A Schooling for Sustainability Framework

By Michael K. Stone

One hardly needs to catalog the challenges that constitute the ecological crisis that is the theme of this issue of *Teacher Education Quarterly.* The encouraging news is the evidence that there are schools across North America and around the world responding to these challenges. They are discovering that guidance for living abundantly on a finite planet lies, literally, under their feet and all around them—in living soil, food webs, and water cycles, energy from the sun, and everywhere that nature reveals her ways. They are drawing on 3.8 billion years of natural research and development to find solutions to problems of sustainable living, make teaching and learning more meaningful, and create a more hopeful future for people and communities.

David W. Orr of Oberlin College describes the task facing educators:

> to teach students how they are part of the natural world; to emphasize self-understanding and personal mastery; to recognize the responsibility to use knowledge well in the world; to understand the effects on people and communities of the application of knowledge; to provide role models of integrity, care, and thoughtfulness in institutions whose actions embody their ideals; to recognize that the process of education is as important as its contents.[1]

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Orr sits on the board of the Center for Ecoliteracy —www.ecoliteracy.org—in Berkeley, California. Since its founding in 1995 by Zenobia Barlow, Peter Buckley, and Fritjof Capra, this public foundation's mission has been education for sustainable living. This article reflects lessons learned from work with thousands of

educators from all types of K–12 schools. While recognizing that there is no schooling-for-sustainability blueprint that fits all schools, the Center has articulated a set of precepts that it calls "Smart by Nature." They are described in more detail in its recent book *Smart by Nature: Schooling for Sustainability*,[2] which profiles schools across the United States that are putting elements of this schooling into practice.

In that book's preface, Barlow proposes

> . . . a radical vision for education—radical in the sense of being essential, fundamental, and deeply rooted. It is founded on a conviction that the best hope for learning to live sustainably lies in schooling that returns to the *real* basics: experiencing the natural world; understanding how nature sustains life; nurturing healthy communities; recognizing the consequences of how we feed ourselves and provision our institutions; knowing well the places where we live, work, and learn.[3]

The Smart by Nature approach is characterized by:

- An operational definition of sustainability
- An expanded understanding of "curriculum"
- A suite of guiding principles
- Shifts of perception resulting from systems thinking
- Desired outcomes described by core competencies

Defining Sustainability

The concept of sustainability, first articulated in the early 1980s, has served as a useful organizing principle for educators, as in the United Nations Decade of Education for Sustainable Development (2005-2014).[4] It has also been so variously defined as to be problematic to many. To some organizations, schools included, "sustainability" seems mostly to mean "what we need to do to stay in business." As Michael Pollan wrote in the *New York Times Magazine* in late 2007, "The word 'sustainability' has gotten such a workout lately that the whole concept is in danger of floating away on a sea of inoffensiveness. Everybody, it seems, is for it—whatever 'it' means."[5] So it is worthwhile to reflect about what "sustainability" could mean.

Imagine sustainability as a far richer concept than simply meeting material needs, continuing to exist, or trying to keep a degraded planet from getting worse. A community worth sustaining would be alive—fresh, vital, evolving, diverse, dynamic. It would care about the quality as well as the continuation of life. It would recognize the need for social, economic, and environmental justice; and for physical, emotional, intellectual, cultural, and spiritual sustenance.[6]

Physicist and systems theorist Capra, president of the Center for Ecoliteracy board, has discussed the need for an "operational definition" of sustainability. The most frequently cited definition is that of the 1987 report of the U.N. World Commission on Environment and Development (the Brundtland Commission): "... sustainable development ... meets the needs of the present generation without

compromising the ability of future generations to meet their own needs." As valuable as this definition has been, it is limited. It references only future generations of humans. Moreover, Capra notes, while the definition is an important moral exhortation, it does not tell us *how* to build a sustainable society. For that, we need an operational definition, grounded in ecological principles.

The key to such a definition, writes Capra,

> . . . is the realization that we do not need to invent sustainable communities from scratch. We can learn from societies that have sustained themselves for centuries. We can also model human societies after nature's ecosystems, which *are* sustainable communities of plants, animals, and organisms. Since the outstanding characteristic of the biosphere is its inherent ability to sustain life, a sustainable community may be defined as one that is designed in such a way that its ways of life, businesses, economy, physical structures, and technologies respect, honor, and cooperate with nature's inherent ability to sustain life.[7]

The capacity to create sustainable societies, in this understanding, depends on ecological literacy—the ability to understand the basic principles of ecology, coupled with the values, skills, and conviction to act on that understanding. This means that ecoliteracy must become a critical capacity for politicians, business leaders, and professionals in all spheres; and hence an important component of education from primary and secondary schools to colleges, universities, and the continuing education and training of professionals.

Curriculum Is Anywhere Learning Occurs

People often inquire about a "sustainability curriculum." Usually they envision a binder of lessons, but "curriculum" deserves a broader, more holistic definition.

A team of educators from the South Pacific atoll Yap once visited the Center for Ecoliteracy. As a parting gift, they left a poster proclaiming, "Curriculum Is Anywhere Learning Occurs." Curriculum understood in this way is everything that the school does that leads to students' learning—whether that learning is intended or not. Students learn from what the school serves for lunch, how it uses resources and manages waste, who is included in its decisions, how it relates to the surrounding community. For better or worse, the unintended learning is often the most powerful; the soda machine in the hallway or the dump truck headed for the landfill can convey more memorable lessons about the school's attitudes than repeated lectures on nutrition and recycling.

Schools are examples of the ecological principle of nested systems; they are embedded within larger systems: school districts, cities, economies, ecosystems. From these surrounding systems, schools take in energy and resources, which they use, transform, recycle, or discharge back into the wider systems. By the materials they use; the suppliers and other organizations they support; and the pollution, waste, and greenhouse emissions they generate or eliminate, schools make these

larger systems either more or less sustainable. Each step in these processes is an occasion for teaching.

In particular, *Smart by Nature* explores four domains—food, the campus, community, and teaching & learning—that offer multiple avenues for the transformative work of schooling for sustainability.

Guiding Principles

Given this definition of sustainability and this understanding of curriculum, the Center has identified four primary guiding principles for schooling for sustainability:

- Nature is our teacher
- Sustainability is a community practice
- The real world is the optimal learning environment
- Sustainable living is rooted in a deep knowledge of place

Nature Is Our Teacher

To envision sustainable human communities, people can look to design principles evolved since the advent of life on the planet. Ecological literacy fosters a perspective essential to sustainable living: that human needs and achievements are both supported and limited by the natural world. We need, says Capra, to teach our children (and our political and corporate leaders) the fundamental facts of life. For example: in a healthy ecosystem, nothing is wasted (one species' waste is another species' food); diversity ensures resilience; most of the energy driving the ecological cycles flows from the sun, which determines the energy budget for sustainable living; life did not take over the planet by combat, but by networking.[8]

School gardens and schoolyard habitats provide excellent opportunities for immersion in nature. Tracing the paths food follows from the seed planted in the garden to the meal in the cafeteria teaches basic ecological literacy concepts—the flow of energy from the sun to plants and animals, planetary cycles of water and weather, the web of relations embodied in every bite we eat. For instance, instead of a grass lawn on its Washington, D.C., middle school campus, Sidwell Friends School constructed a water garden, wetland, and pond. This system adds nature to the campus, uses nature's processes to treat and recycle water from the school's kitchen and lavatories (helping cut the school's use of municipal water by 90 percent), and serves as a hands-on lab for teaching biology, ecology, and chemistry.[9]

Teachers sometimes express a fear that being asked to teach about sustainability will add more content to overburdened workloads. In fact, beginning with sustainability-related concepts observed in nature and organizing material around them can provide relief to teachers by tying subjects together in ways that make more sense to students. To meet Vermont's newly adopted education standards in sustainability, teachers at Champlain School in Burlington identified nine "big ideas

of sustainability" drawn largely from attention to nature: diversity, interdependence, cycles, limits, fairness and equity, connecting to place, ability to make a difference, long-term effects, and community. They then created curriculum maps to track the progression of these ideas from grade to grade and formulated essential questions that tie concepts together across subject-matter boundaries (e.g., What connections and cycles shape our Lake Champlain ecosystem? How do we take care of the world, and how does the world take care of us?).[10]

Sustainability Is a Community Practice

This second guiding principle follows from "Nature is our teacher." Core ecological principles may be seen as different aspects of a single fundamental pattern of organization: Nature sustains life by creating and nurturing communities. No individual organism can exist for long in isolation. Animals depend on the photosynthesis of plants for their energy needs; plants depend on the carbon dioxide produced by animals, as well as on the nitrogen fixed by bacteria at their roots; and together plants, animals, and microorganisms regulate the entire biosphere and maintain the conditions conducive to life.

The profound lesson to be learned from nature is that sustainability is not an individual property, but a property of an entire web of relationships. It always involves a whole community. These lessons can be extrapolated to the world of social relations. Qualities that characterize healthy natural ecosystems, such as diversity and interdependence, support healthy human communities as well. The preservation of endangered human cultures is analogous to the maintenance of biodiversity. Social and economic equity and justice are important to sustainable societies in the same way that maintaining a dynamic balance among the members of a natural ecosystem is important to its sustainability.

Many of the most pressing environmental problems facing us require actions by citizens who are willing and able to collaborate effectively in organizations and communities. In schooling that is Smart by Nature, teachers and administrators model, and students learn and practice, the skills required for cooperative decision making and action.

The process of "greening" a school offers an excellent opportunity to practice working in community: "The Green Team is the heart of the Green Schools process, both organizing and directing activities at the school. Consisting of the stakeholders of the school environment—students, teachers, custodians, facilities managers, parents, and school board members—the Green Team is democratic and can be run by the students themselves. Whatever the type of school or age group, student involvement in the committee is essential."[11]

The Real World Is the Optimal Learning Environment

Children can best explore and understand nature's basic patterns through immersion in the natural world. They are able to step back from their fast-paced,

media-saturated world and experience the rhythms and timescales of natural events when they sow seeds in a school garden in the spring for harvest in the fall or watch a creek they have restored come back to life over months or even years. Children's sense of wonder at the natural world—the emotional connections that may determine how deeply they will care about the fate of nature—can be awakened by finding the life teeming in a handful of soil or nurturing a seed into a healthy plant.

Whether repairing the habitat of an endangered species, tending a school garden, or designing a neighborhood recycling program, students learn more when their actions matter and have meaning. In Smart by Nature schooling, students connect with the natural world and human communities through learning which inspires them to learn in order to acquire knowledge needed to accomplish something they care about or that someone in the wider community wants or needs. They also learn that they can make a difference, laying a foundation for responsible, active citizenship.

"The whole service learning idea adds legitimacy and authenticity to what we're supposed to be doing here," says Clackamas (Oregon) High School teacher Rod Shroufe, whose students spend several Saturday mornings a year conducting restorations, tearing out invasive species, and planting native trees. "To me, that's what makes it real. We're not having them go door-to-door preaching it, and I'm not out wearing tree-hugger shirts. We have a job that needs to happen and the kids are doing it."[12]

Sustainable Living Is Rooted in a Deep Knowledge of Place

When people get to know a particular place well, they begin to care about what happens to the landscape, creatures, and people in it. When they understand its ecology and diversity, the web of relations it supports, and the rhythm of its cycles, they develop an appreciation for and sense of kinship with their surroundings. Place-based education is an important component of "Smart by Nature" schooling. Well-known, well-loved places have the best chance to be protected and preserved so that they may be cherished and cared for by future generations of students.

Students can understand a community better by seeing it through the eyes of people who live and work there and will continue to care about it after the students have graduated and moved away. In the Sustainable Lawrence community organization in New Jersey, students and staff from Lawrenceville School take their cues from local residents, who define the sustainability priorities. Students in a Green Building and Design class at Lopez Island School in Washington participate in an affordable housing project, studying green building techniques, working alongside the people who will live in the houses, and learning about the social issues that make expansion of affordable housing necessary.

Promise of Place, a project of the Center for Place-Based Learning and Community Engagement, summarizes some of the benefits of place-based learning:

> Higher scores on standardized measures of academic achievement (reading, writing, math, science, social studies, GPA); improved behavior in class, greater

pride and ownership in their accomplishments; increases in self-esteem, conflict resolution, problem solving; higher-level thinking skills; teachers become more excited and motivated to develop curriculum, more likely to use local resources for teaching and learning, and are more engaged with students.[13]

Systems Thinking: Shifts in Perception

Understanding ecological principles requires thinking in terms of systems. When nature is our teacher, we see connections everywhere. As John Muir famously wrote, "When we try to pick out anything by itself, we find it hitched to everything else in the universe."[14] In education, though, we are often trying to unhitch everything in order to study the separate parts.

Systems thinking is an antidote to this fragmentation. However, some educators find the idea of systems thinking daunting, in part because the term can denote many different things. In *Schools That Learn,* business and education writer Art Kleiner observes that " 'systems thinking' has been used, in the last two decades, to refer to a confusing array of tools, methods, and practices." He identifies a "viable continuum of systems thinking practices, all with different degrees of rigor, different approaches, and different views of the nature of a system."[15]

Some of the approaches on Kleiner's continuum are rooted in the study of feedback processes derived from engineering, others in nonlinear mathematics and computer modeling. The work of the Center for Ecoliteracy being discussed here is influenced most by Living Systems Theory, as described by theorists including Capra, Humberto Maturana, Francisco Varela, Joanna Macy, and Margaret Wheatley.[16] According to this theory, individual "things" in nature or in society (cells, plants, people, schools, watersheds, economies) cannot be fully understood apart from the systems in which they exist. Moreover, living systems develop and evolve, generating "emergent properties" that are not predictable from the properties of their individual parts, much as the wetness of water cannot be predicted by adding together the properties of hydrogen and oxygen or the tensile strength of steel exceeds the combined strengths of iron and nickel.[17]

Taking a systems approach has important implications for pedagogy and for organizational decision making and practices. Thinking systemically entails several shifts in perception or emphasis, especially for those whose intellectual grounding is the Western scientific, analytic tradition. These shifts are not either/or alternatives, but rather movements along a continuum. They can lead to different ways to teach, evaluate, govern, and effect institutional change.

From Parts to the Whole

By shifting focus from the parts to the whole, schools can help students better grasp the world as they encounter it. Gardens are such an effective setting for teaching because students can directly experience ecological processes in the whole, connected ways they occur in nature rather than in partial, stylized drawings

or descriptions in books. "In high school, we tend to be compartmentalized in our approach to the curriculum," says one biology teacher. "We're trying [at our school] to move in the opposite direction—toward greater integration. In biology classes, we teach about the cycles of carbon and nitrogen through ecosystems. What better way to study those cycles than in the garden composting system?"[18]

A shift in emphasis from parts to whole can result in shifting attention from isolated subjects to integrated curricula and in encouraging scheduling variations, such as moving from individual class periods to block scheduling.

Similarly, long-lasting institutional change is usually more likely if it occurs at the level of the whole school or the district rather than in individual classrooms, one reason that the Center for Ecoliteracy highly encourages participants in its seminars to enroll as schoolwide or district teams.

From Objects to Relationships

In systems, the relationships between individual parts may be as important as the parts themselves. In the systems view, the "objects" of study are often networks of relationships. Farmer/philosopher/writer Wendell Berry uses the analogy of a healthy organ acting within the body. The organ does not "give" health to the body, but is a part of its health: "The health of organ and organism is the same, just as the health of organism and ecosystem is the same."[19]

"Smart by Nature" schooling includes learning to think in terms of relationships, connectedness, and context. For example, the School of Environmental Studies is an eleventh- and twelfth-grade school of choice in Apple Valley, Minnesota. The "Environmental Studies" in its name is broadly understood; the term as used by the school could as easily mean "relationship studies" or "community studies." The core of the school's curriculum is interdisciplinary investigation of the relationships that constitute the natural and human worlds. Studies are organized around a series of overarching questions, from asking what it takes for individuals to create a successful school community to wilderness expeditions investigating organisms' adaptations to their environments to asking, "What are the relationships between changes in population and quality of life?" or "How do legal and political systems affect sustainability?"[20]

This shift in perspective emphasizes relationship-based processes such as cooperation and consensus. Though it can feel counterintuitive to action-oriented school reformers, it's sometimes necessary to spend considerable time cultivating relationships among stakeholders before ever addressing objectives or agendas for change. Schools' governance and decision-making processes become important parts of the education that takes place outside the classroom. Successful schools often act as "apprentice communities" for learning the arts of living in an interdependent world.[21] By example and design, children learn by experiencing cooperation, tolerance, empathy, caretaking, and mutual support.

From Objective Knowledge to Contextual Knowledge

This shift may be facilitated through project-based and place-based learning instead of prescriptive curricula. Different people define "project-based learning" in different ways. The process usually contains some combination of curriculum structured around the requisite knowledge and skills to complete a "real-world" project: a high degree of student initiative, leadership, and participation in selecting projects; learning in which results are not predetermined or fully predictable; teachers as resources or fellow learners rather than dispensers of knowledge; and attention to skills such as setting goals and priorities, managing time, and working with others.

Teaching in a project-based program can be both challenging and highly rewarding to teachers, especially while attending to required content standards. For instance, teachers in the Garden Project at Troy Howard Middle School in Belfast, Maine, address 90 percent of the seventh-grade curriculum in social studies, 30 percent of art, and 20 percent of math, language arts, and science through projects related to growing, processing, and marketing produce from the school's extensive gardens. The math teacher needs to have a repertoire of lessons ready as projects develop (X and Y coordinates when it's time to lay out beds, measurement and calculation of formulas when it's time to till the plots and add soil amendments, etc.). She can do that, says the program's cofounder, "because she really knows her subject and can recognize how an activity can be turned into a lesson that meets the needs of students and standards.... You really need to know the curriculum much better than a regular teacher does, in order to be prepared to make a lesson out of whatever comes up."[22]

From Quantity to Quality

Western science has often focused on things that can be measured and quantified. It has sometimes been implied that phenomena that can be measured and quantified are more important—and perhaps even that what cannot be quantified doesn't exist at all. Some aspects of systems, however, like the relationships in a food web, a school, or a community, cannot be measured. Rather, they must be mapped. Some qualities crucial to sustainable living, such as social justice or a feeling of kinship with the natural world, cannot be quantified.

"The 'environmental crisis,' " writes Wendell Berry,

> ... has happened because the human household or economy is in conflict at almost every point with the household of nature.... If, in the human economy, a squash on the table is worth more than a squash in the field, and a squash in the field is worth more than a bushel of soil, that does not mean that food is more valuable than soil; it means simply that we do know *how* to value the soil. In its complexity and its potential longevity, the soil exceeds our comprehension; we do not know how to place a just market value on it, and we will never learn how. Its value is inestimable; we must value it, beyond any price we put on it, by *respecting* it.[23]

The ongoing debate about standardized testing in schools is a reminder of the difficulty of employing quantitative means to measure complex qualitative

outcomes. New York University scholar and former Assistant Secretary of Education Diane Ravitch was an enthusiastic proponent of No Child Left Behind before becoming one of it most vocal critics. She writes, "When we define what matters in education only by what we can measure, we are in serious trouble. When that happens, we tend to forget that schools are responsible for shaping character, developing sound minds in healthy bodies (*mens sana in corpore sano*), and forming citizens for our democracy, not just for teaching basic skills."[24] Meanwhile, millions of dollars and hours are devoted to drilling students in test-taking strategies rather than the skills and knowledge that the tests are intended to measure.

The challenge for sustainability educators is to devise more adequate means of displaying competency than scores on paper-and-pencil tests. The senior year at the School of Environmental Studies, for instance, culminates in a three-part capstone: a community project that will remain as a legacy when the student graduates, a forum at which students demonstrate their skill at persuading a public audience about an issue that they feel strongly about, and an articulation before their peers of their answer to the ethical question "How, then, shall we live?"[25]

From Structure to Process

Living systems develop. Understanding these systems requires a shift in focus from the structure of organisms and institutions to processes such as evolution, renewal, and change, important concepts for understanding ecological principles. In the classroom, this shift can mean teaching students that how they solve a problem is more important than the answer.

Comprehending the dynamics of change in living systems helps leaders of institutions (including schools) to become more effective, and contributes to the education of students preparing to become leaders. Large-scale changes often begin as small, local actions or information that disturbs the system. According to Living Systems Theory, natural and social systems generally remain in a stable state, while energy, matter, communications, and ideas flow through them. That's why they resist change.

Occasionally, though, a system will encounter a point of instability that precipitates a breakdown or the appearance of new forms. If the system cannot integrate the new status or information, the organization will either collapse or change its structure, practices, or beliefs. The resulting "emergent change" comes not from one person, but from the organization's collective creativity. Leaders can facilitate emergent change and support the institution's capacity for creativity by building up and nurturing its networks of connection and communication, by creating a climate of trust and mutual support, and by encouraging questioning and rewarding innovation. Effecting change sometimes requires that leaders *loosen* their apparent control and take the risk of dispersing authority and responsibility more widely.

Marin Academy in San Rafael, California, experienced what its head at the time, Bodie Brizendine, later called a top-to-bottom "change in consciousness"

around sustainability. It was sparked by a seemingly minor event when a new trustee observed the lack of recycling at a school event. Brizendine responded with, "Wonderful! What do you want to do about it?"[26] That openness led to the emergence of a schoolwide Eco-Council, to which Brizendine gave status and legitimacy by encouraging trustees to join and by appointing key administration personnel, including the business manager and the service learning coordinator, as members. From that small beginning change reverberated through the school's curriculum, student life, governance, and long-term planning.

From Contents to Patterns

Within systems, certain configurations appear repeatedly in patterns such as cycles and feedback loops. Understanding how a pattern works in one system helps us to understand other systems that manifest the same pattern. For instance, recognizing how flows of energy shape a natural ecosystem may illuminate the impact of flows of information in a social system.

This shift has some surprising additional implications for education, according to Capra. "Whether we talk about literature and poetry, the visual arts, music, or the performing arts, there's hardly anything more effective than art for developing and defining a child's natural ability to recognize and express patterns."[27] Among other things, he notes, every time the study of pattern has been at the forefront of scientific theory, artists, such as Leonardo da Vinci and Wolfgang von Goethe, have made significant contributions. "This is very important to us as parents and educators, because the study of pattern comes naturally to children; to visualize pattern, to draw pattern, is natural. In traditional schooling this has not been encouraged."[28]

River of Words, a California-based project founded by writer/educator Pamela Michael and then-U.S. Poet Laureate Robert Hass, puts this principle into practice through an international poetry and art competition, the largest in the world. What happens, asks Michael, when you invite students

> . . . to "imagine" real places, to find poetry in water and earth and stone — not just to explore the beauty of a place, but to feel their connection to it? You get children finding their places in the natural world, children who know that water doesn't just come from a tap, who can name the plants and animals around them, understand the challenges of living sustainably on the Earth, and gain the tools and imagination to address those challenges. You get children who know their "ecological addresses" as well as the names of their streets and towns. You get hope.[29]

Core Competencies

The goal of education conducted according to these principles is cultivation of competencies students need for living in sustainable communities. Knowledge and intellectual understanding are crucial, but they are never enough. Students also need to be able to adapt their knowledge to new circumstances, using it to solve problems and to apply ecological knowledge in practice. Creating and maintaining sustainable

communities may entail hard work over long periods, in the face of conflicting interests and passionate advocates. The strength to persist and the ability to succeed will call for deeply felt, not just understood, concerns, commitments, and grounding.

Preparing young people for sustainable living requires educators who can touch and influence the whole student, including his or her values, abilities, and relationship to the natural world. The Center has identified a set of core competencies—of head, heart, hands, and spirit—which help define outcomes of Smart by Nature teaching and learning:

Head (Cognitive)
- Approach issues and situations from a systems perspective
- Understand fundamental ecological principles
- Think critically, solve problems creatively, and apply knowledge to new situations
- Assess the impacts and ethical effects of human technologies and actions
- Envision the long-term consequences of decisions

Heart (Emotional)
- Feel concern, empathy, and respect for other people and living things
- See from and appreciate multiple perspectives; work with and value others with different backgrounds, motivations, and intentions
- Commit to equity, justice, inclusivity, and respect for all people

Hands (Active)
- Create and use tools, objects, and procedures required by sustainable communities
- Turn convictions into practical and effective action, and apply ecological knowledge to the practice of ecological design
- Assess and adjust uses of energy and resources

Spirit (Connectional)
- Experience wonder and awe toward nature
- Revere the Earth and all living things
- Feel a strong bond with and deep appreciation of place
- Feel kinship with the natural world and invoke that feeling in others

Head-Royce School in Oakland, California, in consultation with the Center for Ecoliteracy, adopted a set of principles of ecoliteracy based on these competencies, toward the end of nurturing students' understanding of ecology, concern for the well-being of the Earth, commitment to living sustainably, and reverence for the natural world.[30] The faculty conducted a schoolwide curriculum audit to identify starting points where faculty members were already teaching concepts related to sustainability.

"This made it seem like it didn't all have to be such a big deal," says academic dean Crystal Land. "No teacher felt that he or she had to go back and trash an American lit course and make it all about Thoreau."[31] Rather, the faculty used their principles of ecology to look at existing subjects through a different lens.

Then teachers conducted their own curriculum reviews, identified access points to tweak the current curriculum using the new principles, and began identifying ways to build the principles into future lessons, units, and courses. Some of their results two years into this process can be seen in a lovely YouTube video, "Principles of Ecology in Our Curriculum: For Now, Paying Attention To What Is," illustrating application of the principles of ecoliteracy in the English and history departments.[32] In concert with the curriculum review and revision, the school chose four principal areas of improvement around sustainability: solid waste reduction and recycling, energy conservation, water conservation, and pollution prevention.

The experience at Head-Royce reinforces the conclusion that schooling for sustainability, as important as it is for equipping students to understand and address ecological challenges, is also a means toward a more satisfying teaching experience. Says history and government teacher Karen Bradley,

> Schooling for sustainability has seeped into my consciousness. I've created some units explicitly around environmental themes. But even more, I've shifted the emphasis on curriculum that already existed or fleshed it out with environmental themes in a way that is really fun and interesting and positive. For example, today we were talking about imperialism and Teddy Roosevelt and watched a documentary about his initiative setting aside land for national parks. I stopped the video and said let's talk about Roosevelt versus [John] Muir, about conservation versus preservation. It was off-the-cuff but it worked.

"I think," she added, "it's that combination of new curriculum units and taking a new perspective on existing ones that makes teaching genuinely inspirational for kids. It's a different way of thinking that makes a class zing."[33]

Notes

[1] David. W. Orr, "What Is Education For?" in *Earth in Mind* (Washington, Covelo, and London: Island Press, 2004), 7-15.

[2] Michael K. Stone, *Smart by Nature: Schooling for Sustainability* (Healdsburg, CA: Watershed Media, 2009).

[3] Zenobia Barlow, Preface, in Stone, viii.

[4] http://www.unesco.org/en/esd/ (accessed July 23, 2010).

[5] Michael Pollan, "Our Decrepit Food Factories," *New York Times Magazine*, December 16, 2007, http://www.nytimes.com/2007/12/16/magazine/16wwln-lede-t.html.

[6] See, for example, Western Washington University professor Victor Nolet: "Although not necessarily incompatible with the larger ideas associated with sustainability, narrower uses of the term *sustainable* to refer exclusively to environmental impacts underrepresent the broader perspective that sustainability entails." Victor Nolet, "Preparing Sustainability-Literate Teachers," *Teachers College Record,* Volume 111, Number 2, 2009, http://www.

tcrecord.org/content.asp?contentid=15177 (accessed July 6, 2010).

[7] Fritjof Capra, "How Nature Sustains the Web of Life," in Michael K. Stone and Zenobia Barlow, eds., *Ecological Literacy: Educating Our Children for a Sustainable World* (San Francisco: Sierra Club Books, 2005), viii-xv.

[8] Stone, 9.

[9] Stone, 64.

[10] Stone, 125.

[11] Green Schools Initiative, "7 Steps to a Green School," http://www.greenschools.net/article.php?id=70.

[12] Stone, 173.

[13] http://promiseofplace.org/Research_Evaluation/50.

[14] John Muir, *My First Summer in the Sierra* (Boston: Houghton Mifflin, 1911), Sierra Club Books, 1988, 110.

[15] Art Kleiner, "The Continuum of 'Systems Thinking,' " in Peter Senge, et al., *Schools That Learn: A Fifth Discipline Fieldbook for Educators, Parents, and Everyone Who Cares about Education* (New York: Doubleday/Currency, 2000), 79.

[16] See especially Fritjof Capra, *The Web of Life: A New Scientific Understanding of Living Systems* (New York: Anchor Books, 1996) and *The Hidden Connections: A Science for Sustainable Living* (New York: Anchor Books, 2002); Joanna Macy, *Coming Back to Life: Practices to Reconnect Ourselves, Our World* (Gabriola Island, BC: New Society Publishers, 1998); Margaret Wheatley, *Leadership and the New Science: Discovering Order in a Chaotic World* (San Francisco: Berrett-Koehler Publishers, 2006).

[17] Macy, 41.

[18] Stone, 131.

[19] Wendell Berry, "Solving for Pattern," in *The Gift of Good Land* (New York: North Point Press, 1982), 134-145.

[20] Stone, 120.

[21] Geoffrey Caine and Renate Nummela Caine, "How the Brain Learns," in Zenobia Barlow, ed., *Ecoliteracy: Mapping the Terrain* (Berkeley: Learning in the Real World, 2000), 51-57.

[22] Stone, 36.

[23] Wendell Berry, "A Nation Rich in Natural Resources," in *What Matters: Economics for a Renewed Commonwealth* (Berkeley: Counterpoint, 2010), 73.

[24] Diane Ravitch, *The Death and Life of the Great American School System: How Testing and Choice Are Undermining Education* (Basic Books, 2009), 167.

[25] Stone, 121.

[26] "Changing the Community's Consciousness," in Stone, 128-133.

[27] Fritjof Capra, "Speaking Nature's Language," in Stone and Barlow, 18-29.

[28] Fritjof Capra, "Ecology and Community," http://www.ecoliteracy.org/essays/ecology-and-community.

[29] Pamela Michael, "Falling in Love with the Earth," in Stone and Barlow, 112.

[30] http://www.headroyce.org/page.cfm?p=51 (accessed July 7, 2010).

[31] "Greening a K–12 Curriculum," in Stone, 181.

[32] http://www.youtube.com/watch?v=YXnLLVdPwbE&NR=1&feature=fvwp (accessed July 7, 2010).

[33] Lisa Bennett, "Where Teaching and Learning Come Alive," in Stone, 153.