. We need to help students appreciate that there is no scientific truth, rather, there are interpretations that, when held up to precedents and standards, either hold their ground or do not. How will students use scientific terminology while speaking with each other, while presenting their work, or while asking questions?

My questions never seem to end because the planning process continues to beg these questions. That is all a part of being an inquiring teacher, and part of designing an inquiry-based expedition in the science classroom. With experience, the more basic questions will be more easily answered and many of these considerations will become more clearly defined. And here is the good news: that just makes way for the questions that will really launch you and your students into rich and wonderful science expeditions.

Catherine Saldutti is a consultant with Expeditionary Learning and president of EduChange, Inc.

Bus stops
Door opens
Plants are mostly dead.

Sean Dowling, seventh grade
King Middle School, Portland, Maine

Reading to Learn Science:

Building Background Knowledge with Reading Strategies

By John LeCavalier and Mary Jo Swartley

The Front Range of the Colorado Rocky Mountains, once an expansive, diverse system of prairie, forest and wetlands, has been experiencing some of the most rapid growth in the United States. With more and more land being gobbled up by urban sprawl, what could possibly be wrong with a proposed 6,200 acre wildlife refuge located on federal land only 15 minutes from downtown Denver? Radioactive waste, that is what. Formerly a nuclear defense facility, the Rocky Flats site produced plutonium triggers for nuclear bombs. It is a superfund site, shut down in 1989 after 40 years of cold war weapons production, and an FBI raid. A subsequent grand jury investigation resulted in a plea agreement in which Rockwell International paid $18.5 million in fines. Ironically, the secret and potentially dangerous nature of the Rocky Flats work kept the surrounding landscape relatively undisturbed and intact.

The proposed Rocky Flats Wildlife Refuge involves a variety of perspectives, informed by sophisticated understandings of complex science concepts and public policy. As a compelling expedition topic, Rocky Flats provides a context for in-depth investigations of the chemical properties of radioactivity, biogeochemical cycles and the nature of ecosystems, biodiversity, habitat loss and restoration. Land use policy investigations include the potential contamination of Denver's water supply, growth management, environmental protection, human health impacts, risk analysis, and environmental justice. Connecting these in-depth investigations is the guiding question, How do we make decisions about how we live and work with the land?

This compelling topic provides the context for students to learn about science content. But it is just a first step. Learning experiences must be carefully planned to scaffold student understanding and build literacy skills. At the 2005 Expeditionary Learning National Conference, we presented a workshop to explore how teachers could incorporate specific reading strategies to build background knowledge and deepen understanding of the Rocky Flats controversy as a compelling topic. We focused our attention on nonfiction science writing and the reading comprehension strategy of determining importance.

"If you're tempted to gain time to cover more curriculum by abandoning getting-ready-to-read mini-lessons, don't give in."

—Laura Robb

As Stephanie Harvey and Ann Goudvis state in *Strategies that Work: Teaching Comprehension to Enhance Understanding* (Stenhouse/2000), "When we teach the strategy of determining importance, we often introduce it in nonfiction. They go together. Nonfiction reading is reading to learn." Good readers determine the importance of different ideas or points of view expressed in a piece of text. They make decisions based on their background knowledge and the context for reading. Students do not often have the background knowledge necessary to make those decisions or engage deeply in the reading. So, as Laura Robb reminds us in her book, *Teaching Reading in Middle School* (Scholastic,

continued on page 9

Sick and Tired:

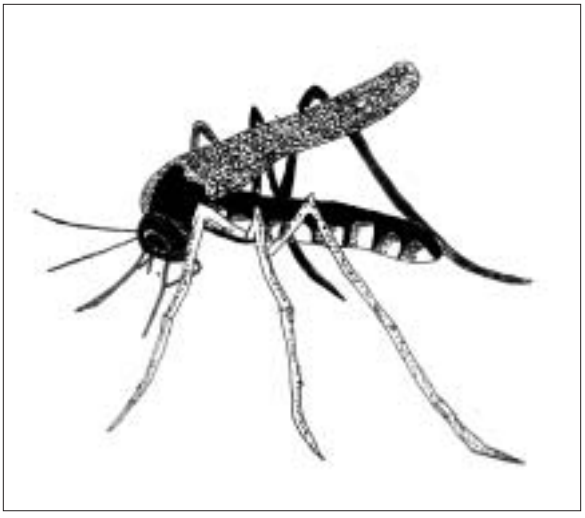
Discovering the Science of Disease with Writing

By Tracie Burroughs

It is the beginning of our expedition, and two recent victims of West Nile virus are visiting with my seventh-grade science students at PIONEER School for Expeditionary Learning in Fort Collins, Colorado. Robert raises his hand, "I had West Nile virus last year. . . . I hardly even noticed I was sick." At this point I can tell that my students think West Nile virus is no big deal.

Then one of our guests says, "Well, I almost died, and I look at life a whole lot differently now." My students perk up, and by the end of the hour are captivated by the stories of emotional and physical struggles, financial difficulties, spiritual growth, and continued medical needs these people have endured. They are true survivors and my students are hooked on learning about West Nile virus.

Not only did this expedition, Sick and Tired, cover complex science content such as immunology, cell structure and function, and infectious diseases, it incorporated literacy, service, and local issues. Using our new science lab, students swabbed the school building and cultured bacterial colonies (we discovered that our computer keyboards were a bacterial extravaganza!), simulated disease transmission through a "fluid swapping" activity, and made Jell-O cell models. Among other studies, students read articles and drew diagrams to learn about mosquitoes and how they serve as disease vectors, why they need blood, and what species is responsible for West Nile virus. Adopting the role of scientist, the students conducted a simulation in which they tested "serum" collected from birds for the presence of West Nile antibodies.



Isabel Cisneros, a seventh-grade student at PIONEER School for Expeditionary Learning in Fort Collins, Colorado, sketched this mosquito during the expedition Sick and Tired.

A Reason to Write

Writing played an important role in this expedition because our final product—an education crate about West Nile Virus for the Colorado Division of Wildlife (CDOW)—included informational pieces written for elementary students. The CDOW has several theme-based crates, complete with a guide, props, games, and activities, available to teachers and other educators. Our crate included a notebook of the pieces students had written on the West Nile virus. A small committee of students culled through 33 pieces to select 15 for the crate.

The possibility that any piece of writing might be part of the education crate—which we first tested on third graders at a local elementary school—motivated students to be creative as they demonstrated their advanced knowledge. The students described detailed symptoms of West Nile, medical treatments, differences between viruses and other types of diseases, dispensed advice for avoiding mosquitoes, and many even discussed how West Nile arrived in the United States and predicted its effects on society.

RAFTS AND SCIENCE WRITING

I used the RAFT as the main vehicle to motivate students to do science writing (RAFT stands for Role, Audience, Format, and Topic, and is a structure for supporting writing across all content areas.). To begin our writing workshops, students learned about two of the 6+1 Traits of Writing: voice and ideas. (For more information, please refer to *6+1 Traits of Writing* by Ruth Culham, Scholastic, 2003) As a warm-up to the RAFT, we looked at examples of each, practiced writing short, fun pieces using each trait and evaluated other student work using 6+1 Trait rubrics. Students found it challenging to simultaneously write well, using either voice or ideas, and include science content. Many of our critique sessions led to discussions about how students struggled with one or the other, finding that they either had wonderful creative writing pieces, but lacked enough science or had too much science and lacked voice. As they wrote, they discovered gaps in their knowledge and went back to complete additional research or review previous scaffolding activities and notes, while working on conventions and basic paragraph and sentence structure.

The 6+1 Traits proved to be a wonderful tool for assessing science content. Students learned as they reviewed or sought new information and then had to incorporate it into a realistic story. For example, students who chose to write from the perspective of a mosquito had to learn the names of the body parts, how blood is extracted from mammals, and how a virus is injected. They needed to know the life cycle of mosquitoes and their habitat requirements. On any given day, it was not unusual to hear students saying things like, "I found all sorts of different information about how many cases of West Nile there have been in Colorado. Which information is right?" or "I think your paper has really strong voice but if it were my piece I might include a little more information on how your character got West Nile." Much of this learning happened for students without them even realizing it because they were so focused on the writing, striving to give their character depth through describing emotional and physical conditions.

> I started to have pains that felt like needles stabbing me, which later I was to find out is called neuropathy, and sometimes my limbs lost all feeling, which is called acute flaccid paralysis, a polio-like syndrome. At night I had nightmares of myself dying slowly. I suddenly started tripping over nothing at all, forgetting simple things quickly, and having seizures. It was the most terrifying thing that has happened to me in my whole life, since what was happening was nothing normal. Seizures are just plain scary. It is horrible to lose your memory for a few minutes and when you wake up you don't remember what happened. When I woke up there would be people standing around me watching me nervously. I could tell they felt helpless. So did I. Also, after a seizure, my body would really hurt.
>
> *Isabel Cisneros, seventh grade*
>
> *PIONEER School for Expeditionary Learning, Fort Collins, Colorado*

Students had a lot of choice, both in which RAFT to respond to and which trait to focus on. For instance, once they understood and could identify strong voice, they selected one of four RAFTS and wrote about it. Next, we explored the trait of ideas, and students again chose one of four RAFTS. For example:

~ You are a female mosquito carrying West Nile virus. Write "A day in the life of…" story about yourself, explaining how you became infected, why you need blood, and people and/or animals you have impacted along the way. You are writing your story to submit to a local nature magazine.

~ You are a reporter for your high school newspaper, writing about a fellow student who contracted West Nile virus. In your article, you write about how a person gets West Nile, how to prevent contracting the virus, symptoms, and how your fellow student is feeling and doing.

WRITING TO LEARN

I assumed that the first writing pieces I received would be at a beginning level and

continued on page 12

Close Observations, continued from page 2

sured, and distinguished the pH of hundreds of samples of water in a LaMotte wide-range color comparator. They were trained to use extreme caution to perform and closely observe the results of and an eight-step Winkler method of titration when titrating a sample of water to measure dissolved oxygen in parts per million. They performed test after test, collecting and observing as they went, to sharply and accurately define their study of water quality.

During Riverworks, we watched the students' skills of data collection and close observation strengthen. It was a major thread of this expedition; it pulled the students forward into the content. They seemed eager and interested enough to move to acquire new knowledge on their own. They started asking questions like, "Why is this water so high in dissolved oxygen?" or "Can I do a pH on the Deering Oaks sample?"

This process of "doing science" collecting, observing, and experimenting allowed the students to risk being wrong. Taking an educated guess and being wrong was okay and through that they were able to deepen their own knowledge of themselves as learners.

Testing the waters of the river helped our students discover and understand more about the environment and themselves. Taking the data we collected and assembling it into useable form helped us as community members identify how we represent, influence, and affect our immediate environment. It gave us perspective, framed our sense of place, and has identified and initiated steps for us to take to help the ecosystem in our own back yard. During our time in this expedition, the students' journey meant something to them. In short, the students took it to heart.

As our culminating event came to a close, seventh grader Eileen Hanley continued her poem reflecting loud and clear the final message of Riverworks:

...You matter. You can make a difference.
we need everyone we can get.
There's nothing to be afraid of.
Sneak a peek behind the ferns to view its grace.
You can be a role model ... for everyone.

Wear shorts or take a coat.
You'll see how important it is that we clean up our river.
If we don't, we will have ruined what was our responsibility.
We will have killed part of our wildlife.
You'll see how beautiful it is and how beautiful it needs to be.

Just see it.
Take a walk.

Scott Comstock teaches science and Luisa Martinez teaches Language Arts at King Middle School in Portland, Maine.

CLOSE OBSERVATION AND WRITING

Early on, we learned about naturalists, and then began taking walks along the Presumpscot River in small groups to experience the river and its beauty. These walks also helped hook our students into the subject.

~ Journals have great power to focus thinking and close observation, to make the observations and thoughts personal to the learner. They should be specific to the task, designed purposefully for the work, and they should be as beautiful as practical.

~ Naturalist notebooks replicated the authentic work of real naturalists. They provided a "seed bed" of ideas, sketches for future work in writing, art, and science. Sketches were taken from the notebook and water colored for a collage-style mural. Students jigsawed their experiences together and were able to teach each other about the various places along the river they had visited and observed.

~ Teaching the short poetic form Haiku required close observation and personalization of the environment. Easy to learn, quick to write and fruitful in personal connection, Haiku provided, the "Ahh..." recognition of the power, beauty, and heart of the Natural World.

—Luisa Martinez

Reading to Learn Science, continued from page 5

2000), "If you're tempted to gain time to cover more curriculum by abandoning getting-ready-to-read mini-lessons, don't give in."

MODELING STRATEGIES

The goal of our workshop was to model before- during- and after-reading strategies teachers could use with their students to build background knowledge and deepen the understanding of compelling science topics.

Tea Party: We got participants ready to read using an adaptation of Kylene Beers' Tea Party, in which students are offered a chance to consider parts of a text before they ever actually read it. Our text was a February 4, 2005 Los Angeles Times article titled, "Dispatch from Rocky Flats National Wildlife Refuge, Colo.: An Idyllic Scene Polluted with Controversy." The text introduced the key players and their different perspectives. We copied juicy quotes and phrases on strips of paper and gave one to each participant. After writing a brief prediction about their strip, everyone got out of their seats and mingled around the room, reading to eachother and discussing possible predictions. The reading challenge in this workshop is minimal but the discussion and social construction of meaning possibilities are rich. Participants then returned to their small groups and wrote a before-reading prediction.

Next, we handed out only the first page of the text and asked participants to text code for new information that confirmed or changed their initial predictions. Again, participants wrote a statement about their revised predictions and lingering questions.

Determining Importance Workshop: Before we handed out the rest of the text, we modeled skimming and scanning as a think-aloud. Participants chose a *who* to become an expert on, and to determine their point of view/perspective on this issue. We then gave participants the rest of the text to read independently, along with a triple entry journal recording form to help readers identify this *who* and their point of view by citing evidence from the text. Participants then shared their findings with their small group.

Gist statement: How can we help students summarize their reading and synthesize their thinking about a topic? And, how can we make sure or assess that students have a clear understanding of the main ideas and concepts being presented in the text? We asked the group to generate a list of important words, which we captured on an anchor chart. We then invited them to work in their small group or in partners to write a paragraph using as many words from the list as possible. Groups then shared out their writing.

Seventh-grade student Tomas Callan drew this tree for the expedition Riverworks at King Middle School in Portland, Maine.

PUTTING IN CONTEXT

Throughout the workshop, participants practiced the reading, writing, listening and speaking both individually, and in large and small groups. Participants continued to build their understanding of the text, taking full advantage of the social construction of meaning.

Our guiding question (How do we make decisions about how we live and work with the land?) connects possible in-depth investigations, and helps synthesize the big ideas surrounding people and their environments. Future learning experiences, e.g., fieldwork, guest speakers, research, mini-lessons, can build from this initial immersion into the topic, as part of a carefully scaffolded plan that culminates in authentic, high quality products.

For struggling or reluctant readers, science texts can be overwhelming. The complexities of the Rocky Flats controversy require students to synthesize many science concepts and vocabulary. Integrating reading strategies into science expeditions is essential to teaching content and developing literacy skills; students read to learn while learning to read.

John LeCavalier and Mary Jo Swartley are Northwest region school designers with Expeditionary Learning.

For a complete description of the workshop, protocols and graphic organizers, please visit www.elob.org/publications/webarchive/v13n4tt.html.

Generating Inquiry through Fieldwork:

Caring About Water in Second Grade

By Kristin Stoddard

As I looked around the classroom, I began thinking of the day ahead of us. I realized that I had a carefully laid-out plan, but could not clearly articulate (and as it turns out, hardly imagine) what the students would discover together during their fieldwork. I have reached the conclusion that a certain amount of uncertainty leads to the best discoveries.

For some of my second graders at the Academy of Learning and Leadership, fieldwork is the only time that they leave their neighborhood, located in one of the most challenged areas in Milwaukee, Wisconsin. And so, the class hummed with nervous excitement as crews—assigned to study vegetation, signs of life, flow and depth/water sample—boarded the bus. At the first stop in downtown Milwaukee, we spent some time looking at the confluence of the Menomonee and Milwaukee River and some children wondered if the joined rivers would end up in Lake Michigan or an ocean. They watched large cargo boats carrying coal up the river toward the industrial area of Milwaukee. Soon the children took out clipboards, opened fieldwork books, and recorded their observations.

Malik Covington, a second grader at Academy of Learning and Leadership in Milwaukee, Wisconsin, sketched these buds at Hart Park.

We had just finished an in-depth, inquiry-based study of water, including scientific concepts such as density, properties of water, states of water, water in weather, and the water cycle. We had collected and examined neighborhood water under microscopes. Now students were ready to begin making discoveries about water in their environment and how they, as children, affect water. My goal was to have students understand not only how important water is to humans, but that water is also a habitat for many plants and animals. I wanted students to appreciate the fresh water that is so plentiful in their area and learn to care for it.

Discovery and Questioning

At our first stop, I could already see that students were well on their way to making the discoveries and asking the questions that I had hoped they would. Students wondered why the river was so deep here.

"Why was it brown?" asked DuShawn.

"It must be polluted, like the one in that book we read," answered Danyea.

Iran sat off to the side pointing and counting, "I am counting how many people throw their cigarette butts in the river." The bus stopped in two other river locations around downtown where students continued to talk with one another about what they were learning.

By midday, the bus reached Hart Park, the place along the Menomonee River that we would be visiting monthly (three times) during the remainder of our expedition. Students immediately noticed trees and soil surrounding the river. It was much shallower and less wide than at the previous stops. Students were able to get much closer to the river, and could study it first hand.

CREWS GET TO WORK

The flow crew used a stick and a stop watch to test the rate at which the river was traveling. They became interested in whether the river traveled faster near the edge or in the middle and began researching that question. The vegetation and signs of life crews lifted logs and rocks, and moved dead leaves out of the way to find anything living or growing on this very early spring day. The depth/water sample crew was busy choosing a place to measure the depth of the river on each visit. They gathered water samples to study under the microscopes at school. Finally, they used a test to determine the level of oxygen in the river and began trying to determine why there were such high levels of oxygen in the river.

Soon crews finished their research and each of the children had quiet time to do a technical drawing of something that they had found during their explorations. Children were resting against trees, sitting on rocks or sprawled out on the ground examining objects. I looked around in awe and decided that this was definitely one of the most worthwhile days we had spent together in our nearly two years together as a class. They had taken their first steps into research; we were out of the classroom learning more than ever. Students had worked together and began cooperating on a project that they would share with their community.

SHARING KNOWLEDGE

Experts had visited our classroom to help students to understand the big picture of water in our world and how lucky they are to live near the Great Lakes, which make up 90 percent of our country's fresh water. Students learned their responsibility to water, and the many ways humans damage river and lake water every day. They got to see many animals during their fieldwork together and each student began researching an animal for their own research report.

Throughout this expedition, students became true gatherers of data and creators of information. They developed skills allowing them to synthesize large amounts of information and determine what was most important. This allowed students to do a monthlong research project on an animal that depends on water for a home. They asked questions, studied with partners, used the Internet, and compiled as much information as they could to individually write six-to-eight paragraph essays about their animals.

Fieldwork helped students to care about water as an important natural resource and habitat. They wanted to share what they knew. Back at school, students began creating a class book, based on *One Less Fish* by Kim Michelle Toft and Allan Sheather (Charlesbridge Books, 1998), about what harms animals in our local rivers. Students presented this story through readers' theater at the final celebration of the expedition, and the class sold copies of the book to benefit a local organization called Friends of Milwaukee's Rivers.

As I reflect back on how I felt on that first day of fieldwork, I had a sense of uncertainty. I now feel a great sense of accomplishment. Students not only learned important scientific concepts about water, they developed a passion for going out into the field, making discoveries, and sharing with others what they had learned. At the final celebration, I watched as the children performed, explained fieldwork technical drawings and writing, showed off research reports on animals that depend on water, sold the *One Less Fish* books, and explained science experiments, and I knew that they shared my sense of accomplishment and pride.

Kristin Stoddard teaches second grade at the Academy of Learning and Leadership in Milwaukee, Wisconsin.

D'Angelo Montgomery, a second grader at Academy of Learning and Leadership, sketched this bridge over the Menomonee River in downtown Milwaukee. At each stop, students did a technical drawing to note differences between places.

FIELDWORK
NOTES FROM EXPEDITIONARY LEARNING CLASSROOMS

SEPTEMBER 2005 VOLUME XIII, NUMBER 4

Non-Profit Org.
U.S. Postage
PAID
Permit No. 878
Dubuque, Iowa

Expeditionary Learning
Outward Bound
Regional Office
1090 Alta Vista
Dubuque, Iowa 52001

www.elob.org

Expeditionary
Learning
Outward Bound

An approved
New American
Schools Design

Sick and Tired, continued from page 3

would need lots of work. I knew students would find gaps in their knowledge that we had not covered or needed reinforcement or would have inaccurate scientific information. I assumed that the writing would be weak in content as students focused on voice and creativity. As always they exceeded all expectations. As they tackled each writing piece, first using voice and then ideas, their content knowledge improved. They researched symptoms and treatments of West Nile, species of birds most affected, how veterinarians treat horses, and described the immune response happening in the body. They received feedback from peers to guide their writing and became passionate about having accurate and thorough information because doing so helped strengthen their use of voice or ideas.

After completing a one-page response to a RAFT for each trait, students were given a rubric, picked one piece to polish, and began critiquing and revising. The final product not only demonstrated strong voice or ideas, but also reflected student understanding of West Nile virus and the immune system. The level of vocabulary and ability to articulate understanding was way beyond anything I dreamed would be possible for seventh grade. The 6+1 Traits have given me a tool to facilitate my students in learning to write and writing to learn in science, and I am awed and inspired by the power of literacy.

Tracie Burroughs teaches science at the PIONEER School for Expeditionary Learning in Fort Collins, Colorado.