

Environmental Literacy: Education as if the Earth Mattered

by David Orr

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After due reflection on the state of education in his time, H. L. Mencken concluded that significant improvement required only that the schools be burned to the ground and the professoriate hanged. For better or worse, the suggestion was largely ignored. Made today, however, it might find a more receptive public ready to purchase the gasoline and rope. Americans, united on little else, seem of one mind in believing that the educational system K through Ph.D. is too expensive, too cumbersome, and not, on the whole, very effective. They believe that it needs radical reform. They are divided, however, on how to go about it. On one side of the debate are those who argue that the failure is due mostly to the lack of funding for laboratories, libraries, equipment, salaries, and new buildings—a view held most avidly, not surprisingly, by professional educators. On the other side are those such as Benno Schmidt, the former president of Yale University, who propose to abandon much of the present system of schools and create a national system of for-profit schools.

Both sides of the debate agree, nonetheless, on the basic aims and purposes of education, which are, first, to equip our nation with a “world class” labor force in order to compete more favorably in the global economy and, second, to provide each individual with the means for maximum upward mobility. About these, the purposes of education both higher and lower, there is great assurance.

Yet there are better reasons to rethink education that have to do with issues of human survival, which will dominate the world of the twenty-first century. The generation now being educated will have to do what we, the present generation, have been unable or unwilling to do: stabilize a world population that is growing at the rate of a quarter of a million each day; stabilize and then reduce the emission of greenhouse gases, which threaten to change the climate—perhaps disastrously; protect biological diversity, now declining at an estimated rate of one hundred to two hundred species per day; reverse the destruction of rainforests (both tropical and temperate), now being lost at the rate of one hundred and sixteen square miles or more each day; and conserve soils, now being eroded at the rate of sixty-five million tons per day. Those

who follow us must learn how to use energy and materials with great efficiency. They must learn how to utilize solar energy in all its forms. They must rebuild the economy in order to eliminate waste and pollution. They must learn how to manage renewable resources for the long term. They must begin the great work of repairing, as much as possible, the damage done to the earth in the past two hundred years of industrialization. And they must do all of this while addressing worsening social and racial inequities. No generation has ever faced a more daunting agenda.

For the most part, however, we are still educating the young as if there were no planetary emergency. Remove computers, a scattering of courses throughout the catalog, and a few programs, and the curriculum of the 1990s looks a lot like that of the 1950s. But the crisis we face is first and foremost a crisis of mind, perception, and values—hence, a challenge to those institutions presuming to shape minds, perceptions, and values. It is an educational challenge.

More of the same kind of education that enabled us to industrialize the earth can only make things worse. This needs to be stated strongly to underscore the fact that the environmental crisis is not primarily the work of the ignorant and uneducated; rather, it is that of so-called well-educated people who, in Gary Snyder’s words in *The Practice of the Wild*, “make unimaginably large sums of money, people impeccably groomed, excellently educated at the best universities—male and female alike—eating fine foods and reading classy literature, while orchestrating the investment and legislation that ruin the world.” These are people who have been educated to think that human domination of nature is our rightful destiny. I am not making an argument against education but rather an argument for the kind of education that prepares people for lives and livelihoods suited to a planet with a biosphere that operates by the laws of ecology and thermodynamics.

The skills, aptitudes, and attitudes necessary to industrialize the earth are not necessarily the same as those that will be needed to heal the earth or to build durable economies and good communities. Resolution of the great ecological challenges of the next century will require us to reconsider the substance, process, and purposes of education at all levels and to do so, as Yale historian Jaroslav Pelikan writes in *The Idea of a University: A Reexamination*, “with an intensity and ingenuity matching that shown by previous generations in obeying the command to have dominion over the planet.” But Pelikan himself doubts whether the university “has the capacity to meet a crisis that is not only ecological and technological, but ultimately educational and

moral.” Why should this be so? Why should those institutions charged with the task of preparing the young for the challenges of life be so slow to recognize and act on the major challenges of the coming century?

A clue can be found in a small book called *Universities and the Future of America*, written by Derek Bok, the former President of Harvard University. Bok writes:

Our universities excel in pursuing the easier opportunities where established academic and social priorities coincide. On the other hand, when social needs are not clearly recognized and backed by adequate financial support, higher education has often failed to respond as effectively as it might, even to some of the most important challenges facing America. Armed with the security of tenure and the time to study the world with care, professors would appear to have a unique opportunity to act as society’s scouts to signal impending problems. . . . Yet rarely have members of the academy succeeded in discovering emerging issues and bringing them vividly to the attention of the public. What Rachel Carson did for risks to the environment, Ralph Nader for consumer protection, Michael Harrington for problems of poverty, Betty Friedan for women’s rights, they did as independent critics, not as members of a faculty.

This observation appears on page 105 of the book and is not mentioned again. It should have been on page one and would have provided the subject for a better book. Had Bok gone further, he might have been led to ask whether the same charge of lethargy might be made against those presuming to lead American education. He might also have been led to rethink old and unquestioned assumptions about liberal education. For example, John Henry Newman, in his classic *The Idea of a University*, drew a distinction between practical and liberal learning that has influenced education from his time to our own. Liberal knowledge, according to Newman, “refuses to be informed by any end, or absorbed into any art.” Knowledge is liberal if “nothing accrues of consequence beyond the using.” “Liberal education and liberal pursuits,” he wrote, “are exercises of mind, of reason, of reflection.” All else he regarded as practical learning, which had no place in the liberal arts.

To this day Newman’s distinction between practical and liberal knowledge is seldom transgressed in liberal arts institutions. Is it any wonder that faculty, mindful of the penalties for transgressions of one sort or another, do not often deal boldly with the kinds of issues that Bok describes? I do not wish to excuse faculty, but I would like to note that educational institutions more often than not reward indoor thinking, careerism, and safe conformity to

prevailing standards, all of which maintain the split between liberal and practical knowledge.

Harvard philosopher and mathematician Alfred North Whitehead had a different view of the liberal arts. “The mediocrity of the learned world,” he wrote in 1929 in *The Aims of Education*, could be traced to its “exclusive association of learning with book-learning.” Real education required “first-hand knowledge,” by which he meant an intimate connection between the mind and “material creative activity.” Others, like John Dewey and J. Glenn Gray, reached similar conclusions. In *Re-Thinking American Education*, Gray wrote, “Liberal education is least dependent on formal instruction. It can be pursued in the kitchen, the workshop, on the ranch or farm . . . where we learn wholeness in response to others.” A genuinely liberal education, in other words, ought to be liberally conducted, aiming to develop the full range of human capacities. And institutions dedicated to the liberal arts ought to be more than mere agglomerations of specializations.

Had Bok cared to proceed even further, he would have had to address the loss of moral vision throughout higher education. Stan Rowe writes in *In Home Place: Essays on Ecology* that the university has “shaped itself to an industrial ideal—the knowledge factory. Now it is overloaded and top-heavy with expertness and information. It has become a know-how institution when it ought to be a know-why institution. Its goal should be deliverance from the crushing weight of unevaluated facts, from bare-bones cognition or ignorant knowledge: knowing in fragment, knowing without direction, knowing without commitment.” Many years ago William James saw this coming and feared that the university might one day develop into a “tyrannical Machine with unforeseen powers of exclusion and corruption.” We are moving along that road and should ask why this has come about and what can be done to change it.

One source of the corruption is the marriage between the academy and the worlds of power and commerce. This marriage was first proposed by Francis Bacon, though it was not fully consummated until the Manhattan Project during World War II. But marriage, implying affection and mutual consent, is perhaps not an accurate metaphor. The union is, rather, a cash relationship, beginning with a defense contract here and a research project there. At present, not a few university departments still work as adjuncts of the Pentagon and others as adjuncts to industry, in the hope of reaping billions of dollars in fields such as genetic engineering, nanotechnologies, agribusiness, and computers. Even where this is not true, it is difficult to escape the conclusion that much of what passes

for research, as historian Page Smith writes in *Killing the Spirit*, is “essentially worthless . . . busywork on a vast almost incomprehensible scale.”

Behind the glossy facade of the modern academy there is often a vacuum of purpose waiting to be filled by whomever and whatever. For example, as reported by Gene Logsdon (in “Death of a Sacred Cow,” *Ohio*, May 1992) the College of Agriculture at a land-grant university of note claims to be helping “position farmers for the future.” But when asked what farming would be like in the twenty-first century, the Dean of the College replied, “I don’t know.” Asked, “How can you [then] position yourself for it?” the Dean replied, “We have to try as best we can to plan ahead.” This reminds me of the old joke in which the airline pilot reports to the passengers that he has good news and bad news. The good is that the flight is ahead of schedule; the bad is that they are lost. Ironically, in a time of eroding soils and declining rural communities, “turf grass management” is the hot new item at this College of Agriculture.

Finally, had Bok so chosen, he would have been led to question how we define intelligence and what that might imply for our definition of an “educated” person. From an ecological perspective it is clear that we have often confused cleverness and intelligence. Cleverness, as I understand it, tends to fragment things and to focus on the short term. The epitome of cleverness is the specialist whose intellect and person have been shaped by the demands of a single function. Ecological intelligence, on the other hand, requires a broader view of the world and a long-term perspective. Cleverness can be adequately measured by SAT and GRE tests, but intelligence is not so easily computed. In time, I think we will come to see that true intelligence tends to be integrative and often works slowly while mulling things over. Further, intelligence can be inferred, according to Wendell Berry in *Standing By Words*, from the “good order or harmoniousness of [one’s] surroundings.” In other words, the consequences of our actions are a measure of our intelligence, and the plea of ignorance is no good defense. Because some consequences cannot be predicted, the exercise of intelligence requires forbearance and a sense of limits. Ecological intelligence, in contrast to mere cleverness, does not presume to act beyond a certain scale at which effects can be known and unpredictable consequences would not be catastrophic.

The modern fetish with smartness is no accident. The highly specialized, narrowly focused intellect fits the demands of instrumental rationality built into the industrial economy, and for reasons described by Brooks Adams eighty years ago (and quoted by Page

Smith in *Dissenting Opinions*), “Capital has preferred the specialized mind and that not of the highest quality, since it has found it profitable to set quantity before quality to the limit the market will endure. Capitalists have never insisted upon raising an educational standard save in science and mechanics, and the relative overstimulation of the scientific mind has now become an actual menace to order.” The demands of building good communities within a sustainable society within a just world order will require more than the specialized, one-dimensional mind and more than instrumental cleverness.

For perspective, let me add that the only people who have lived sustainably on the earth without damaging it could not read. This does not mean they were ignorant. To the contrary, they had enormous amounts of knowledge. Indigenous peoples’ knowledge of their ecosystems is extensive. We will never be able to match it. Some ancient agricultural systems were exquisite ecological creations. The ways in which people are educated make all the difference. All previous peoples who had sustainable cultures wove education and research together within the vessel of community. Our culture has taken education and research out of community and broken that vessel.

Looking ahead to the twenty-first century, the task of building a sustainable world order will require dismantling the jerry-built scaffolding of ideas, philosophies, and ideologies that constitutes the modern curriculum. Five measures are necessary to do this.

First, we must develop more comprehensive and ecologically solvent standards for truth. The architects of the modern worldview, notably Galileo and Descartes, assumed that those things that could be weighed, measured, and counted were more true than those that could not be quantified. If it couldn’t be counted, in other words, it didn’t count. Cartesian philosophy was full of potential ecological mischief, a potential that Descartes’ heirs developed to its fullest. His philosophy separated humans from the natural world, stripped nature of its intrinsic value, and segregated mind from body. Descartes was at heart an engineer, and his legacy to the environment of our time is the cold passion to remake the world as if we were merely remodeling a machine. Feelings and intuition have been tossed out along with those fuzzy, qualitative parts of reality such as aesthetic appreciation, loyalty, friendship, sentiment, charity, and love.

These assumptions are not as simple or as inconsequential as they might have appeared in Descartes’ lifetime (1596-1650). A growing

number of scientists now believe, with Stephen Jay Gould, that “we cannot win this battle to save [objectively measurable] species and environments without forging an [entirely subjective] emotional bond between ourselves and nature as well—for we will not fight to save what we do not love” (“Enchanted Evening,” *Natural History*, Sept. 1991).

If saving species and environments is our aim, we will need a broader conception of science and a more inclusive rationality that joins empirical knowledge with the emotions that make us love and sometimes fight. Alfred North Whitehead noted the difference in Science and the Modern World: “When you understand all about the sun and all about the atmosphere and all about the rotation of the earth, you may still miss the radiance of the sunset. There is no substitute for the direct perception of the concrete achievement of a thing in its actuality. We want concrete fact with a high light thrown on what is relevant to its preciousness.”

Karl Polanyi described this as “personal knowledge” in his book of that name, by which he meant knowledge that calls forth a wider range of human perceptions, feelings, and intellectual powers than those presumed to be narrowly “objective.” Personal knowledge, in Polanyi’s words, “is not made but discovered . . . It commits us, passionately and far beyond our comprehension, to a vision of reality. Of this responsibility we cannot divest ourselves by setting up objective criteria of verifiability—or falsifiability, or testability . . . For we live in it as in the garment of our own skin. Like love, to which it is akin, this commitment is a ‘shirt of flame,’ blazing with passion and, also like love, consumed by devotion to a universal demand. Such is the true sense of objectivity in science.”

Cartesian science rejects passion and personality but, ironically, can escape neither. Passion and personality are embedded in all knowledge, including the most ascetic scientific knowledge informed by the passion for objectivity. Descartes and his heirs simply had it wrong: there is no way to separate feeling from knowledge or object from subject; there is no good way to separate mind or body from its ecological and emotional context. It may even be the case—as Donald Griffin, among others, is coming to suspect and as he states in *Animal Minds*—that intelligence is not a human monopoly. Science without passion and love can give us no good reason to appreciate the sunset, nor can it give us any purely objective reason to value life. These must come from deeper sources.

Second, we must challenge the hubris buried in the ~~hidden~~ curriculum which assumes that human domination of nature is good, that the growth

economy is natural, that all knowledge, regardless of its consequences, is equally valuable, and that material progress is our right. Because we hold these beliefs, we suffer a kind of cultural immune-deficiency anemia that renders us unable to resist the seductions of technology, convenience, and short-term gain. In this perspective, the ecological crisis is a matter of discerning between “life and death, blessing and cursing,” as the writer of Deuteronomy put it, and of learning to choose life. It is a test of our loyalties and of our deeper affinities for the living world, what E. O. Wilson calls “biophilia.”

Third, we must address the fact that the modern curriculum teaches a great deal about individualism and rights but teaches little about citizenship and responsibilities. The ecological emergency can be resolved only if enough people come to hold a bigger idea of what it means to be a citizen, and this knowledge will have to be taught carefully at all levels of education. Unfortunately, a pervasive cynicism about our higher potentials and collective abilities now works against us. Even my most idealistic students often confuse self-interest with selfishness, a mistake that allows both Mother Theresa and Donald Trump to be described as self-maximizers, both merely “doing their thing.”

This is not just a social and political problem. The ecological emergency is about the failure to comprehend our citizenship in the biotic community, as Aldo Leopold noted in *A Sand County Almanac*. From the modern perspective we should see clearly how utterly dependent we are on the wider community of life. Our political language gives little hint of this dependence. The word “patriotism,” for example, is devoid of ecological content. It must come to mean how we use our land, forests, air, water, and wildlife. To abuse natural resources, to erode soils, to destroy natural diversity, to waste, to take more than one’s fair share, or to fail to replenish what has been used must someday come to be regarded as unpatriotic. And “politics” must once again come to mean, as Vaclav Havel puts it in *Summer Meditations*, “serving the community and serving those who will come after us.” Our notions of citizenship and politics are anemic in large measure because our language has been corrupted by those who have stood to gain a great deal if words could be compromised. A primary task of educators and teachers is to restore integrity to language in order that we might reclaim the commonwealth that rightfully belongs to all of us.

Fourth, we must question the widespread assumption that our future is one of constantly evolving technology and that this is a good thing. Those who call this faith into question are

dismissed as Luddites by people who, as far as I can tell, know little or nothing about the real history of Luddism. Faith in technology is built into nearly every part of the curriculum as a kind of blind acceptance of the notion of progress. When pressed, however, true believers describe progress to mean not a consciously chosen path but a mindless, uncontrollable technological juggernaut moving through history. Increasingly, such assumptions are being incorporated into our methods of pedagogy without much serious question. Computer literacy, for instance, has become a national goal, pushed more often than not by people who have something to sell. This technological fundamentalism deserves to be questioned. Is technological change taking us where we want to go? What effect does technology have on our imagination and particularly on our social, ethical, and political imagination? And what net effect does it have on our ecological prospects?

We need an ecological imagination with which we can envision restored landscapes, renewed ecosystems, and whole people living in a whole biosphere. Yet in a technological age it should come as no surprise that our imagination is increasingly confined to technological possibilities: faster and more powerful computers, television, virtual reality generators, genetic engineering, nanotechnologies. In *The Road to Wigan Pier* George Orwell warned that the “logical end” of technological progress “is to reduce the human being to something resembling a brain in a bottle.” Behold, fifty years later there are now those who propose to develop the necessary technology to “download” the contents of the mind into a robot-like machine/body (Moravic). Orwell’s nightmare is coming true, thanks in no small part to research conducted in our proudest universities. Such research stands in sharp contrast to our real needs. We need decent communities, good work to do, loving relationships, stable families, and a way to transcend our inherent self-centeredness. Our needs, in short, are those of the spirit, yet our imagination and creativity are overwhelmingly aimed at things.

There is a fifth challenge looming on the horizon, one that strikes at the oldest and most comfortable assumption of all: that education can take place only in “educational” institutions. During a recent social gathering I was bluntly informed by a Fortune 500 executive that corporations, now engaged in what they take to be education, will put many schools and colleges out of business in the next two decades. This is a warning to which teachers and administrators should listen, and for the same reasons that General Motors should have listened had a Toyota executive said something similar around, say, 1970. Colleges and universities are

expensive, slow moving, often unimaginative, and weighted down by the burdens of self-congratulation and tradition. They offer a discipline-centric curriculum that corresponds modestly with reality. The grip colleges and universities now have on “education” will be broken when young people discover alternatives that are far cheaper, faster, and better adapted to economic realities. The rub is that corporations will not educate liberally. Instead, they will offer something more akin to hi-tech job training. But that will not matter much to the growing number unable to afford the expense of a liberal arts education; it will matter, however, in terms of our larger prospects, whether people are trained narrowly or educated liberally.

“No important change in ethics,” Aldo Leopold once wrote, “was ever accomplished without an internal change in our intellectual emphasis, loyalties, affections, and convictions.” Ecological education aims to bring about that change in emphasis, loyalties, affections, and convictions necessary to heal the breach between humanity and its habitat. It is less a reform tinkering at the margins of the status quo than a jailbreak from old assumptions, from the straitjacket of discipline-centric curricula, and even from confinement in classrooms and school buildings.

Ecological education will, first, require the reintegration of experience into education, because experience is an indispensable ingredient of good thinking. One way to do this is to use the campus as a laboratory for the study of food, energy, materials, water, and waste flows. Research on the ecological impacts of a specific institution reduces the abstractness of complex issues to manageable dimensions, and it does so on a scale that lends itself to finding solutions, which is an antidote to the despair felt by students when they understand problems but are powerless to effect change. Campuses need to take a closer look at the economic potential of their regions to find out how their money could be spent locally and invested locally to help move the world in a more sustainable direction. For example, students researching food purchases at several liberal arts colleges helped their food services to replace distant suppliers with ones closer to the campus while reducing costs, improving food quality, and helping the local economy. At Oberlin, where I teach, students acquired data on campus resource flows and presented recommendations to the administration, some of which are being implemented at a significant savings to the college.

We need to go further. The old curriculum is shaped around the goal of extending human dominion over the earth to its fullest extent. The

new curriculum must be organized around what can be called the “ecological design arts,” around developing the analytic abilities, ecological wisdom, and practical wherewithal essential to making things fit in a world of microbes, plants, animals, and entropy. Ecological problems are in many ways design problems: our cities, cars, houses, and technologies often do not fit in the biosphere. Ecological design requires the ability to comprehend patterns that connect, which means looking beyond the boxes we call disciplines to see things in their larger context. Ecological design is the careful meshing of human purposes with the larger patterns and flows of the natural world; it is the careful study of those patterns and flows to inform human purposes. Competence in ecological design requires spreading ecological intelligence—knowledge about how nature works—throughout the curriculum. It means teaching students the basics of what they will need to know in order to stretch their horizons, to create a civilization that runs on sunlight; uses energy and materials with great efficiency; preserves biotic diversity, soils, and forests; develops sustainable local and regional economies; and restores the damage inflicted on the earth throughout the industrial era.

But we must go further still. I do not know who first proposed dividing the world up into disciplines, but the time has come to think about how we might reconnect things. To do so, I propose that we dedicate part of the curriculum at all levels to the study of a thing or a place in our environment such as a river, a mountain, a valley, a lake, soils, a marsh, a particular animal, birds, the sky, the seashore, or even an entire small town. A course on a local river, for instance, could begin with a float trip down the river to acquaint students with the thing itself. Students might then select different aspects of the river to study, including its evolution, human settlements, ecology, fish and aquatic life, the effects of pollution on it, the laws governing its use, and so forth. The course ought to conclude with a second float trip, during which students describe to one another what they’ve learned.

Things like rivers are real, disciplines are abstract. Real things engage all of the senses, not just the intellect. To understand a river one must master most of what is in the curriculum and some things that are not. To know a river well, moreover, one must feel it, taste it, smell it, swim in it, see it in its different moods, and converse with other people who know it well. Disciplinary knowledge tends to be isolated from tangible realities and is often difficult to connect with concrete ecological realities. I am proposing that students learn to appreciate, respect, and perhaps even love a specific part of the created world before we give them the

power implicit in purely abstract, decontextualized knowledge. If students learn to understand how the world works as a physical system and why this understanding is important for their life prospects and their means of livelihood, they will also know how to make an economy that works.

The point here has to do with where to attach the cart to the horse. Defenders of the conventional curriculum believe that mastery of a discipline leading toward specialized knowledge is an end in itself. I recommend reversing this priority in order to place knowledge in a specific ecological context, to engage all of the senses of the student, not just the intellect, to initiate a romance with the natural world, and perhaps also to teach the limits of knowledge relative to a specific feature of the natural world, which is the beginning of ecological wisdom.

Ecological education will also require changes in the operations and priorities of schools and colleges. For example, in the survey of institutional resource flows mentioned above, students discovered ways in which their institution could reduce costs, improve services, lower environmental impacts, and help the local economy. The principle here is simple: those institutions that purport to induct the young into responsible adulthood ought themselves to be responsible stewards of the world the young will inherit. Colleges and universities often measure themselves by such indicators as endowment per student or percentage of faculty with Ph.D.s; from an ecological perspective, another set of indicators of institutional quality would include:

1. emission of CO₂ per student;
2. percentage of materials recycled;
3. percentage of recycled materials purchased;
4. use of toxic materials;
5. percentage of renewable energy consumed;
6. percentage of organic wastes composted;
7. water use per student;
8. percentage of food served that was organically grown;
9. beef consumed per student.

Beyond reducing environmental impacts, educational institutions could make use of their large budgets to help leverage the emergence of sustainable local and regional economies. Thus, a decision to buy food grown organically on local farms could provide an incentive to local farmers to shift production toward environmentally sustainable methods of farming. The same principle is true throughout most of the range of goods and services purchased by

educational institutions. These institutions are visible and well respected. What they do and how they do it matters to a public looking for leadership. Were a college or university to announce that it intended to take the future seriously enough to reduce its environmental impacts to the lowest possible level and to do so while improving the local and regional economy, people would take notice.

These principles apply similarly to the management of endowment funds. Arguably, the best investment an endowment manager can make is not in one stock or another but in energy efficiency on the campus. For example, reducing the amount of energy consumed by campus lighting to what is now technically possible can return 40 to 60 percent on the investment (equivalent to a payback time of roughly two years). Other improvements in energy efficiency also offer attractive, if lower, rates of return. After installation, the savings from energy efficiency operate much like an endowment for only the cost of maintenance. The same opportunities may be possible for investments in local energy efficiency. In either case, the point is to use the financial power of educational institutions to leverage the emergence of environmentally sound local economies.

We think that education occurs mostly in buildings, yet apparently we believe that the design and operation of those same buildings have nothing to do with education. This assumption is a mistake, partly because it overlooks the hidden curriculum in academic architecture. The design of academic buildings is a kind of crystallized pedagogy full of hidden assumptions about power, about how people learn, how they relate to the natural world, and how they relate to one another. But the design and operation of buildings provide an educational opportunity as well: the art of ecological design encompasses such fields as landscape architecture, solar engineering, the ethics of material selection, the economics of life-cycle costing, and the design of closed-loop waste systems.

Architecture need not convey messages of human dominance over nature. A solar aquatic wastewater system designed by John Todd for the Bourne School in Toronto is a beautiful example of ecological architecture. The system, one of Todd's "living machines," is an ensemble of plants and animals in a series of translucent fiberglass tanks located within the school. Wastewater enters the tanks and exits cleaner than conventionally treated wastewater. Instead of being hidden, the system is prominently visible. It looks like an indoor greenhouse, and, more importantly, it teaches students in a visible and powerful way about closing waste loops and

about how to use natural means to solve real problems that all too often appear beyond remedy.

Finally, I would like to add a word about the goals of ecological education. The value of an education cited most often by its vendors is that it increases the graduate's upward mobility and lifetime earnings.

Accordingly, we aim to prepare the young for what guidance counselors call "careers." We rarely mention what used to be described as a "calling." In a larger perspective, this is foolish. Students ought to be encouraged first to find their calling: that particular thing for which they have deep passion and which they would like to do above all else. A calling is about the person one wants to make of oneself. A career is a coldly calculated plan to achieve security and have a bit of "fun" that turns out, more often than not, to be deeply unsatisfying, whatever the pay. A calling is not the product of calculation but of an inner conversation about what really matters in life and what difference one wants to make in the world. A calling starts as a hunch. It is risky. It operates more by inspiration than by premeditation. A career is a test of one's IQ; a calling not only tests for intelligence but for one's wisdom, character, loyalty, and moral stamina as well. A person can always find a career in a calling, but it is far more difficult later in life to find a calling in a career. Once a person opts for safety, the die is cast. A career is, finally, a failure of imagination and a sign that one believes the world to be poor in possibilities.

We ought to encourage our students to find their calling in good and necessary work. The best and most necessary work for our age involves in a thousand ways the recalibration of humanity's values, institutions, behaviors, and expectations with those of the Earth. This is the task of education in our time.

I would like to close with the words of E. F. Schumacher: "Education which fails to clarify our central convictions is mere training or indulgence. For it is our central convictions that are in disorder, and, as long as the present anti-metaphysical temper persists, the disorder will grow worse. Education, far from ranking as [our] greatest resource, will then be an agent of destruction." I think these words are prophetic. It is time to address the ecological emergency as, in fact, a crisis of mind and of education.