

Chapter 2



Sustainability and Ecological Literacy

What if higher education were to take a leadership role, as it did in the space race and the war on cancer, in preparing students and providing the information and knowledge to achieve a just and sustainable society? What would higher education look like? The education of all professionals would reflect a new approach to learning and practice. A college or university would operate as a fully integrated community that models social and biological sustainability itself in its interdependence with the local, regional, and global communities. In many cases, we think of teaching, research, operations, and relations with local communities as separate activities; they are not. All parts of the higher education system are critical to achieving transformative change that can only occur by connecting head, heart, and hand.



— Anthony D. Cortese, President, Second Nature, 2004

Chapter 2 captions (top to bottom)

Cornell University's entry in the 2005 Solar Decathlon included an edible garden. This team earned second place overall in the competition. Photo by Stefano Paltera/Solar Decathlon

Students and faculty at the Oberlin College Adam J. Lewis Center (William McDonough + Partners) for the August 2003 Agents of Change workshop. Photo courtesy of Agents of Change

The house designed and built by the Pittsburgh Synergy team (Carnegie Mellon University, the University of Pittsburgh, and the Art Institute of Pittsburgh) for the 2005 Solar Decathlon had a wall of windows and a porch. Photo by Chris Gunn/Solar Decathlon

CHAPTER 2: SUSTAINABILITY AND ECOLOGICAL LITERACY

DEFINING OUR TERMS

Sustainability

Architects often refer to sustainability as if there is wide consensus about its meaning and its implied strategies. In fact, the term has become so common and used in so many different ways that it almost eludes definition, which is why it is important to clarify what it means in the context of this report. The word itself is clear: to sustain something is to keep it in existence. (Sustain stems from roots meaning “to hold from below,” to provide support.) Generally speaking, then, sustainability is the task of maintaining existence. But such a simple definition begs many questions, the most obvious of which is the existence of whom or of what?

On its Web site, the AIA COTE states it is “dedicated to preserving the earth’s capability of sustaining human existence.” This statement implies supporting the ability of both humanity and nature to exist, rather than supporting human activity at the expense of nature.

But existence alone does not ensure prosperity and, as it is popularly understood, sustainability is a hopeful agenda aiming for more than mere survival. The so-called “triple bottom line” of sustainability strives for maximum value, not just slight improvement, in three areas—ecology, economy, and society. In other words, sustainability envisions the prosperity of culture and nature. Both should thrive, not just survive.

The word sustainable came into widespread use after Lester Brown’s seminal book, *Building a Sustainable Society*, appeared in 1980. While he offered insightful criticism and strategies “to put us on a sustainable path,” he neglected to define the term itself. The most familiar explanation came seven years later when the United Nation’s World Commission on Environment and Development published *Our Common Future*, also known as the Brundtland Report, after Norwegian Prime Minister Gro Harlem Brundtland, chair of the commission. A single phrase from this document has become the most widely quoted definition of sustainability, which, according to the report, “meets the needs of the present without compromising the ability of future generations to meet their own needs.”

Typically, this line from Brundtland is cited out of context, while the report’s focus on economic growth is rarely discussed in detail and its recommendations have not been widely embraced. David Orr, whose writing inspired the Ecological Literacy in Architecture Education (ELAE) program, takes issue with Brundtland. As Orr explains, unfettered growth cannot be maintained because every system has limits. Orr’s complaint stems from his view that in popular discourse there are two views of sustainability—what he calls “technological sustainability” and “ecological sustainability.” The former is quantitative and relies on doing the same things more efficiently. The latter is qualitative and requires a fundamentally new way of doing things. To explain the difference and demonstrate how both views are necessary, Orr gives a medical analogy: if a man suffers a heart attack, doctors must first attend to his vital signs so he may continue to live, but his recovery is followed by the longer process of dealing with deeper causes such as diet and lifestyle.¹

¹ Orr, David. 1992. *Ecological Literacy*. Albany: State University of New York-Albany, p. 24.

While design must be informed by the quantitative aspects of technological sustainability, overemphasizing them loses sight of how systems flourish long term. Environmentalists now focus less on particular species and more on the health of whole ecosystems, for the fundamental revelation of ecology has been that all things are interwoven to a degree never imagined before. This realization leads to more expansive views. Many argue that the modernist tendency to study things in isolation—an all too familiar habit among architects and engineers—led to the problems that sustainability is now attempting to correct. The quality of all life is at stake.

Ecological Literacy

Though the concept of ecological literacy has been championed by many (including Alan Berkowitz and Fritjof Capra), the teachings of David Orr have most influenced the ELAE program. Orr writes that while every community implicitly understands the value of literacy—a basic knowledge of language and numbers—few understand the importance of ecological literacy, a basic knowledge of the earth. He cites Aldo Leopold, the American pioneer of wildlife ecology, as saying that the problem with environmental education is that it seeks harmony with nature among a people that has forgotten what nature is.

A basic definition of ecology is “the study of the relationships and interactions between living organisms and their natural or developed environment.” Three important traits are clear: ecology concerns relationships, not strictly things; those relationships are between the organisms themselves and between the organisms and their environment; environment may be “natural” or “developed.” Ecology encompasses the entire environment and its various systems.

An education founded on the principles of ecology is straightforward: education is the pursuit of knowledge, knowledge is intended to further human well-being, and human well-being depends on the health of all living systems. Without understanding the earth, the very purpose of education fails. And the study of the earth from an ecological perspective is not merely the study of things but an intense awareness of infinite interrelationships, of causes, effects, and limits, of beauty. No person may rightly be called educated without what Leopold calls “an intense consciousness of land.”²

The challenge and the promise of ecological literacy is its breadth. How do we teach something that affects everything in ways we do not completely understand? Similarly, Orr asks whether pursuing ecological literacy requires adaptation or revolution: Is environmentalism simply another subject or academic department, or is it potentially an integrative principle leading to a radical reconceptualization of education?³ He maintains that because current methods at every level typically treat subjects in isolation, students fail to see the connections between them. As a result, ecology appears unrelated to other fields, when in fact it informs every field. Orr calls for the substance and the process of education to be rethought. As the foundation for an “earth-centered education,” he offers six principles (paraphrased here):

- All education is environmental education
- Environmental issues are too complex to be understood through a single discipline
- Education occurs as a dialogue with a place
- Method is as important as content
- Experience with nature promotes better intellects
- Experience with nature promotes practical competence.

² Orr, David. 1992. *Ecological Literacy*. Albany: State University of New York-Albany, p. 148

³ Ibid., p. 140.

Ecological literacy, then, is interdisciplinary education centered on direct interaction with the environment in which it occurs. The results are better minds and better places.

Sustainable Design

If sustainability is a vague term, sustainable design presents an even greater challenge. Many architects use the term as if it applies only to buildings and not to all of human enterprise or even to other design professions although some of the most inspired examples have occurred in other fields, such as product design. Discussions of sustainable design tend to be narrow in focus and vague in purpose so the broader goal of engaging various disciplines in the ecology of place tends to be misunderstood, marginalized, or dismissed altogether. Although architects now generally acknowledge that sustainability is important, many tend to see it as a strictly technical solution without fully understanding the mechanics or worth of green technologies. As a result, the entire industry is abuzz with vague generalizations and valuable principles get reduced to marketing sound bites.

Because of this confusion, how designers may best incorporate sustainability is understandably a subject of some debate. Some emphasize energy. Eugene Odum argued that since everything is essentially energy, design should begin by establishing free power sources. This type of strategy focuses on effectively managing the earth's resources for the future. Others stress a present need to create healthful, uplifting environments for people by providing access to the outdoors, fresh air, abundant daylight, and healthful materials. Of course, all of these strategies are interrelated, and whether some take precedence over others is where the debate arises.

Within the building industry, many guidelines exist, but they are not completely consistent and some directly contradict each other. The most popular American standard, the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system, has helped raise public awareness but its very popularity risks perpetuating serious shortcomings because the public appears to believe LEED is synonymous with sustainability. As a result, more ambitious and arguably more effective strategies about place and culture may be overshadowed.

Despite common references to LEED as a "design tool," the system actually suggests very little about what architects conventionally consider the most fundamental facets of design—form, space, and image. From this point of view, LEED rewards buildings that save resources in the short run but may not survive in the long run because they fail to inspire the community around them. To paraphrase Orr, if it isn't beautiful, it isn't sustainable. If people do not love something, eventually they may abandon it. Sustainable design must put as much emphasis on design as it does on sustainability.

The AIA COTE has developed its own criteria⁴ for defining sustainable design, which it describes as "an approach that holistically and creatively addresses land use, site ecology, community design and connections, water use, energy performance, energy security, materials and construction, light and air, bioclimatic design, and issues of long life and loose fit." Taken to its logical conclusion, the final phrase—"long life and loose fit"—implies not only durability and flexibility but also beauty. If buildings are to last, they should be built soundly but also planned strategically to accommodate possible future functions and outlive their immediate use and users so they may survive centuries rather than decades. If designed to be disassembled easily and safely, components may be adapted and reused even if the building as a whole does not endure. And from a design standpoint, aesthetic appeal increases the likelihood of longevity.

⁴ See Appendix, Top Ten Measures of Sustainable Design

The AIA COTE description of sustainable design as a “holistic approach” indicates it is not a product but a process. It concerns not just more rigorous technical criteria for building but, instead, a complete attitude about how to practice design. This version of sustainability is “ecological” (Orr’s term) because it considers the entire system of design. Arguably the single most important factor is the process known as integrated design: the close collaboration among all stakeholders (client, community, and regulatory agencies) and professional disciplines (architecture, landscape architecture, structural and mechanical engineering, and others) during all phases of the project, including predesign and concept design. This ensures that decisions are made with the necessary expertise in every area. For example, some decisions made even very early, such as building location, orientation, and massing, affect performance in ways for which even the most sophisticated technology cannot compensate. An interdisciplinary process with strong design leadership promotes not just better building performance but also more expansive knowledge. Integrated design is ecological literacy in practice.

Ecological Design

Because architects typically think of sustainable design as merely high-performance building, pedagogical methods emphasize technology. To integrate ecological literacy in architecture schools requires a different approach. Orr proposes an alternative he calls “ecological design” and describes in detail the proper education for designers:

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.⁵

Ecological design, then, is “the careful meshing of human purposes with the larger patterns and flows of the natural world.” To achieve this, designers need an intimate understanding of those patterns and flows, and they cannot attain that understanding within the conventionally narrow scope of their discipline. A broader, interdisciplinary education and process are essential.

A CONVERSATION WITH DAVID ORR

The AIA COTE organizers of this project were deeply inspired by David Orr, whose words appear in every chapter of this report. Orr is professor and chair of the Environmental Studies

⁵ David Orr. 1992, October. “Environmental Literacy: Education as If the Earth Mattered.” E. F. Schumacher Lectures.

Program at Oberlin College, and he is perhaps the most influential living writer on ecology of place and environmental literacy in higher education. He was the force behind the Adam Joseph Lewis Center, a \$7.2-million home to the Environmental Studies Program, designed by William McDonough + Partners and hailed as a milestone building by the U.S. Department of Energy. Orr is the author of four books: *The Last Refuge: The Corruption of Patriotism in the Age of Terror* (Island Press, 2004), *The Nature of Design* (Oxford, 2002), *Earth in Mind* (Island, 1994), and *Ecological Literacy* (SUNY, 1992). He is co-editor of *The Global Predicament* (North Carolina, 1979) and *The Campus and Environmental Responsibility* (Jossey-Bass, 1992). He serves on several boards, including those of Second Nature and the Center for Ecoliteracy, and is a trustee of the Educational Foundation of America. He spoke with Kira Gould in August 2005.

Gould: You have written about ecological literacy and a new way of approaching education. What role can architects play in this transformation?

Orr: Looking at the success of the high-performance building movement and the U.S. Green Building Council, we know architecture can play a huge role. Architecture could be the point of this spear if it so chooses. I believe architecture can play an enormously important catalytic role. Part of the reason for this is that people are visual creatures and architecture, as a visual art and science, is a powerful instructor. Architecture is crystallized pedagogy. The question to think about is, How can we make architecture a fluid and dynamic pedagogy?

That's what we've tried to do at the Adam Joseph Lewis Center. We use our building as a focal point for a wide range of research on many subjects. I have found that architecture is a gold mine as a teaching tool. It's powerful, visual, and compelling. We have just begun to scratch the surface on how and what architecture can teach. Architecture has to sip energy, not guzzle. A good building will be zero discharge and be made of materials that honor the earth and our children's prospects—there's a reality you cannot escape.

Gould: What can educators learn from the way architects think and work?

Orr: Vitruvius was one of the first systems thinkers in the Classical world. Having said that, I don't think I have a book on my shelf by an architect on pedagogy that I find really compelling. Architecture is itself a profound pedagogy but the book has yet to be written.

Being a part of a design team is incredibly exciting—it's an experience without borders, where you cannot dawdle, you have to be engaged in reality, and the building has to work. The conversation crosses all the bounds, addressing what people will do in the building; how it will be heated, cooled, and lit; what it will cost; and much more. This is the essence of interdisciplinary process. Every building that goes up on every campus is an educational opportunity.

On the Lewis Center, we slowed the process a bit to accommodate real, meaningful student involvement but the payoffs were enormous. Students were so inspired and they've gone on to a great many things. Awareness of the project expanded and the number of donors increased, which further expanded the possibilities. This kind of project is incredibly powerful. It builds bridges where there were barriers among the administration, faculty, staff, students, and into the community. I remember a certain insouciant freshman who insisted on calling Bill McDonough by his first name. He had a meaningful experience and has since gone on to architecture school and opened his own practice.

Gould: Despite the popularity of sustainable design, today's design professionals appear to lack a coherent values framework. Is sustainable design just the latest trend in schools?

Orr: No one can run the film fast forward and arrive at anything like a sustaining and decent future. We have to think about staying power; what it will take to get our civilization to basic

stability and resilience. If we fail to build a secure, durable civilization that operates within a recognizable moral framework and ecological limits, we are toast. If you have a sufficiently macroscopic vision, you cannot be optimistic right now. There are few grounds for optimism but there are good reasons for hope.

Seeing this as a trend or fashion is just not acceptable. We have to increase the ante so that it is not seen that way. It has to be the benchmark. We are talking about going from being an ephemeral civilization to one that does great things. The design professions should take the lead in that process.

There is good news ahead but it is 50 to 100 years out. It will get worse before it gets better. The decades ahead will be difficult, what E. O. Wilson calls “a bottleneck.” But architecture has an important role in this, too. We need an architecture that builds hope.

Gould: The ELAE project and grant program recognizes courses and programs that make connections with nontraditional disciplines. Unfortunately, few courses tackled what may be one of the most important needs: a foundation for a design course steeped in ecology and earth awareness. What do you think such a course might provide?

Orr: Designing such a course would be an interesting challenge. Perhaps the best contribution I can offer is to mention the exercise I give students at the outset of my Ecological Design course. I pull out the Hippocratic Oath and ask the students, “What would be the comparable oath for designers?” I ask my students if they would work with Wal-Mart. “Are there situations from which designers should remain aloof? Or should they always try to bring sustainability to make something better than before?” That is their first challenge in my course and such thinking would be valuable in an architecture program as well.

Gould: In the current state of architecture and architecture education, do you see any opportunities or obstacles in pursuing ecological literacy?

Orr: There are certainly obstacles. These include an overblown sense of isolation and a strange sense of rigor that can become a kind of rigor mortis. The obstacles in any institution of higher learning are many. Higher education institutions have yet to become what Peter Senge calls “learning organizations.”

One issue to question is the vehicle of the university. It has been very slow to change. Universities look like what General Motors might have looked like to a perceptive analyst of the auto industry in the 1970s—destined to fail. What will the new model be? Will it be something like Taliesin or the Ecosa Institute? These are two ends of a spectrum and there’s a great deal between, all with challenges. Maybe it is time to design a truly new organizational structure that can educate students about architecture and ecological design in a new way.

Gould: How does your concept of ecological design relate to architecture and architecture education?

Orr: It seems to me that architecture is a subset of a larger field, ecological design. This is the larger art of fitting the pieces of a society into a coherent pattern of fairness, resilience, and sustainability. If architecture is a subfield of that, then its role is to lead the coalescing of the energy flows, water, and biota into something that meets those characteristics (fair, sustainable, resilient, and beautiful).

Then you face the question, Do you start the students with specifics or with the big picture? The conservative approach is to learn the basics first, then big picture. The other, perhaps more radical, view is to start with ethics and big picture. Actually, you have to do both. All education

should orient people to “here is where we are”—you are on planet earth, it has a biosphere—and then begin to relate architecture to the realities of the biosphere and learn about the evolution of the built world.

Understanding human evolution is an important part of this. This debate about evolution would never have happened in late 19th century because the scientists involved were familiar with the case that Darwin had made. The reasoning pattern was clear to them. In the late 20th century and early 21st century, they have forgotten how we got to that view. Any decent program would have to address this subject: the history of the process, creatively taught against the background of current realities, is critical. You need detail and big picture to arm students against facile forgetfulness.

Gould: What is your opinion of the way “green design” is being approached in mainstream architecture practice?

Orr: I have a fear that green design, not sustainability, could be taken as the latest fad. There’s a growing assumption that if we design our buildings right, we’ll have a cool future. To be clear, we are not going to build our way out of the mess we’re in. That is not going to happen. Green design has to be part of a larger transformation.

Pretty soon we’ll have lots of green office buildings and then green Wal-Marts. But a green Wal-Mart relying on exploitive labor and underpriced oil cannot be sustained. In a larger perspective, a green Wal-Mart would need to undermine mass consumption. In fact, at the end of peak oil, the Wal-Mart model fails when it can’t get cheap goods from China. The biophysical basis upon which Wal-Mart exists is about to come to an end. I fear that we may wind up with hundreds of thousands of green buildings existing in a very brown social and economic fabric.

Green design should be a catalyst to something still bigger, which is one reason why monitoring is so important. Every green building should tell a story about how it is connected to the wider world and what that means—the story of how that link works and why it matters so that we learn to understand buildings as systems that are part of larger systems.

Gould: Ecological literacy suggests blurring the lines between professional disciplines. How does this relate to the practice of architecture?

Orr: In architecture projects, there are no disciplines. There are only questions, which take you to disciplines. Do we need a building? What is the quality of human experience in the building? What are the materials that might work and what are their real costs?