Academic Planning in College and University Environmental Programs: Proceedings of the 1998 Sanibel Symposium

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With an Afterword by Anthony Cortese

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PREFACE

Symposium: Academic Planning in College and University Environmental Programs, the proceedings of which comprise this volume, is but the first step, I hope, in a series of gatherings and other methods of meeting the professional needs ofthose working in environmental programs in higher education. This sympoisum on Sanibel Island convened key stakeholders in tertiary environmental education for an important discussion of the curriculum, framed and facilitated by leaders in the North American academy. It was an unusual opportunity for a diverse group to consider the value of such exchange of ideas on an ongoing basis in future meetings and, perhaps, in a professional society.

With the encouragement and assistance of those attending and with the abundance of needs expressed at the meeting, I intend to continue to pursue fulfillment of the professional requirements of the field for publication, networks, standards of quality, and strategies to advance academic programs. Recently, with the support of the Nathan Cummings Foundation, Richard Tchen and I organized a Sanibel Symposium Planning Group meeting to discuss how to continue the momentum established on Sanibel and how to begin to meet these needs.

The group of eleven chosen for its diverse expertise and creative energy, spun many exciting ideas. The most immediate need as the group saw it was to convene an even broader Sanibel Planning Group meeting to plan a "summit" on sustainability in higher education, including the professional schools in health, architecture, engineering, law, and divinity. This ambitious undertakind would be a working gathering of the community of all higher education stakeholders in education for sustainability. We will seek foundation support for such a Symposium. We will also continue to explore other possibilities and to articulate a vision of overcoming the marginalization of environmental programs, of empowering educators, of developing concrete strategies for education for sustainability, and of acceptance by the academy of its moral responsibility to the environment.

Please feel free to contact any of us editors, members of the Sanibel Symposium Planning Group, or the staff at North American Association for Environmental Education to offer assistance as we move toward hopeful visions of professional advancement for those in College and University environmental programs.

INTRODUCTION

James L. Elder

What strange times we live in. Humanity is residing in a ship of sorts, this planet earth, which has sprung a huge leak. By chance some of us occupy rooms near the damage, or somehow have seen or heard evidence of the leak. Yet by and large we sail blithely on, full steam ahead, the band playing as though it were business as usual. Water floods the hold, undermining the entire system of human life so elaborately built up over our entire civilization, not to mention the life of many other species. Yet we act as if we had all the time in the world.

One would think that academia would be one of the most perceptive passengers on this ship. Thus it should be one of the first to sound the alarm. But by and large all we hear is silence from this quarter.

When David Orr in Ecological Literacy calls for all education to be environmental education, he does so from a perspective that recognizes from which we human beings come. We are our environment. It is illusory to believe that there is a separation between the two. So how can we even begin to think about education without grounding it in this reality?

But there is also a very practical perspective from which all education must be environmental education. When a ship springs a leak, all passengers have an immediate responsibility to drop their passenger role and at least try to become crew members, helping to stanch the flow as best they can and as their own talents allow. Thus, if we do not utilize all the resources at education's disposal to begin to address our common environmental problems, we are like those passengers who refuse to participate in the saving of their own ship.

It shocks many of us to see the depth of this problem, to grasp how deeply ingrained into the very fabric of our society is the assumption that we are somehow separate from our environment. We recognize that both our basic approach to the process of education and the institutions that support that educational process also embody fundamental assumptions that perpetuate this self-destructive worldview. We then start to realize, as David Orr explains so clearly in his keynote address, the sources of our denial about the depth of the illusion.

The small but growing body of environmental educators, along with others, has been sounding the warning bell. As we do so, we are finding that the leaks are not just in far off board rooms and government halls, but that they exist even within our own institutions and, upon further reflection, at times within our very programs.

Eldridge Cleaver in Soul on Ice asserted that if you aren't part of the solution, then you're part of the problem. As the basis for this Symposium, we set out on Sanibel to further the process of exploring how we might more fully become part of the solution, how we might uncover those ways in which we unintentionally perpetuate the problem. Or, as W.J. Rohwedder put it in his paper, how can we walk our talk? How can we insure that we have fully left behind the role of passenger on this leaky vessel and are making the maximum contribution we can as a member of the emergency crew?

We need to examine our own assumptions about educational processes and institutions, just as we are calling for others to do in sectors such as government and business, to see where we have blinders and how we can do a better job. We have some knowledge and understanding of the leaks; and we have already invested significant time and effort studying them.

But the traditional academic role that is limited solely to study is insufficient and inadequate in the face of a social crisis. Our special understanding brings with it a moral imperative to act. We must begin the work of social change ourselves. We need to provide clear leadership both within our own institutions - with initiatives such as "greening" campuses - and within our own communities - with initiatives such as service learning. If we are not highly visible to others in taking such initiative, then the core values of environmental education will be ignored by the rest of the world. If we of all people do not take action to effect positive environmental change, who will? And a not coincidental outcome of our taking practical and immediate environmental action is a vastly improved educational process for our students.

An old Buddhist saying goes something to the effect that, if one wants to make the ground comfortable for walking, one can try to carpet the earth in leather. But it is preferable to simply cover one's own feet with leather. In other words, change starts at home.

Such a commitment to change at home can begin with directing our professional efforts, such as designing our classes and operating our institutions, in a manner which reflects the reality that people and environment are indivisible. David Orr articulates in his keynote address the crisis in which our academic institutions often wallow, blissfully unaware. In particular, he challenges all to recognize that the buildings in which we reside are in fact a large part of our own environment on a daily basis and that they reflect how we relate to our larger environment. We tend to dismiss buildings as inconsequential to the process of education. We are mistaken. Buildings are an intimate, if hidden, part of our pedagogy. Buildings teach, quietly but forcefully. They speak volumes to students about our values and about how we expect people to relate to each other and the environment.

Orr also describes well the wide spread changes required in order to turn our academic institutions from passengers into crew. He acknowledges that the very manner in which our academic institutions function is inherently part of the problem. Consider for a moment how business works. When business invents a new widget, it has long recognized that the methods used to produce old widgets are not likely to be effective in making new widgets. For example, the same production and management processes used to make typewriters simply can not make computers. New products require new production (and thus new management) methods. Products and production methods coevolve over time. As a result, almost no production and management approaches employed in the 19th century are used in the 20th.

Yet academia is nearly the only sector of society to maintain the very same production and organizational methods in the 20th century as in the 19th. Curricula have changed, new knowledge has been created, and new expectations of graduates have developed – but the fundamental processes of teaching and administering our academic institutions remain virtually unchanged. So, if we want to change our "product" and produce an environmentally literate graduate, then we must reinvent, or coevolve, how our academic institutions function and work. Faculty reward systems, the role of administration, the discipline-based organizational structure, the focus on research, the outdated tenure system, even the one hour class period all need to be redesigned.

Jack Crocker responds to Orr with a concise description of his perspective in a unique venture to redesign the old methods of academic production. He was hired as the first Dean and charged with creating a vision for a new university, Florida Gulf Coast University (FGCU). FGCU is not aiming to complete break the mold; it is an evolving attempt to take some risks in combining the traditional university model with significant alterations. The tenure system, which some feel has outlived its initial purpose and now is part of the problem rather than part of the solution, has been replaced at FGCU with multiyear contracts. Thus the whole power structure of the academy has shifted. A departmental structure has been replaced with program clusters, thus helping to blur discipline-based identities. Interdisciplinary collaboration in curriculum and college management is a requirement.

Application and action components have been added to theory in designing programs. A required core of courses aims to integrate curriculum and disciplines, create problem-based learning, and confront major contemporary issues. And most importantly, ecological literacy has been made a university-wide student learning outcome. This courageous initiative goes a long way towards addressing the challenges articulated by Orr.

W.J. Rohwedder also responds to Orr with an inspirational example of how he has managed to put to work his and Orr's understanding about the impact of that physical constructed space in which we reside. He explores how place is a teacher, how our interior and exterior landscapes interact, how both our explicit and implicit values are manifested in the structures we build. He concludes that our campus buildings simply do not support our environmental values or our intentions to produce environmentally literate graduates. Instead, they actually create more leaks in the ship. He shows us how he led the creation of a new building with no leaks.

Louise Chawla next calls for us to engage our students with the community, and eloquently explains why we need to do so. She too recognizes that place is a teacher. She expands on Orr's and Rohwedder's sense of place to include the community along with the campus environment. Confining education to the classroom, or even to the campus and classroom, sends the message to all involved that learning and the real world have no connection. What an odd message to send, when many colleges pride themselves for producing life-long learners. Where will these life long learners learn, if not in the real world?

Building links with the community can refocus environmental education programs on people, and thus diminish this false people/environment separation. Too many academic programs assume that environmental problems will be solved by an elite group of leaders in science who will somehow influence business and government. Instead, the failures of international development have demonstrated quite clearly that solving environmental problems will often be accomplished only with the involvement of local citizens.

Growing Up in Cities, a multinational initiative to engage urban youth in efforts to change policy-making, is a wonderful success story on how to do just that. It recognizes that today's environment belongs more to tomorrow's citizens than the generation now are in charge. Withholding youth from participation in those issues that are their birthright is not only immoral, it ought to be criminal. We are depleting their environment, not ours - they have a far more inherent right to it than we do. And the huge degree of learning and excitement generated in students who participate in community based programs leaves absolutely no doubt about the effectiveness of such pedagogy. Chawla too acknowledges that our institutions are not structured to encourage and support community-oriented courses, that we are trying to make computers in a typewriter factory.

In responding to Chawla, Charles Hopkins reasserts the critical role of education in achieving environmental progress, and the reasons why our institutions belong in the community and the community in us. He acknowledges the need to engage youth in their community, and expresses concern about how poorly we relate to youth in general. We need to learn with and beside youth, as partners in the learning process.

Eric Pallant describes a brilliant program at Allegheny College that achieves all that Chawla asks and more. Pallant has reached out to the community, and found an eager and grateful partner in the educational process. As a result, his students benefit, and the community benefits. He has built a model of what many call service learning in environmental studies. Such environmental studies programs are "messy" education. They do not fit well within conventional academic structures, whether they be promotion and tenure systems, short classes, or traditional student evaluation approaches. They are difficult to manage, compared to more conventional pedagogical approaches. They require skills not often possessed by faculty (e.g., complex project planning, political negotiation, etc.). They generate all manner of ethical issues unfamiliar to most faculty. And their educational benefits are uncertain, in that the tools for evaluating their educational effectiveness have not yet been fully developed. Nonetheless, those of us who have built such programs are convinced beyond doubt that they involve a much more effective and powerful learning process than conventional techniques. As Pallant notes, his students are emerging from college with the tools -- and commitment -- for being active, engaged citizens in whatever communities they reside.

There must be a reason why conventional education evolved the operating structures to which it still clings so tightly today. Perhaps these structures allow faculty and administrators to more easily manage the otherwise very personal and eclectic process of learning. The question, of course, is whether or not we have lost the heart of education in the process of making it more manageable. In other words, the messier the educational process perhaps the better it may be - and correspondingly, the more difficult it is to manage.

Milton McClaren turns next to yet another place, beyond the classroom and the community, to the Internet as an emerging tool for education. What does the Internet implicitly teach as a place? What will the impact be of the technological revolution, which in turn is creating a societal revolution, on environmental education? Fraught with potential as well as pitfalls, the net can help us get connected, or help us become even more disconnected, with both ourselves and our environment. It can help us patch the leaks - or it can create new ones. We need to find ways to use opportunities offered by this revolution, especially collaborative knowledge building, to further understanding about our environmental condition and the options for going forward. And ultimately, we need to know when to turn off the machines and go for a walk in the woods.

In responding to McClaren, George Davis points out that the manner in which we train teachers to be environmental educators can also be part of the problem. He sees the recent development of standards throughout K-12 education as revolutionizing teacher training. He urges us to seize this development as an opportunity to redirect our efforts from in-service EE training towards including a quality EE component into pre-service preparation for all K-12 teachers, thus helping to integrate environmental education into the mainstream K-12 curriculum. He has in mind a better patch for one of the bigger leaks in the ship: our entire educational system. The congruence between the goals of the national educational reform movement and the methods used in environmental education present us with a huge opportunity to influence all of society – if we can figure out how to take advantage of it. He goes on to elaborate those qualities that make for good environmental education, which, while intended for K-12 EE programs, also are equally applicable to environmental studies and environmental science programs.

Mary Paden responds by developing some of McClaren's points further. She too sees cyberspace as holding peril as well as promise. She hopes that an information-based economy might allow the world economy to grow with less material input, thus sparing the environment; she fears that it can also increase an already strong sense of separation from the environment. She ponders the impact of learning via computer compared to learning from nature, concluding both are valuable. The computer opens up education to an entirely new audience: those of us unable to attend classes because we are too busy or because we live where classes are not available. She emphasizes that Internet access changes the role of the teacher from information provider to guide. In addition to the computer's role in communications, it has a critical role in developing critical thinking skills, especially those quantitative skills needed to sort through the mass of information and databases available.

Finally, we present reports of three working groups in the symposium. Each set off on its own journey to further explore some of the issues raised by speakers. The group facilitated by Anthony Cortese and recorded by Ed

Kormondy mentally tore down the entire university structure and rebuilt it from the bottom up, beginning with reconceptualizing the fundamental purpose of a university. Little was left of the original structure when they finished. Instead, they created the framework for an entirely new organization designed to build computers, rather than typewriters.

Collette Hopkins led her group in an exploration of preservice teacher training. They found agreement that the best such programs provide real life experiences as part of the curriculum. But preservice programs are not widespread and often suffer from inconsistent quality, and a lack of consensus about what constitutes environmental education.

The working group that I facilitated tackled some of the challenges and risks of working in and with the local community. At the most basic level, we came to realize that most if not all of us viewed ourselves and our programs as fundamentally involved in an effort to build better communities. To explore this perspective further, the group broke into three subgroups that dealt with a particular aspect of community building: the specific aims of involving students in the community, the challenge of engaging today's disenfranchised youth, and the problem of experts. While it can be exciting and full of potential to build community links, it also requires careful thought and an awareness that one is working in largely uncharted territory. But this is precisely where we'll find many of the leaks in the ship, and so it is where we need to go.

In designing this Symposium, we intended to bring together members of the higher education community who had thought deeply, often over decades, about environmental programs. We wanted to begin a larger discussion of the challenges confronting the field as a whole, and what might be done to help the field develop and grow.

We had to face the fact that higher education environmental programs have an unusually complex history. In short, this history is an amalgamation of not only related disciplines such as ecology and biology but also of many prior (and still extant) fields such as conservation education, nature studies, interpretation, outdoor education, and natural resource studies.

Adding to this complexity is the fact that, within the current field of environmental programs, there are at least three distinct subfields: environmental studies, environmental education, and environmental science -- each with a very different take on its mission, content, scope and pedagogy. To make matters even more challenging, new fields such as global studies, sustainable development, education for sustainability, conservation biology and others all have a constantly evolving and intimate relationship with environmental programs. How can we get our minds around the future of this amorphous field when we are not even clear on its relative boundaries -- what it does and does not include?

What we found by the end of the weekend on Sanibel was that, despite the differences within the subfields of environmental programs, there was also a great degree of commonality, a commonality not always visible to those of us who haven't rubbed shoulders much outside our own subfield. Perhaps the reader can now too perceive the outline of those threads of commonality that also bind this volume together. They are all grounded in a call to us as environmental educators to practice what we preach, to explore just how far we can go with this call to fundamentally change our relationship with our environment, with ourselves. Place as a teacher. The essential role of community relationships in our programs. The need to restructure not only curriculum but also the very core of those institutions which support curriculum delivery. Recognition that the study of environmental problems alone is not enough, that study needs to be integrated with action. In short, academia -- indeed all education -- as a very different place than it is now.

The next report, "Whither? A Learned Society for Faculty in College and University Environmental Programs," is a summary the final session of the Symposium. This session held a short discussion on where the movement begun on Sanibel might go from here. We reviewed the needs of higher education environmental programs, concluding above all that they need a stronger, more vibrant, and supportive sense of *community*. We started to consider the possible creation of a new initiative, such as a society, to meet this need, and we outlined the possible functions of such an initiative. It was unfinished work, not only because the brief weekend ended, but also because the future direction of environmental programs has yet to be fully clarified.

Einstein said that one can not use the same thinking, or paradigm, that created a problem to solve that problem. In other words, the problem is embedded in -- and a result of -- the very thinking and perspective that created it; so the only way to reach a solution is to begin with changing the paradigm -- far easier said than done. College and university environmental programs hold a vision of the future, a new paradigm that the world desperately needs. Our challenge is to find new ways to help realize that vision, both globally and locally.

In particular, environmental educators need to provide greater leadership within both the education and environmental fields. For example, the technology-based, regulatory-driven paradigm of environmental policy is fading rapidly. A new environmental paradigm that puts education at its core holds the potential to be an exceptionally compelling replacement. As David Rejeski recently noted in the Environmental Communicator, "We have picked many of the low hanging fruit on the environmental improvement tree. What remain are networks of diffuse and chronic problems. In this global village (of interconnected, diffused environmental problems), education, learning and the management of knowledge have key roles to play. What if educators, not the engineers or economists, have one of the clearest and most compelling alternative paradigms to offer?"

What if we, as environmental educators, really are the ones who hold the solution to saving this leaky ship and all aboard? Can we live up to such an enormous obligation and opportunity? Perhaps the papers herein can be of some initial help.

Prior to the Symposium, a variety of field trips were available on Sanibel, nearby barrier islands, and even "overseas," as islanders call the mainland. Kristie Seamon Anders anchored the Local Symposium Planning Committee in organizing these trips. Anders is Director of Environmental Education for the Sanibel Captiva Conservation Foundation and a fabled naturalist and storyteller.

Sense of Place on Sanibel Island

Green emeralds glisten in the sun, strung as a chain of barrier islands that define the estuary known as Pine Island Sound. These resources result from unique circumstances that provide habitat for some of the most spectacular wildlife in the country. The islands are perched at the confluence of salt and fresh water . . . land and sea . . . temperate and tropical climate. The islands are a place where abundant life provides a vibrancy rarely seen.

For over fifty years, the islands have been a destination for many vacationers, and a home for thousands of people, people who worked together toward a common goal of peacefully coexisting with wildlife. Had the political leadership of the 1950s had their way, not only would Sanibel be developed for 90,000 residents, but it would also bridge the adjacent barrier islands with the idea of becoming another Miami/Fort Lauderdale resort area. Retired school teachers, store clerks, business people, and health professionals began lobbying the state to purchase Upper Captiva and Cayo Costa Islands for park lands. They began investigating the scientific data necessary to make sound decisions for planning. Paired up with leading scientists of the day, citizen scientists began collecting information on wildlife species, populations, and habitat requirements.

Ultimately, the people of the islands decided to incorporate as a city, to seize their own destiny, and to choose to live in harmony with wildlife and the necessary habitat to sustain them all. They hired an innovative land use planning team, led by Ian McHarg, to develop a plan for the community in a way that protected the function of the natural systems, but allowed for controlled development.

That plan still guides the city today. The human carrying capacity was set at 9,000 dwelling units. Sensitive areas, such as mangroves and fresh water wetlands, received small density assignments. Mangrove areas were zoned at one house per forty acres; freshwater wetlands were zoned at one house per twenty acres. Higher, more stable, and less sensitive areas received higher density assignments.

These green emeralds are here because people saw the challenges, had a desire to seize their destiny, and acted upon their own convictions. Today, the city police are called to relocate alligators from swimming pools, land development code requires the footprint of development to be less than 30% of the parcel and 75% of the landscaping must be native vegetation, and people thrill to see bald eagles and roseate spoonbills. This community is a place where visitors, businesses, manatees, and retirees are all called neighbors.

The community continues to face pressure to build more and save less, but they remain loyal to their conservation efforts. There are more lands to buy, more habitat to restore, and more people to teach. They are bound by a vision where wildlife and humans peacefully coexist and live abundantly on and around these emeralds in the sea.

The islands made a perfect setting for the Symposium on sustainability and responsible actions. Field trips allowed people to watch pink roseate spoonbills glide through blue skies; to watch the early dew dry as birds awakened to reconfirm their territory; to marvel at the treasures the tide left for early morning beach explorations; to dip paddles in the estuary as kayaks glided over sea grass beds and through mangrove creeks; to explore the bridgeless islands spared from intensive development and to breathe deeply the scent of the Gulf air, be lulled by the waves against the shores, to feel the warmth of the March sun, taste the salt crystals on the back of a black mangrove root; and witness the beauty of the Eden called Sanibel.

Many participants made time to record their thoughts and impressions during journaling sessions. Greeting the sun as it rose, closing out their day with reflection, and taking home memories that can be recalled when the mind needs respite. The footprints left on the islands were washed over by the tides, but the synergy of the Symposium is an indelible mark on our spirits. In each person, there is now a place called Sanibel.

The Symposium began on the campus of Florida Gulf Coast University near Fort Myers on Friday afternoon, March 6, 1998, with several pre-conference meetings and workshops. After dinner, participants gathered with an audience of students, faculty, and the public to hear a much-anticipated keynote address by David Orr, Professor of Environmental Studies and Politics and Chair of the Environmental Studies Program at Oberlin College. Before going to Oberlin in 1990, he was the co-founder of the Meadowcreek Project, an environmental education center located in Fox, Arkansas (1979-1990), and a Professor of Political Science at Agnes Scott College and the University of North Carolina-Chapel Hill (1971-1979). He is the author of Earth in Mind (Island Press, 1994), Ecological Literacy (State University of New York Press, 1992), The Campus and Environmental Responsibility co-editor with David Eagan (Jossey-Bass, 1992) and The Global Predicament with Marvin Soroos (University of North Carolina, 1979).

TRANSFORMATION OR IRRELEVANCE: THE CHALLENGE OF ACADEMIC PLANNING FOR ENVIRONMENTAL EDUCATION IN THE 21ST CENTURY

Preface

The subject this evening is academic planning. I can think of few things more likely to be greeted with a thundering yawn in an after dinner talk. At the same time I can think of few subjects with greater potential importance for improving the human prospect in the century ahead. The challenge of equipping students to participate in the building of a sustainable and decent society is **the** fundamental challenge to educational institutions at all levels. What would it mean for colleges and universities to get serious about "the underlying intellectual issues and moral imperatives of having responsibility for the earth, and to do so with an intensity and ingenuity matching that shown by previous generations in obeying the command to have dominion over the planet" (Pelikan, 1992)? In exploring that question, I will organize my remarks in three parts, beginning with the factors that may explain, in part, why colleges and universities have been so slow to respond to environmental issues. In the second part, I will describe a project on my campus that required a radically different approach to planning. In the third section, I will offer some reflections about how we might improve environmental planning.

Part One

It is increasingly obvious that within the lifetimes of students now attending college, world population is expected to rise to a number between nine and twelve billion people, human actions will drive perhaps 20% of the species now on the earth into extinction, and the emission of heat-trapping gases will force global climate into a less stable and probably far less desirable state. Surveying these and other global trends, 102 Nobel laureates in science and 1600 other scientists from 70 countries signed the World Scientists' Warning to Humanity (1992), which read in part:

> Human beings and the natural world are on a collision course. . . . If not checked, many of our current practices put at serious risk the future that we wish for human society and . . . may so alter the living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about.
>
> We the undersigned, senior members of the world's scientific community, hereby warn all humanity of what lies ahead. A great change in our stewardship of the earth and the life on it is required, if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated.

A substantial and growing body of scientific evidence, in fact, confirms the view that humans are at or near critical thresholds of planetary stability and ecological carrying capacity. Evidence that we are crossing these thresholds will become apparent in increasing disease, famine, species extinction, habitat destruction, ecological instability, increasing number and severity of storms, drought, and heat waves, technological accidents caused by a growing willingness to do things we would otherwise not want to do, and growing violence over the control of water and resources. Humankind, in other words, is now in the first truly global crisis that concerns our survival as a species, the terms by which we might do so, and what it means to be human. Since mutual dependence on a common global environment is the one thing all of us share, global change is not just another issue on a long list, but the lens through which all other issues must be seen.

All of us here today have heard such things many times before. Most of you have uttered similar warnings. And all of you have labored long and hard to change the curriculum and operational directions of your own institutions. But relative to the magnitude of the challenges ahead, the inescapable fact is that 20-25 years of dedicated and often visionary work to build environment into the curriculum have not dented the problem. Higher education goes on much as it has for a century or more -- but now with computers. In the face of impending problems and potential catastrophes described in the World Scientists' Warning, the response of colleges and universities is generally lethargic. As a result, despite the growth in numbers of environmental studies programs, most college and university graduates are fundamentally ignorant about ecology, global environmental change, and why these things ought to matter to them. Why have institutions of higher education -- of all organizations -- been so complacent in the face of mounting evidence that humanity is in real jeopardy of mutilating its earthly home? This is not, on the surface at least, what one might expect of institutions dedicated to advancing knowledge and presumably to the health of the world their students will inherit. Yet virtually everywhere there is a pattern of denial, evidence of what Thomas Berry calls "a deep cultural pathology." Why is this so?

The answers, I think, lie at different levels. First, at an organizational level, denial is embedded in the very fabric of the bureaucracy, management, and committee structure characteristic of higher education in the post-World War II era. Colleges and universities have become over-managed and under-led institutions operating more and more like businesses with customers. College presidents increasingly regard themselves as CEOs whose chief mission is fundraising. Few think of themselves as intellectual and moral leaders, and presidents will not often invest themselves in controversies that jeopardize their upward mobility. The result is a poverty of wisdom in high places, reinforced by a fundamental ignorance of ecology and the basics of global change. If administrators (and trustees) are aware of the reality of global change, that awareness is seldom allowed to influence institutional priorities. Institutions of higher education are, accordingly, governed on the assumption that business will continue more or less as usual for as long as the mind can imagine. Blindness, and sometimes outright ignorance, is reinforced by the financial and ideological dependence of colleges and universities that tends to make them reluctant, unimaginative, and mostly toothless critics of everything from free trade and the electronic global economy to the efforts underway to re-engineer the fabric of life.

At the faculty level, denial takes the form of excuses that we simply do not have the time or expertise to worry about issues beyond our particular specialization, especially those that make us feel uncomfortable in polite circumstances. It simply does not pay for scholars to question the anthropocentrism or "pre-analytic" assumptions buried in their disciplines, to say nothing about questioning those of other disciplines. Those who do are mostly either safely tenured or short-timers who go on to careers outside the academy. For all of the talk about freedom of inquiry, the fact is that all too often disciplinary standards, professional loyalties to the "American Association of (fill in the blank)," and words like "rigor" are used to suppress debate about fundamental assumptions and paradigms. Colleges and universities, often regarded as places of radicalism, are seldom very radical about issues having to do with the environment. In this regard, the striking fact about faculty life is not so much the conversations that we have as those we do not have. I'm thinking of the urgent need for biologists to converse with economists, or for ethicists to talk with genetic engineers. When such conversations do occur, the results can be provocative and fundamentally important.[1]

There is more to be said, however. Denial is not just a way of avoiding the future, it is also a way to avoid discussing our own complicity in the larger problems of our time. In his time, George Orwell noted that:

> we all live by robbing Asiatic coolies and those of us who are "enlightened" all maintain that those coolies ought to be set free; but our standard of living and hence our "enlightenment," demands that the robbery shall continue.

Not much has changed. In an ecological perspective, we continue to live comfortably by robbing the poor and diminishing the prospects of our children. In the words of Catholic theologian Thomas Berry:

> The university, as now functioning, prepares students for their role in extending human dominion over the natural world, not for intimate presence to the natural world. Use of this power in a deleterious manner has devastated the planet. We suddenly discover that we are losing some of our most exalted human experiences that come to us through our participation in the natural world about us. So awesome is the devastation we are bringing about that we can only conclude that we are caught in a deep cultural pathology, a pathology that is sustained intellectually by the university, economically by the corporation, legally by the constitution, religiously by the church.

All of us here tonight are part of this system. We are well paid. We have sabbaticals and time off to do research. We fly to exotic places to discuss how to save the world thereby adding to the problem of climatic change.

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[1] For example, the collaboration between Carl McDaniel, a biologist, and John Gowdy, an economist, in two major publications. Likewise, the collaboration at Stanford University resulting in a major article in *Science*.

Relative to the vast majority of people, we have a good thing going. And our standard of living and our enlightenment, too, demands that the theft continue.

As for our students, despite the rise in interest in environmental problems in the past 20 years, most will graduate knowing little about the environment and seeing scant reason to care. An annual survey of entering freshman indicates that 74.9% of incoming first-year students prefer being "well-off" to developing a philosophy of life or improving their minds (New York Times, January 1, 1998). Interest in causes such as environment or racial justice has apparently declined sharply. Twenty years earlier the percentages were reversed. The study concludes that this is the most apathetic and apolitical generation surveyed since the poll began.

The practical effect of denial at all levels becomes evident when colleges and universities develop "Strategic Plans" to chart their future. The results are seldom very strategic nor are they often useful as plans. Mostly, they are full of self-congratulation and empty posturing intended to improve their "market share" of students and to raise money. And none that I have seen acknowledges that environmental change on a global scale has anything to do with the educational mission of the particular institution or that it might radically alter the lives and career prospects of their students. Most institutional planning reflects old and worn-out assumptions that Homo sapiens is an insignificant force in nature. Planning documents are accordingly filled with undefined phrases about diversity, multiculturalism, and social empathy without saying what these words have to do with the preservation of biological and real cultural diversity. Only a few colleges have made knowledge of how the physical world works a high priority for their students or an operational priority for the institution. But many have made student "wellness" a major priority by building campus fitness centers and putting salad bars in dining centers without apparent awareness that human wellness in a sick environment is temporary at best. In short, planning in higher education seldom reflects the central fact of our existence -- that aware of it or not, we are part of an ecological community and that community is coming undone in no small measure because of the choices and actions of highly educated people. What can be done?

Part Two

Most of what little I know at first hand about academic planning I have learned in the past three years in an effort to design and build an environmental studies center on the Oberlin College campus. My official role was to raise the necessary funds from "sources not otherwise likely to give to the college." Less officially, I was heavily involved in the selection of the architect, development of the building program, and building design. My experience, described below, may or may not be entirely typical of planning on other campuses. In broad outline, however, I think the case may shed light on how campus planning relative to environmental issues might be improved.

In June of 1995, with the leadership and active support of a new President, Nancy Dye, the Trustees of Oberlin College granted approval to raise funds and design an environmental studies center that would meet advanced standards for ecological design. My role in the project entailed both fund-raising and facilitating the design process. The project was not done as part of a major capital campaign because doing so would have delayed the project indefinitely, and the likelihood of the environmental studies center being included in any such campaign would have been small in any event. In short, to be done at all, the project would have to occur outside the normal planning and fund-raising activities of the college. Moreover, opportunity presented itself in the arrival of a new President sympathetic to environmental studies and to curricular innovation generally.

The project had a history that extended back to the mid-1980s with faculty discussions about creating an environmental center. Those discussions, however, resulted in no action. In 1992-1993 a year-long class on ecological design rekindled the idea and developed a pre-program for an environmental studies center at Oberlin College. Twenty-five students and a dozen architects met over two semesters to discuss ecological design and to develop the core ideas for the project. We began by questioning why we ought to do anything at all. Once the need for facilities was established, participants questioned whether we ought to build new facilities or renovate an existing building. After careful analysis, students and faculty settled on the necessity for new construction. The basic program that emerged from the year-long effort called for an approximately 14,000 square foot building that:

discharged no wastewater, i.e. "drinking water in, drinking water out";
generated from sunlight more electricity than it used over the course of a year;
used no materials known to be carcinogenic, mutagenic, or endocrine disrupters;
used energy and materials with great efficiency;
promoted competence with environmental technologies;
used products and materials grown or manufactured sustainably;
was landscaped to promote biological diversity;
promoted analytical skill in assessing full costs over the lifetime of the building;

promoted ecological competence and mindfulness of place;
became, in its design and operations, genuinely pedagogical; and
met rigorous requirements for full-cost accounting.

We intended, in other words, a building that caused no ugliness, human or ecological, somewhere else or at some later time.

When finally allowed to proceed in June, 1995, the terms of the approval set stringent boundaries on the risks the college was willing to accept. Funds could not be solicited from any source connected with the college and from none expected to give in the future. I was given two years in which to raise funds and complete the basic design work. Both requirements influenced the pace and character of the project. The fact that we could not solicit funds from donors affiliated in one way or another with the College required that the building be designed to be as widely appealing as possible. But no other kind of building would be worth doing. The short timetable required that we move quickly to select an architect and design team and get on with the job at hand.

To help coordinate the design of the project and to engage students, faculty, and the wider community in the design process, I hired two graduates from the Class of 1993. I also engaged California Polytechnic University architect John Lyle to help conduct the major design charettes, or planning sessions, that began in the fall of 1995. Some 250 students, faculty, and community members participated in the thirteen charettes, in which the goals for the Center were developed and refined. This was the first time in anyone's recollection that students were engaged in the actual design of a college building. Our intent was to make the design experience as educational as possible. Overall, it worked quite well.

In the same period we advertised the project nationally, and eventually received 26 applications from architectural firms with interests in the emerging field of "green architecture." We selected five for interview and in January of 1996 selected William McDonough & Partners in Charlottesville, Virginia as the lead design firm. With their help, we also assembled a design team of engineers, landscape architects, and others that would meet throughout the process. To fulfill the requirement that the building generate more electricity than it used, we engaged Amory Lovins and Bill Browning from the Rocky Mountain Institute as well as scientists from NASA's Lewis Space Center. In order to meet the standard of zero discharge, we engaged the services of John Todd and Michael Shaw -- the leading figures in the field of ecological engineering. For landscaping, we brought in John

Lyle and the firm of Andropogen, Inc., from Philadelphia. To this team, we added a structural and mechanical engineering firm from New York City, a firm to model energy performance, and a local contractor. During the programming and schematic design phase, this team and representatives from the College met by conference call weekly and in regular face-to-face sessions.

The team approach to architectural design was new for the College. Typically, the architects do their work alone, passing finished blueprints along to the structural and mechanical engineers who are told to heat and cool it and hand the project off to the landscape architects to prettify the results. By engaging the full design team from the beginning, we intended to maximize the integration of building systems with technologies and of the building with its landscape. Early on, we decided that the standard for technology in the building was to be state-of-the-shelf, but that the standard for the overall design of the building and its various systems was to be state-of-the-art. In other words, we did not want the risk of untried technologies, but we did want the overall product to be at the frontier of what it is now possible to do with ecologically smart design.

The building program called for major changes, not only in the design process but also in the selection of materials, relationship to manufacturers, and in the way we counted the costs of the project. We intended to use materials that did not compromise the dignity or health of people somewhere else. We also wanted to use materials that had as little embodied fossil energy as possible, hence giving preference to those locally manufactured or grown. In the process, we discovered how little is generally known about the ecological and human effects of materials use, and how little the present tax and pricing system supports standards upholding ecological or human integrity. Unsurprisingly, we also discovered that the present system of building codes and permitting does little to encourage innovation leading to greater resource efficiency and environmental quality.

Typical buildings are a snapshot of the state of technology at the time they were designed, and they obsolesce quickly thereafter. In this case, however, we intended for the building to remain technologically dynamic over a long period of time. In effect, we proposed that the building adapt or learn as the state of technology changed and as our understanding of design became more sophisticated. This meant that we did not want to own particular components of the building such as the power system (photovoltaics and fuel cells) which would become obsolete as technology advanced. We are exploring other arrangements, including leasing materials and technologies that will change markedly over the lifetime of the building.

The same strategy applied to materials. William McDonough & Partners regarded the building as a union of two different metabolisms, one industrial, the other ecological. Materials that might eventually decompose into soil were considered part of an ecological metabolism. Otherwise they were part of an industrial metabolism and might be leased from the manufacturer as a "product of service" and eventually returned as a feedstock to be remanufactured into new product. Interface Corporation in Atlanta, for example, is leasing the carpet and raised flooring for the center for one dollar per year and will exchange it at the end of its useful lifetime.

Further, standard cost accounting includes only costs of design and construction. As a consequence, institutions tend to ignore operating costs that buildings incur over their expected lifetimes, as well as all of those other costs to environmental and human health that are not included in the prices of energy, materials, and waste disposal. In this project, we plan to account for the full costs of the project, including those to the environment. Overall, the budget for the Center ($6.1 million) is higher than a typical building of the same size because we included:

students, faculty, and community members in the design process;
research into materials and technologies to meet program goals;
higher performance standards, e.g., zero discharge and net energy export;
more sophisticated technologies;
greater efforts to integrate technologies and systems;
a building maintenance fund in the project budget.

In addition, we plan to do a materials audit of the building, including an estimate of the amount of CO_2 released because of the construction, along with a proposal of ways to offset these costs.

Finally, when all of the systems are operational, the building will produce its own electricity, saving approximately $21,000/year. The college has agreed to contribute the saved costs for five years into a building endowment fund to be matched 1:1.5 by the Heinz Foundation. In other words, we will use savings from energy efficiency and renewables to fund building maintenance over the longer term.

The project is on schedule for a summer of 1998 groundbreaking, with a tentative completion date in mid-1999. The basic energy, lighting, and fluid dynamics models have been completed and we now know that the goals described in the building program can be met. The anticipated energy performance of the building ("ESCTR" in Figure One) will be half or less of what is now considered to be the "green" standard.

FIGURE ONE

HEATING, VENTILATION, AC, & LIGHTING COSTS ***(PER FT^2/YEAR)***

	ESCTR	**"GREEN"**	**AVERAGE**
BTU's/FT^2/YR	**10,500-15,000**	**30-50,000**	**70,000**
$/$FT^2$/YR	**.20-.29**	**.80**	**1.00-1.50**
SAVINGS/YR: **(w/o pv's)**	xxx	$6,783	$16,093

TOTAL ENERGY BUDGET: 39,000-58,500 kwh/yr

Moreover, when all of the systems are completed, the building will generate the electricity it will use from a combination of photovoltaics and fuel cell designed by NASA (Figure Two).

FIGURE TWO
ENERGY SCHEMATIC

PHOTONS -> ELECTRONS -> HYDROGEN -> ELECTRONS -> H_2O
(SUNLIGHT) (PHOTOVOLTAICS) (ELECTROLYSIS) (FUEL CELL)

It will purify wastewater on site. It will minimize or eliminate the use of toxic materials. It will be designed to remain technologically dynamic well into the future. It will be instrumented to display energy and significant ecological data in a central atrium. We intend for the wood and other materials used in the building to be purchased from forests that meet the highest standards for ecological management. The story of the building will be prominently displayed throughout the structure. It will be landscaped to include a small wetland and forest as well as gardens, orchards, and greenhouse. In short, it is being designed and built to instruct future students in the arts of ecological competence and the possibilities of ecological design applied to buildings, energy systems, wastewater, agriculture, landscapes, and technology.

As important as the building and its landscape are, the more important effects of the project have been its impact on those who participated in the project. Some of the students who devoted time and energy to the project began to describe it as "our legacy" to the College. Because of their work on the project, many of them learned about ecological design and how to solve real problems by doing it with some of the best practitioners in the world. Some of the participating faculty who were skeptical about the possibility of changing the institution came to see change as sometimes possible.

Part Three

What would be required for colleges and universities to respond to the challenges and opportunities ahead with energy and imagination? I would like to offer seven suggestions, based on the experience described above.

a) **Develop leadership.** The essential factor in the Oberlin project was the support of the President. Without it, the project would not have been possible. Generally, however, I think it is fair to say that, relative to issues having to do with the long-term sustainability of the human enterprise, there is a leadership vacuum in higher education. This vacuum is evidence of a general ignorance of the dynamics and substance of environmental problems in high places. The large majority of college administrators simply have not thought very deeply about long-term ecological and population trends or how their institution might respond to them. In this regard, colleges are a bit like ships at sea, with storm clouds ahead and no one scanning the horizon from the crow's nest. Accordingly, colleges and universities need a new generation of leadership dedicated to overcoming the complacency, self-congratulation, and busyness that often pervades higher education.

Therefore, serious efforts to improve both the substance and process of environmental planning in higher education must begin with efforts to remedy the ecological illiteracy of those who commission, conduct, and evaluate plans. The solution, admittedly easier said than done, is to implement efforts to improve ecological literacy of administrators and trustees in the same way that Second Nature is doing through faculty workshops.

b) **Institutional policy.** After detailed analysis of the energy performance of buildings on the Stanford University campus, one engineering student wrote that "Stanford's buildings may not be illegal, but they are irresponsible" (Selmon and Schneider, 1997, p.28). The same could be said of all but a handful of buildings on college campuses and most campus operations, for that matter. But it is possible to design buildings and entire campuses that are energy efficient, powered by current sunlight, discharge no waste, and demonstrate ecological competence (Lyle, 1994). And through better design we can teach our students that our ecological problems are solvable and that doing so would help to solve other problems as well.

The creation of the Oberlin environmental studies center was more difficult than it should have been because the college, like most others, has no energy or environmental policy for new construction and none for operations, purchasing, investment, or curriculum. Yet on most campuses, there are good models in the form of policy guidelines and administrative procedures that guide efforts to develop and upgrade computer literacy, and improve fairness between people of different gender, sexual orientation, and race. There is also a small, but growing, number of institutions implementing rigorous standards for energy efficiency, recycling, water, and waste. The important planning questions have to do with how all colleges might be energized to rethink what the various measures of institutional success paraded in annual surveys of colleges and universities mean at a time when the entire human enterprise is in jeopardy.

Any such policy ought to begin with a benchmark audit of inputs and outputs, and set targets that steadily improve energy and resource efficiency, reduce CO_2 emissions, close waste loops, and minimize environmental impacts over a period of years as if evolution, ecology, thermodynamics, and the long-term future really mattered. That policy ought to set upper levels for acceptable paybacks for the increased costs sometimes incurred by improved efficiency and environmental performance at, say, ten years, equivalent to an annual rate of return of 7%. Further, an environmental policy ought to include practical steps to use institutional buying and investments to help leverage the emergence of sustainable communities in the surrounding region. For example, buying locally from manufacturers and farmers who do their work with care for the environment ought to become a central part of institutional policy.

c) **Promote innovation.** Colleges are often risk-averse institutions in which the cardinal rule for administrators and faculty alike seems to be: do not make a mistake. The penalties for taking chances are generally high enough that few are willing to risk much. As a result, institutions of higher education innovate slowly and painfully. In the words of one study:

> Colleges and universities are indeed insulated from many competitive pressures; they have no stockholders, and their governing boards have few ready measures to judge performance . . . Thus, top university administrators often operate reactively. Their agendas are molded by whoever is sufficiently motivated to demand their attention. Short-run problem-solving erodes the time available to focus on the 'big picture.' (Siegfried, Getz, Anderson, 1995)

Institutional conservatism in the case described above occurred as constant pressure to eliminate all financial risk to the college, regardless of longer term benefits in the form of educational opportunities for students, improved admissions yield, and favorable publicity. Being on budget became more important than achieving the larger vision. The project came perilously close to being shelved after one year because estimated costs were thought to be rising faster than pledges. In such circumstances, the reaction of the institution was to reduce the scope of the program or, perhaps, to terminate the project altogether.

Ironically, the "make no mistake" strategy can create costs and risks of a different sort. Indecisiveness, in the guise of fiscal conservatism, added perhaps 10-15% to the overall costs of the project described above and caused significant delays that increased costs further. But the greater risk is that higher education will simply fail to respond with vigor and imagination to the largest issues on the human agenda which indirectly and directly have to do with population growth, resources, climate stability, soil loss, and biotic impoverishment. The contrast between colleges and corporations in this regard is striking. No viable business could long survive the kind of complacency and inertia characteristic of most institutions of higher education.

There are many good reasons for Colleges and universities to encourage staff, faculty, and administrators to take initiative for good cause without fear of penalty if things do not work out. The question is how, not whether, to encourage the spirit of innovation throughout the institution. Beyond removing the penalties for failure, institutions can encourage innovation through a variety of measures, beginning with simple recognition of those who do it. Further, innovators ought to be rewarded financially. Savings or avoided costs from improved efficiency, for example, ought to be reinvested into a fund to finance ongoing innovation and reward personal initiative.

d) **Integrated planning.** The Oberlin project required us to design not just a building, but a whole system integrating technology, energy use, life cycle costs of materials, structure, the landscape, environmental impacts, and the larger educational purposes. This, in turn, required an unusual level of creativity, flexibility, collegiality, and a high tolerance for risk. Operationally, the project required a high level of integration across departments and operational divisions of the college including the office of construction, college operations, finance and development, various faculty departments, the architects, and members of the design team. This level of integration proved to be difficult to achieve, and the project came close to collapse again late in the second year. It was saved only when the President brought in an outside facilitator to mediate between the design team and college officials.

For a variety of reasons having to do with turf protection, division of labor, and the low priority assigned to the environment, college planning tends to be fragmentary and short-term. There are few incentives to do system-wide planning which requires transcending administrative departments or administrative-academic boundaries, even when there are good financial or intellectual reasons to do so. Budgetary planning tends to be short-term, precluding life-cycle costing. The alternative, which Peter Senge calls the "learning organization," is a more fluid, open, adaptable, farsighted, and forgiving kind of organization (Senge, 1990).

e) **Planning begins with the educational mission.** The planning for this project began not by projecting the trajectory of one discipline or another, but rather by asking what students would need to know in order to help make a sustainable and sustaining world in the 21st century. The answer students themselves gave included such things as knowledge of solar technologies, ecological design, full-cost accounting, and practical skills of restoration ecology, gardening, horticulture, and forestry. The fact is that most disciplines need criticism that can only come from outside the discipline where the "pre-analytic" assumptions are open to review and scrutiny. Taking long-term global change seriously would require us to think more carefully about what liberal education means in our time and what our students will need to know to be relevant to the large issues of their times.

To extend this point further, campus planning ought to begin with questions about what students will need to know to help build a sustainable world, rather than questions about disciplinary priorities and abstractions about the "advancement of knowledge." The design of new science facilities, for example, might begin with an acknowledgement that we are living through a century in which scientific knowledge has often been used promiscuously. The evidence is found in nuclear weapons, holes in the ozone layer, thousands of toxic waste dumps, and even in the 300-500 chemicals inscribed in our fatty tissues that do not belong there. Could we rethink how we conduct scientific education? Could we teach chemistry, for example, as nature does it -- what is being called "biomimicry"? When nature creates hazardous chemicals, it does so in small amounts that are contained and are always biodegradable. Why not teach students to do chemistry similarly and to be utterly circumspect about making chemicals for which there is no evolutionary experience?

By some reckoning, we are about to enter a period of promiscuous biology in which some will re-engineer the fabric of life on earth more to their liking. Humankind will survive the twentieth century, but with less margin for error than we might have wanted. We are not likely, however, to survive a century of promiscuous biology in a way that enhances our humanity. To protect and enhance life in the century ahead, students will need to know many things, including how to discriminate between knowledge that advances life and that which places it in jeopardy or diminishes it. Planning, accordingly, should begin with questions about values and goals, then reason back to curriculum, and finally to architectural design and operations.

All of this implies the need to rethink what the liberal arts mean in an ecological perspective. It means exploring the unexamined assumptions implicit in our technological fundamentalism, the controlling assumptions hidden in a curriculum organized by departments and disciplines, and the anthropocentrism that limits our willingness to see ourselves as only a part of a larger ecological community on a long evolutionary journey. Our students will need to think in patterns and systems, yet, rhetoric to the contrary, we still tend to emphasize disciplinary specialization. They will need a kind of lateral rigor to combine knowledge from different fields, yet we still educate them as if rigor were exclusively vertical and meant going deeper and deeper into a particular discipline. They will need a larger sense of beauty that insists on causing no ugliness, human or ecological, somewhere else or at some later time. Yet we still educate them as if art, science, morality, and the long-term human future were unrelated. The relevant planning questions have to do with how we might create the resources, time, and intellectual tolerance to question the reductionism and anthropocentrism buried both in institutional operations and in the organization of our academic life.

f) **The importance of vision.** The Oberlin project was financially possible in large part because the building program and the fund-raising strategy were one and same. Since trustees, alumni, and others with any likelihood of giving to the college could not be asked for funds, we could not raise money by playing the card of institutional loyalty. Accordingly, I did not attempt to sell a building so much as a set of ideas about the human role in the natural world crystallized in the form of a building. As a fund-raising project, in other words, the right building in an ecologically constrained world and the smart building converged around a project that aimed to advance the dialogue about the relationship between architecture and pedagogy and about the human role in the natural world. But college planners, who regard themselves as utterly practical people, are often uncomfortable by anything remotely visionary. Those who have to raise funds, on the other hand, know that vision is ultimately the only thing they have to offer to prospective donors.

But there is far more at issue than self-interest narrowly defined. Most institutions began with a vision of how peoples' lives and the world might be improved. Oberlin College, for example, is a distinctive institution in large measure because its founders and early leaders were willing to risk the very existence of the college for the ideal of human equality. We have drawn on the moral capital they created ever since. In our own time it is fair to ask of any of our institutions what we are willing to risk and what moral capital we will leave behind. Many of our predecessors risked it all for human equality. That struggle continues, but it is now subsumed in a far larger struggle to ensure a habitable planet for coming generations so that all other struggles might go on. Future generations, the presumed beneficiaries of our strategic planning, will care not a lick for how we stacked up against the conventional indicators of institutional success. They will measure us, rather, by our foresight and for what we were willing to risk on their behalf.

g) **Institutional learning.** Finally, the real test for any innovation is the extent to which it changes the default settings and becomes part of the routine behavior of the institution. There is a tendency for institutions to seal off innovations rather like the body encases alien viruses. Some on my campus still regard the Environmental Studies Center as an interesting but isolated experiment having no relation to other buildings now in the planning stage or to campus landscaping or resource management. The pedagogically challenged will see no further possibilities for rethinking the process, substance, and goals of education, relative to the challenges of the 21st century. If these attitudes persist, the Environmental Studies Center will exist as an island on a campus that simply mirrors the larger culture. On the other hand, the project offers a model that might inform curriculum, architectural standards for all new construction and renovation, decisions about landscape management, financial decisions about payback times and full-cost accounting, and creative ways to engage the wider community.

FIGURE THREE

PLANNING MODELS COMPARED

	Environmental Studies Center	Typical planning
Starting Point	curriculum	architecture
Paradigm	ecological	industrial
Time Horizon	long-term	short/medium
Scope of planning	large	limited
Student/community participation	encouraged	excluded
Planning structure	integrated	serial/linear
Technological innovation	high	moderate/low
Materials selection	embodied energy	initial cost
Energy accounting	yes	no
Environmental accounting	yes	no
Project accounting	least-cost/end-use	conventional
Life-cycle costs	low	high
Building obsolescence	slow	rapid
Riskiness	moderate to high	low
Planning style	collegial	adversarial

Part Four

More than any other institutions in modern society, colleges and universities have a moral stake in the health, beauty, and integrity of the world their students will inherit. We have an obligation to provide our students with tangible models that calibrate our highest values with our best capabilities --models that they can see, touch, and experience. We have an obligation to create grounds for hope in our students, some of whom see themselves as "Generation X." But hope is different than wishful thinking, so we have a corollary obligation to equip our students with the analytical skills and practical competence necessary to do the hard work ahead of reweaving the human presence in the world. When the pedagogical abstractions, words, and whole courses do not fit the way the academic campus in fact works, they learn that hope is just wishful thinking, or worse, rank hypocrisy.

We have, therefore, a moral interest in making certain that campus purchasing, investments, and operations of the physical plant do not undermine the integrity, beauty, and stability of the world students will inherit. With that obligation in mind, could farsighted colleges take the lead to declare, say, a ten year goal to power themselves by a combination of greater efficiency, emerging solar technologies, and hydrogen? Why not? The limits are no longer technological or even economic, but those of imagination and commitment. Could some declare a similar goal to become zero-discharge campuses and eliminate waste in all of its forms? Again, why not? Through the imaginative use of our buying and investment power, could they help leverage the emergence of a genuinely sustainable economy in their surrounding communities? And could they incorporate such things into the curriculum in ways that cross disciplinary boundaries while having a practical effect on the world? Why not? The important planning questions have to do with how institutions of higher education might imaginatively calibrate their moral interest in the long-term future with their actual institutional behavior and do so as part of a larger effort to teach the next generation that the world is indeed rich in good possibilities.

References

Cohen, Joel. (1995). How Many People Can the Earth Support?. New York: Norton.

Daily, Gretchen. (1997). Nature's Services: Societal Dependence on Natural Ecosystems. Washington, D.C.: Island Press.

Lyle, John. (1994). Regenerative Design for Sustainable Development. New York: John Wiley.

Pelikan, Jaroslav. (1992). The Idea of the University. New Haven, CT: Yale University Press.

Science (25 July, 1997), special issue on "Human Dominated Ecosystems."

Senge, Peter. (1990). The Fifth Discipline: The Art & Practice of the Learning Organization. New York: Doubleday.

Selmon, Eric, and Schneider, Stephen. (1997). "Energy/Environment Curriculum Enhancement: 'Real World' Projects Confronting Obstacles to Energy Efficiency Implementation in Local Institutions" (unpublished).

Wacknernagel, M., and Rees, W. (1996). Our Ecological Footprint: Reducing Human Impact on the Earth. Philadelphia: New Society Publishers.

Union of Concerned Scientists. (1992). World Scientists' Warning to Humanity.

After a night of island sleep, travelers awoke to a brilliant Florida dawn—and an engaging responding address by Jack Crocker, Dean of the College of Arts and Sciences at Florida Gulf Coast University. He has published poetry and fiction, written for public television, and given readings and performed at many colleges, universities, and conferences throughout the nation. Having grown up on a farm, he has a reservoir of memories connected to land and the seasons, to which he still returns with respect.

A VISION IN THE MAKING

I was asked to respond to David Orr's presentation at this conference. What follows is not a specific response to his talk, but rather an account of the influence of his writing and thinking on me in relation to a unique venture I have had the good fortune to be engaged in over the past two and a half years -- the founding of a new university. While my account contains some personal confession, it is connected to curriculum change that pertains, I hope, to this conference.

In 1995 I was hired as dean of the college of arts and sciences at Florida Gulf Coast University (FGCU). At that time, FGCU, established by the Florida legislature and slated to open in August 1997 in Ft. Myers, had a name and a mission statement, but no buildings, no students, and no curricula. It would emphasize technology and part of its mission was to be new and different and to take risks. It was clear to me that the President and the Vice-President of Academic Affairs demonstrated commitment to the risk portion by hiring me, a would-be poet with many more years of indifference to (and sometimes contempt for) deans than being one.

Besides its newness and penchant for risk-taking, including a faculty collective bargaining agreement allowing departure from tenure lines to multi-year appointments, the university had become embroiled in an environmental controversy concerning its location. The site comprised wetlands, possible Florida panther habitat, and a strategic location as part of the Estero Bay watershed. An environmental group brought suit. The lawsuit was settled six months later, and the university opened on time. Obviously, this environmental story is more complex than I have presented it, but I use it here only to help set the context of what I was hired into--a new, different, risk-taking university that had been plunged into a highly visible environmental conflict.

One of my first tasks was to create a "vision" for the college. The word vision, spoken in a bureaucratic context, kicked into gear my normal cynicism, especially in connection to academia. On the hopeful side, however, rather than trying to change a university, I was involved in creating a new one. The main reason everyone gave for coming to FGCU had become a mantra: "It's a once in a lifetime opportunity to create a university from scratch, to do something new."

By now, the words new, different, and risk-taking had turned into a brainrash I had to deal with. They expanded and changed the very nature of all the questions. How could the college of arts and sciences best meet the needs of students, the community, society, the planet (I have to say it) "for the 21st century"? What shape should the curriculum take? What kind of faculty would be needed? Did "new" mean simply "another" university, the tenth in the Florida system? Or, did these words herald a commitment to transforming how at least one university goes about its business? In the face of these daunting questions I inscribed a screensaver message on my computer that scrolled across my consciousness every day: First, Courage; then, Vision.

The courage part and vision thing are where David Orr comes in, or least his books come in -- Ecological Literacy and Earth in Mind. I had already decided to buck the traditional university model, especially the fragmented curricula and departmental sects, and had been using Robert Frost's "Mending Wall" to bolster my iconoclasm. The richness of this poem invites several interpretations, but for my purposes I chose to see it as an example of nature ("Something there is that doesn't love a wall") subverting our human obsession with constancy and order. As you may recall, one character insists on replacing the fallen stones annually, even though the wall no longer serves any practical purpose. He is enslaved by a cliché, "Good fences make good neighbors." His reverence for the past ("He will not go behind his father's saying.") sustains his resistance to change. Such ignorance of nature's ways and cloistered belief in human dominance lead to an annual act of empty ritual and a parody of human wisdom. The result is a kind of Sisyphean travesty.

I had decided to go behind my father's saying, but my courage still needed shoring up and my vision needed to come from a different slant. As we know, the traditional university exerts religious force to keep backsliders in line. Heir to this orthodoxy, I developed a knee-jerk defensiveness to my own ideas as they veered toward heresy. David Orr's writings helped keep me from offending myself. They seemed the work of a kindred heretic.

Comments like the following from Earth in Mind hit like swigs of quality bourbon and began to help focus the "vision" I was seeking: (There are a few faculty currently in the College of Arts and Sciences who would say that I had one swig too many.)

> Education . . . can be a dangerous thing. . . . It is time, I believe, for an educational "perestroika," by which I mean a general rethinking of the process and substance of education at all levels, beginning with the admission that much of what has gone wrong with the world is the result of education that alienates us from life in the name of human domination, fragments instead of unifies, overemphasizes success and careers, separates feeling from intellect and the practical from the theoretical, and unleashes on the world minds ignorant of their own ignorance. . . .(p. 17)
>
> A fourth myth of higher education is that we can adequately restore that which we have dismantled. I am referring to the modern curriculum. We have fragmented the world into bits and pieces called disciplines and subdisciplines, hermetically sealed from other such disciplines. As a result, after 12 or 16 or 20 years of education, most students graduate without any broad, integrated sense of the unity of things. The consequences for their personhood and for the planet are large. (p. 11)
>
> . . . we fail to show how things can be made whole again. One result is that students graduate without knowing how to think in whole systems, how to find connections, how to ask big questions, and how to separate the trivial from the important. Now more than ever, however, we need people who think broadly and who understand systems, connections, patterns, and root causes. (p. 23)
>
> . . . The truth is that without significant precautions, education can equip people merely to be more effective vandals of the earth. . . . (p. 5)

Other passages that helped me break the commandments of the Church of the Holy Academy, I found in Ecological Literacy. I will confess that I got pleasure from Orr's reasoned resentment of true believers like Harold Bloom:

> For all of his conspicuous erudition, Professor Bloom seems to regard the liberal arts as an abstraction. For example, rather than merely "reconstitute the idea" of educated human beings, why not actually educate a large number of them? Likewise, his reverence for the classics is not accompanied by any suggestion of how they might illuminate the major issues of our day. The effect is ironically to render them both sacred and unusable, except for the purposes of conspicuous pedantry. . . . (p. 98)

Or his rhetorical sneer at the crass research agenda behind the lip service to serious investigation of interactions between humans and nature espoused by an "executive associate" of the Social Science Research

Council:

> The gap between alleged interest [in environmental degradation] and action he attributes to the lack of "a formulation of research issues that are intrinsic to the viewpoint of the social sciences." In other words, the fact that human survival now hangs in the balance is not itself of much interest to social scientists unless it can be translated into familiar terms, and converted into a well-funded research agenda.
>
> . . . .
>
> Whether all of this well-funded activity, conferences in expensive hotels and exotic places, paper shuffling, and field building will have anything to do with reversing destructive planetary trends, the author does not say. One suspects that the reason he does not say is that he has not thought much about it. He seems to regard planetary distress, and the accompanying human suffering, in the same way ambulance-chasing lawyers do automobile accidents -- as an opportunity to cash in. (pp. 164-65)

I apologize to David Orr for presenting his words out of context. People should read the books. But I did not choose the passages randomly. They have implications for the structure and content of curricula, especially in the liberal arts, and they point out boldly the irrelevance and inanity of some traditional icons of the academy. In effect, he does to education what nature does to the wall in Mending Wall. He subverts the complacency of the entrenched status quo.

What does all this mean for the college of arts and sciences at Florida Gulf Coast University? With the help of some outstanding faculty (perhaps a critical mass of academic atheists) we have put in place a curriculum and an organization that alters the traditional model of a college. While it does not go nearly as far as Orr demands, it heads in that direction. I believe we have made progress on at least three fronts: institutionalizing ecological literacy, integrating curriculum, and changing the way we think about learning.

The Colloquium: a Sustainable Future

We were able to get agreement, before the university ever opened, that ecological literacy would be one of the university-wide student learning outcomes. The Vice-President of Academic Affairs, Suzanne Richter, strongly supported this goal (and, by the way, gave crucial support for our hosting this Sanibel conference), along with the other deans. I will spare you the details, but the result of this agreement was a course called The Colloquium: A Sustainable Future that was instituted as a graduation requirement for all undergraduate students at Florida Gulf Coast University. Two environmental studies faculty, Win Everham and John Fitch, with consultation from Bill Hammond (who was later to join the faculty), helped in the initial planning and conception of the course. A little later we were fortunate to hire Peter Blaze Corcoran, the organizer of this conference, to develop, teach, and direct the delivery of the course. Significantly, while it is housed in the College of Arts and Sciences, the Colloquium is viewed as a "university" course, and faculty from the other academic colleges participate in the teaching and planning.

Peter can tell you about it in detail, but in brief the course is upper-level, built around the idea of education for sustainability and is field based. The campus itself is used as a lab, and students take field trips to a variety of other ecosites in the area. A sense of place is stressed. There was, and continues to be, some resistance, from students who complained because it was a requirement and not connected to their major, from some faculty and program chairs who did not want to give up three semester hours from their own course requirements, and some expected political carping. Preliminary assessments are showing that it is becoming more accepted, but more importantly, that it is making a difference in students' thinking and lives.

Bachelor of Arts in Liberal Studies

At the same time we were institutionalizing ecological literacy, I was working on finding ways, and agreement, to change the traditional college's rigidly departmental structure and way of thinking. Part symbol and part substance, we have succeeded, I believe, in blurring discipline-based identities, broadening academic allegiance, making interdisciplinary collaboration in curriculum and college management a requirement, and adding to theory and narrow-knowing the importance of application and action, especially in relation to major contemporary issues.

Opening with twelve discipline-based programs -- art, biology, computer science, English, environmental studies, history, earth systems science, interdisciplinary social sciences, mathematics, psychology, Spanish, and theatre -- we blunted the identity of the traditional disciplinary degrees by subsuming them under an even older tradition: we offer only a Bachelor of Arts in Liberal Studies. Furthermore, we named the discipline-based programs "concentrations" rather than majors. (In fact, each concentration has at least 36 semester hours, which is as many, or more than, a traditional major.)

Rather than departments, we organized into program clusters with program leaders, not chairs. The program leaders do not have evaluation authority and serve more in a coordinating role on equal collegial footing with all other faculty in the program. While this is not the time to elaborate on it, I must say that the dynamics of our organizational structure were affected by our hiring faculty into multi-year contracts instead of tenure-track lines. The whole power structure of the traditional academy changes.

The central component of the degree, however, and the linchpin to making these changes work was the development of a required core of courses, the Collegium of Integrated Learning, that aimed to integrate curriculum and disciplines, create problem-based learning, and confront major contemporary issues.

The Collegium of Integrated Learning

The Collegium of Integrated Learning is an eighteen semester hour core of courses at the upper-level designed to create a community of inquiry. Students and faculty work together to explore the cultural, social, historical, philosophical, moral, scientific, and humanistic roots of contemporary issues and how they have developed across time. Issues and topics are identified in five general areas: Culture and Society, Politics and Economics, Science and Technology, Ecology and Environment, and Media, Literature, and the Arts. Individually and in teams, and in collaboration with faculty from various disciplines, students investigate these contemporary issues and problems in each of the five areas. This approach requires students to build an integrated context by examining issues through a variety of perspectives and methods and to formulate their own interpretations and responses to the issues.

Inquiry-based Learning

The inquiry, or problem-based, learning approach, calls on students to learn in ways they may not be accustomed to. The courses are intended to be interdisciplinary; stress engaged learning rather than passive lecturing; expect broad and fundamental knowledge in history, social sciences, natural sciences, and humanities; require critical, creative, systematic, and collaborative thinking; and depend on the ability to find and intellectually defend connections among multiple points of knowledge. In addition, success in this integrated core relies on the sophisticated use of communication, information, and technological skills.

Distribution of Courses

The 18 hours of the integrated core have the following distribution:

IDS 3301	Issues in Culture and Society	(3)
IDS 3302	Issues in Politics and Economics	(3)
IDS 3303	Issues in Science and Technology	(3)
IDS 3304	Issues in Ecology and Environment	(3)
IDS 3305	Issues in Media, Literature, and Art	(3)
IDS 4306	Integrated Core Capstone	(3)

The Collegium becomes the shared basis for the degree. In a sense, the discipline choices become the electives, thus reversing the traditional curriculum structure. Because this core is required for the degree, all faculty in the college are responsible for it. Consequently, while they may apply their expertise and discipline-based knowledge in these courses, faculty must move outside the comfort of their disciplines. Ideally, the integrated core engages us in what we don't know so well and offers the opportunity for creativity in course topic and design every semester.

We have tried to provide integration in other ways throughout the curriculum, beginning with lower-level general education courses. Students begin our general education program with the course "Styles and Ways of Knowing" and end it with the course "Connections." These courses introduce students to critical thinking and ask them to be able to make connections. These courses help prepare students for what the Collegium of Integrated learning is about and establish a pattern of introduction, skill and knowledge attainment, and capstone experience, that is repeated in the Collegium as well as in the discipline-based programs.

We have attempted to construct and provide a more unified academic experience by combining the traditional university model with some altering innovations. We are working on a campus ecosystems model not only as a means to ecological literacy but also as a holistic way of thinking. While what we have achieved so far is more of a whimper than a bang when compared to David's call for change, I am glad to thank him for some of the ideas and the inspiration in helping me "go behind my father's saying."

References

Orr, David. (1992). Ecological Literacy: Education and the Transition to a Postmodern World. Albany, NY: State University of New York Press.

Orr, David. (1994). Earth in Mind. Washington, D.C.: Island Press.

A spirited response to Orr, full of illuminating questions, was delivered by W. J. Rohwedder, Professor in the Department of Environmental Studies and Planning at Sonoma State University. He has been teaching full time at SSU since 1981. His primary teaching and research areas are environmental education, sustainable design, and computer-aided communications. He has been an educational consultant for numerous organizations, including the World Resources Institute, U.S. Environmental Protection Agency, U.S. Peace Corps, President's Council on Sustainable Development, The Energy Foundation, and the California Department of Education. He is a founder of EcoNet, an international computer network.

THE PEDAGOGY OF PLACE: WHAT DO OUR CAMPUSES TEACH?

Introduction

While all of us involved in education pay great attention to the content and methodology of our lessons, rarely do we pay as much attention to the physical spaces or "environment" in which we teach. We know place has tremendous pedagogic power. But what do our campuses teach?

After setting context, I have offered a set of fundamental questions about the pedagogy of place which I feel are especially relevant to anyone involved in environmental education. While these questions are focused on institutions of higher education, they apply to any formal or non-formal institution, as well as to any grade level. I would like to encourage you to consider these questions in the context of the places where you teach. In light of these questions, I then offer some challenges for those of us who consider ourselves to be environmental educators. Finally, I have briefly profiled our efforts at Sonoma State University to utilize the pedagogy of place by creating a new facility -- known as the Environmental Technology Center (ETC). We believe that the ETC reflects a significant new vision for a building on a university campus, one which we believe is a model for other campuses around the world.

Setting Context

Tom Bender, in Environmental Design Primer (1977), wrote:

> We have drawn a distinction at our skins which is contrary to the most important relationships and processes that concern us and our well-being. WE ARE OUR ENVIRONMENT -- what lies outside forms what lies within. WE ARE OUR ENVIRONMENT -- the environment of our minds brings into existence both the conceptual and physical spaces we inhabit. What we are becomes our world.

Barry Lopez, in Crossing Open Ground (1989), wrote:

> The interior landscape responds to the character and subtlety of the exterior landscape; the shape of the individual mind is affected by land as it is by genes.

The message communicated by these insightful quotes is clear. Place is a teacher. Whether looking from the inside out (mindscape shaping landscape) or the outside in (landscape shaping mindscape), the dynamic between our minds and our places is powerful, purposeful and pedagogic. To treat it lightly or without careful attention is a fundamental mistake that is being repeated each and every day by highly respected educators. Even by those of us who teach environmental education. Especially by those of us who teach in places of "higher education."

Questions

As I have begun to explore the pedagogy of place as well as the specific impact of campus facilities and grounds, I have come up with a series of fundamental questions. While I do not for a moment pretend to have the "answers" to these questions, I hope they can serve as touchstones to help each of us begin to explore the teaching power of place in our own academic backyards.

Here are the basic questions:

> What are the typical landscapes of higher education institutions? (By landscapes I am referring to buildings, grounds and infrastructure.)
>
> What do these landscapes teach us and our students?
>
> What impact do these exterior landscapes of higher education have on the cognitive structures and intellectual paradigms of our interior landscape?
>
> How does the physical and the curricular landscape of our college and university environmental programs impact the interior mindscape of our students? Where is our landscape inconsistent with our mindscape, and how do we fix it?

These questions overlap, they give rise to many other questions, and they have sets of nested questions within them. Nevertheless, I would like to use them as a framework within which we can begin to explore the pedagogy of place in higher education.

What are the typical landscapes of higher education institutions?

What do our students and faculty see each and every day, whenever and wherever they are on campus? They see a set of consistent structures. Large square buildings which house discrete departments (e.g., music, math) or academic units (e.g., natural science, humanities). These large square buildings hold large and small square rooms in which square chairs are organized into rows, all facing one direction. Everywhere that I have been in the developed world, the physical and intellectual landscape appears consistent.

What about the processes within these landscapes? Whether due to design or operation (or both), I see facilities that are routinely very wasteful of energy and other natural resources. The energy that is wasted is typically produced by fossil fuels. In addition, educational facilities also generate tremendous amounts of solid and chemical waste.

It seems ironic that places designed to enlighten the mind are built and operated in a manner that often seems so mindless. David Orr, in Earth in Mind (1994), underscored this incongruity when he wrote:

> It is paradoxical that buildings on college and university campuses, places of intellect, characteristically show so little thought, imagination, sense of place, ecological awareness, and relation to any larger pedagogical intent.

What do these higher education landscapes teach us and our students?

When viewed as a campus, the structure and location of university buildings teach us that disciplines must be distinct and not connected. Interdisciplinary study is not a valid academic enterprise because it is not physically represented. Unlike the real world, where knowledge from distinct disciplines is always fundamentally connected, the location and structure of campus buildings teach a diametrically opposed notion of reality. The moral of the story is that the most knowledgeable people in our society believe we should study only within isolated disciplines. University landscapes teach us *the "preferred" epistemology*.

Furthermore, the isolation of disciplines within discrete university buildings teaches that people in different disciplines should not meet each other and interact (e.g., do research together, co-teach courses). While this phenomenon is probably promoted most dramatically by the evaluation and tenure process of higher education, it is nevertheless exacerbated by the common physical structure of academic institutions.

The interior structure of classroom spaces promotes future disconnection and isolation. The "chairs all in a row facing forward" structure of the vast majority of university classrooms suggests that students should not interact in class and they can only learn from the teacher, not from each other. Our university landscapes teach us *how and from whom we must learn*.

The design of university buildings as well as the technologies and materials chosen to build them teach us that energy is cheap and that natural resources are unlimited. Inefficient structures, powered by fossil fuels and built from energy-intensive materials that are harvested and manufactured with little regard for the environment, are far too commonplace on university campuses. Even with the tremendous advances in sustainable architecture and engineering made in the last few decades, campus construction continues to reflect that wasteful paradigm of the past.

The operation of these facilities, once built, also teaches that energy is cheap and natural resources are unlimited. Energy, natural resources such as water and soil, and *especially* paper, are generally treated as if there may be no tomorrow. While important new initiatives have occurred on some university campuses in recent years (National Wildlife Federation, 1998), these initiatives are unfortunately the exception rather than the norm.

Both the design and operation of university facilities clearly teach us how the "most educated people" build and run the places in which they work. The lesson is clear and convincing -- albeit profoundly disturbing. Educated and responsible citizens pay little attention to their consumption of energy, their generation of waste, or the related impacts these behavioral patterns on future generations or other living things. Our schools teach us *how we should act*.

What impact do these exterior landscapes of higher education have on the *cognitive structures and intellectual paradigms* of our interior landscape?

How does the landscape of higher education impact the mindscape of students and faculty? In addition to teaching us that disciplines must be distinct and that interdisciplinary study is not a valid academic structure, the landscapes of higher education teach us that learning within isolated subjects is more appropriate than learning about whole systems or, in the words of Gregory Bateson, "the patterns which connect." Not only do our academic landscapes voice disapproval for interdisciplinary study, they also suggest that interdisciplinary *thinking* is without merit.

The fundamental message of higher education landscapes suggests that to understand the world, one must understand the parts. To become more knowledgeable, one must learn more about a specific component of knowledge, not more about the whole. Specialization is encouraged. Synthesis and integration is discouraged. Unfortunately, this message clearly promotes and perpetuates the Cartesian, reductionist worldview that lies at the root of so many of our social and environmental problems today. Nevertheless, our academic institutions teach us *how we should think*.

How does the physical and the curricular landscape of our college and university environmental programs impact the interior mindscape of our students? Where is our landscape inconsistent with our mindscape, and how do we fix it?

These questions bring the previous discussion home to roost. First, what about our immediate physical landscape? What about the buildings and classrooms in which college and university environmental programs are taught? While our rhetoric in college and university environmental programs is focused around the dramatic need for sustainable techniques and technologies, do our buildings and operations demonstrate sustainability? If the design and operation of our facilities do not fully exemplify the fundamental application of the lessons we are seeking to impart, what then is the message that we convey to our students? If we cannot put into practice in our own places what we hope to see manifested in society, then who can? Who will?

David Orr, in Ecological Literacy (1992), summarized this situation when he stated:

> We have an obligation to provide our students with tangible models that calibrate our highest values with our best capabilities; models that they can see, touch and experience. When pedagogical abstractions, words, and whole courses do not fit the way the academic campus in fact works, they learn that hope is just wishful thinking, or worse, rank hypocrisy.

Beyond the structure and operations of our facilities, what about the structure and operation of the curriculum in our environmental programs? What are the cognitive structures that we are trying to promote in our students and are they clearly reflected in both the structure and content of our curriculum?

My experience suggests that our environmental studies and/or environmental science curriculum function less as an integrated, "ecological" system and more like a loosely connected series of courses. While our individual courses may address the need for integration and synthesis of knowledge in society so as to obtain the whole systems perspective necessary to understand and solve complex problems, the structure of our curriculum is rarely carefully designed so as to achieve this perspective.

How many of our courses are coherently sequenced and carefully articulated with other courses in our major? My hunch is that in most cases university environmental programs are primarily a loosely connected set of courses which are packaged and treated as a coherent environmental curriculum. From this assemblage we assume that a whole systems paradigm with integrated cognitive patterns and structures will somehow magically emerge without facilitation from within the minds of our students.

While this can and does happen, serendipity is not the most proactive stance we can take if we want to promote new patterns of thought and behavior. Instead, we should begin with a careful review of our existing curricular structures, we should aggressively promote increased faculty interaction and cooperation, and we should design and teach connective courses designed specifically to promote a whole systems, ecological *gestalt*.

Looking Outside In, Not Just Inside Out

In closing, I want to offer a fundamental challenge to those of us who teach about the environment, regardless of what level you teach. I believe that while we have made great strides in defining what we mean by "environment" and by documenting what one should know to be ecologically literate, it is time to place much greater effort on understanding how our schools impact the ways we perceive the environment.

While our historical focus in the environmental field has been directed towards looking from inside out to the environment around us, I am convinced that we now have to pay equal attention to looking from the outside in. We need to see how the structure of institutions and their dominant paradigms impact the ways in which we "see" our world and act within it. While the structures of mind bring into existence our external reality, the models of thought and action we see around us while in "school" have a profound impact on our structures of mind. Simply said, the environmental crisis is a crisis of mind as much, if not more, than a crisis of behavior -- and one of the primary perpetrators of this crisis is the institution of higher education. Pogo was right. In order to ameliorate the deleterious lessons of landscape taught on most campuses today, as educators we need to shift some of our attention from what we should know about our environment, and put more of our attention on how our environment, especially our educational environments, impact us. In light of that knowledge, we must begin to reshape or remake the fundamental structure and behavior of learning institutions so as to be in alignment with the lessons and rhythms of natural world which supports us.

It is time to get busy pulling weeds and picking stones -- in our own academic backyards. We cannot keep complaining about how hard it is to operate our "round peg" environmental programs in the "square hole" of higher education in the 20th century. It is time to get busy changing the "shape of the hole" to the "shape of the whole."

The challenge is elegantly simple, yet extremely urgent. However small, however bold, it is time to get on with it. Answer these simple questions and then get to work. How can we modify existing spaces and create new spaces on our campuses to promote systems of thought and practice that will help to insure the sustainability of all life on the planet? How can we practice what we preach in the places where we teach?

The EarthLab and Environmental Technology Center (ETC)

> Sometimes the dissonance between reality and false beliefs reaches a point when it becomes impossible to avoid the awareness that the world no longer makes sense. Only then is it possible for the mind to consider radically different ideas and perceptions.
>
> Gregory Bateson, Steps to an Ecology of Mind, 1972

In an attempt to answer some of the questions I have proposed above and to consider radically different ideas and perceptions, several years ago we set out to envision and then create a place where much of what we *explored in our courses* could be *applied on our campus*. We started by reclaiming a one-acre parking lot which we labeled the EarthLab. Step-by-step we brought life back to the site; it now includes extensive food, herb and flower gardens, a solar greenhouse, and a compost demonstration area. This volunteer-based project has involved university students, elementary-aged youth, "youth-at-risk," faculty from several disciplines, community members, and local businesses. Our latest project on the EarthLab site is a new building which will serve as a model of sustainable building techniques and technologies that focus on fundamental human needs of energy and food production. We call it the Environmental Technology Center, or ETC.

I would like to briefly describe our mission and objectives in building the ETC in the hope that they will be helpful to others considering similar projects. For those of you interested in the more technical, construction-related aspects of the ETC, please visit our web site (www.sonoma.edu/ensp/etc), where you can find design criteria, section and floor plan drawings, and artist renderings.

Our mission statement for the ETC is short, but actually very complex:

> To design, build and operate a dynamic, interactive and integrative facility where faculty, students and community members from a wide variety of disciplines can work together in applied research training, academic study and collaborative environmental projects.

This statement needs some further dissection to fully understand our perspective. By *dynamic*, we mean a building that is constantly changing so as to accommodate shifts in the focus of curriculum, advances in technology, and changes in research methodologies. We knew we could never create a "state-of-the-art building" because by the time you design, put out to bid, build and commission a building, it is anything but state-of-the-art. This is especially so when your focus is sustainable design. *Flexibility* was a fundamental design principle.

By *interactive*, we mean that the environment, the building, and the occupants are involved in a *participatory exchange*. The building is informed by the weather and it reacts accordingly. We as occupants are informed by the building and we in turn interact with it so as to achieve the desired results in heating, cooling, lighting, and function. From the beginning we have called this "a building that teaches."

By *integrative*, we mean that the center strives to *bring together* on and off-campus academics and practitioners from different disciplines so we can integrate our knowledge and experience in order to achieve a whole systems viewpoint from which we believe new techniques and technologies will emerge. This is a facility designed to *connect* -- discipline with discipline; campus with the community; sustainability with science and technology. It is *not* going to be just an exclusive playhouse for the students and faculty in environmental studies.

We also began with a commitment to *applied research* -- research that promotes direct experimentation in the context of natural phenomena and contemporary applications. We believe students need to learn how to conduct valid research, but they also need this research to translate directly to what they experience in their everyday world. This approach gives relevance and meaning to the academic principles introduced in course work while encouraging critical thinking and heuristic problem solving.

Finally, we believe that the ETC should promote *collaborative environmental projects* -- building teams of students, faculty and community members with diverse interests and backgrounds to focus especially on projects which can benefit from collaboration. This project-based learning approach is also consistent with our constructivist view of learning.

In addition to our mission statement, we also have a broad set of objectives for the ETC. They include:

> to serve as a model for other universities by addressing campus-related environmental technologies and techniques.
>
> to serve as a center for interdisciplinary environmental science education, demonstration and research training.
>
> to serve as a model pre-service and in-service training facility with a focus on science, technology and society.
>
> to serve as a field-based education site for local schools, connecting pre-service and in-service teachers with K-12 youth.
>
> to serve the surrounding community through education, demonstration and consultation.
>
> to serve as a classroom, display area, and mini-conference facility.
>
> to help make Sonoma State University a model of public sector environmental responsibility.

When one adds up these goals and objectives, it is clear that, from a *philosophical and programmatic basis*, we have a radically different university building. This is also a radically different building from a *design and operational basis.*

Extremely important lessons have already been taught during the design process. For our students, helping to design the ETC was hopeful and empowering. They saw a public institution that was for once not teaching hypocrisy and was instead attempting to "walk the talk." By participating in the process and lending their heads and hands, they also learned directly about the complexity of sustainable design, the importance of knowing the "hard" sciences, and the critical role of economics in decision making.

We were also committed to using bioregional resources, personnel and material, whenever possible during design. We hope the ETC will be a catalyst for others in our region who would like to build similar buildings. We therefore sought out people from our bioregion who could help translate interest in the ETC at Sonoma State University into reality in other places. Local architects, engineers, consultants, and manufacturers were used whenever possible. This was also true in the selection of materials and technologies. We sought to invest in the local economy and minimize the embodied energy expended in the transportation of materials and technologies to the job site from far away.

In the design process, we used sustainability as a fundamental design criteria for everything from material selection, to technologies, to ultimate deconstruction. Materials will include: recycled plastic lumber, walls and ceilings built of third-party-certified sustainable lumber and cellulose insulation, "smart" windows that are optically treated for optimal performance, laser-cut fresnel skylight lens which uniformly distribute daylight, locally-obtained rammed earth thermal mass walls for holding solar heat gained during winter days which is reradiated at night, and concrete with 50% of its energy-intensive cement replaced with rice hull or coal fly ash. We were committed to utilizing materials, technologies, and design criteria that other campuses could immediately afford, adapt and adopt. We labeled this criterion as "state-of-the-shelf technology, with state-of-the-art design."

Unique technical and operational aspects include building controls which utilize data from the campus weather station to determine when to automatically open or close windows, indirect evaporative cooling technology which uses approximately one-fifth of what a conventional air conditioner would use, air-to-air heat exchangers which pass thermal energy from out-going interior air to incoming fresh air all activated automatically by CO_2 sensors, and a photovoltaic electrical system which will provide more than enough electricity from the sun to power the building during the day so it will actually be running our utility meter backwards. Our computer models show that this building will be using 10-20% of what current university buildings use when built under the so-called energy stringent California Title 24 Building Codes.

Because this is a building that teaches, it will also contain features such as cut-away sections to reveal interior wall construction and web-connected digital display kiosks which will provide multimedia, real-time information on the building performance to anyone, anywhere, anytime.

We also purposefully chose to call our building an Environmental *Technology* Center. We felt it was time to move beyond "environmental *studies*" to "environmental *technology*." The Webster Dictionary underscores our perspective. *Studies* is defined as (1) the use of the mind to *gain knowledge,* (2) the act or *process of learning* about something. *Technology* is defined as (1) *applied science;* also: a technical method of *achieving a practical purpose.* (Emphasis added.) We felt that we needed to move beyond the image often associated with the word "studies." *Studies* suggests a field that seeks only to understand ("gain knowledge"), is still transitioning through adolescence, and is in the midst of trying to figure out what is going on ("process of learning"). We certainly know that we need more knowledge about the environment and how we can better behave in light of natural processes.

We also know that we are engaged in a never-ending process of learning. Nevertheless, we feel that we have sufficient evidence of the deleterious impacts of our current technologies and behaviors, and we know what we can do *now* to make a difference. We want to embrace but also move beyond studies. What we need are models of *applied science* with the *goal of achieving a practical purpose*.

To summarize, the ETC at Sonoma State University would like to teach a different set of lessons than those most commonly taught by university landscapes. We hope to teach that:

> Disciplines can and should connect. For example, Ethics and Economics and Energy and Environment must be connected.
>
> While the price of energy may seem cheap, the cost of energy is not. We must use much more energy efficiently and whenever possible, tap into the renewable, sustainable sources.
>
> Our environment sustains us. It is our source and our survival. By combining the best thinking in science and technology with the rhythms of nature, we can build comfortable and functional buildings which have far less impact on the environment.

When we open the doors of the ETC to welcome in the new millennium, it will teach something radically different than university buildings have taught us so far. It will teach us about the importance of the interconnections between disciplines, as well as the importance of the content within disciplines. It will teach us that our buildings do not have to reflect ignorance and waste, that we can instead choose to create places and wield technologies that embrace and manifest the concept of sustainability.

It is a bold new message with power, promise, potential ... and hope.

References

Gregory Bateson. (1979). Mind and Nature. New York: E.P. Dutton.

Tom Bender. (1976). Environmental Design Primer. New York: Schocken Books.

Barry Lopez. (1989). Crossing Open Ground. New York: Vintage, p.65.

David Orr. (1994). Earth in Mind. Washington, D.C.: Island Press, p.112.

David Orr. (1992). Ecological Literacy. New York: State University of New York.

National Wildlife Federation. (1998). Green Investment, Green Return: How Practical Conservation Projects Save Millions on America's Campuses. Washington, D.C.: National Wildlife Federation.

After some discussion and response to the papers in working groups and a seaside lunch, participants reconvened to be challenged to think beyond university boundaries in a second keynote address by Louise Chawla, an Associate Professor at Whitney Young College, the Interdisciplinary Honors Program of Kentucky State University. She recently completed two years as a Fulbright Scholar at the Norwegian Center for Child Research at University of Trondheim. Dr. Chawla is a distinguished researcher in environmental psychology, significant life experiences, and childhood memory. Louise is coordinator of Growing Up in Cities, an eight-nation action-research study. Her book In the First Country of Places, Nature, Poetry, and Childhood Memory is regarded as a significant contribution to understanding the importance of the ecology of environmental memory.

ACADEMIC PLANNING AS A CATALYST IN REALIZING THE ROLE OF CHILDREN AND YOUTH IN SUSTAINABLE DEVELOPMENT

In a meeting focused on planning for environmental programs in higher education, why direct your focus beyond the university, to think about young people beyond the university boundary? Is it the right time to think about wider communities, when higher education faculty and administrators already face steep challenges in seeking to develop integrated environmental curricula for their own students? I have pondered this question myself, and bring the proposition that the design of dynamic environmental programs requires that universities and colleges build links to the communities in which they are embedded, and to the larger global community, from the very beginning of the planning process.

When I ask you to consider children and youth, what is this population? In international legal documents, "children" has a very specific definition: all human beings under the age of 18. Therefore, children are those below college age. "Youth" is a more amorphous term. There is no legal definition, and people use it variously to mean 12 to 25 year olds, or 18 to 30 year olds, or other groupings within this range. In other words, it includes the traditional college and university population. Therefore, in asking you to think about how academic planning can be a catalyst in realizing the role of children and youth in sustainable development, I am asking you to think about ways to combine college and university students in common efforts with their agemates outside the campus and with those younger than themselves.

I have chosen this age group because it is the one with which I am familiar. Children and youth are the subjects and agents of an international UNESCO project that I coordinate. This project engages young people in evaluating and improving their local environments. Much that I will say, however, could be extended upward in age to apply to "town-gown" or "globe-gown" relationships in general. On a fundamental level, the subject of this paper is how academic planning can create opportunities for college and university students to understand and address environmental issues in collaboration with people beyond the academy: the community surrounding the campus, and those farther away.

In even broader terms, this paper's subject can be seen as an example of one way to implement the first principle of the Rio Declaration that world governments signed at the United Nations Conference on Environment and Development, or the Earth Summit, in 1992. According to this principle: "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." This principle parallels the principle of this talk as well: that just as sustainable development needs to be people-centered, education for sustainable development needs to be people-centered, too. I could be using any group of people, but I am using the group with which I have the most experience--children and youth--in order to argue this point.

People-centered Development

I teach in a history of ideas program, so I want to begin with a bit of history about this principle. It may not seem immediately relevant to environmental studies programs, but let me relate it, and then I will try to convince you that it is.

The principle that development needs to be people-centered is not a new idea of the 1990s. It began to form soon after World War II, in opposition to the dominant model of development that remains strong today, which assumes that development centers around industrial production and consumption. In the 1950s, 1960s, and 1970s, the development agenda was set by colonial, communist, autocratic, and democratic bureaucracies, often in close consultation with captains of industry and industrial agriculture. In the fields and factories, workers were expected to carry out the plans determined by the bureaucratic and business elite. What has changed today is that a similar vision of development--development centered around the production and consumption of goods and services--is supposed to be determined by the invisible hand of the free market, with governments often struggling to maintain some form of control.

In the 1950s and '60s, a small but increasingly vocal opposition began to form, observing that "development," in this sense, was destroying rural villages and old urban neighborhoods. It was development for societies' elite, these captains of industry and agriculture and the politicians they subsidized -- the same people who did the planning--at the expense of the poor. It was development for the few at the expense of the many. The concept of people-centered development--development that would be determined by the many for the benefit of themselves, their villages, and their neighborhoods--became articulated at this time. In this connection, I can mention Paolo Freire's Pedagogy of the Oppressed, Paul and Percival Goodman's Communitas, and the now iconic article by the advocacy planner Sherry Arnstein on "A Ladder of Citizen Participation." By the 1970s, "people-centered development" and "participatory development" were key terms in development circles.

Then came the 1980s, when those in the establishment moved to reconsolidate their control. In many ways, the great international conferences of the 1990s, such as the Earth Summit, can be seen as an attempt by the United Nations and international NGOs (non-governmental organizations) to recapture the momentum of the 1970s and to regain what had been lost in the 1980s.

There is another side to this history. I will mention it briefly, and then get on to the relevance of this background for environmental programs. By the time of the Earth Summit in 1992, this opening principle--that sustainable development must be people-centered--had emerged as a leading issue of contention between nations of the North and the South. The member states of the United Nations from the Southern Hemisphere, who now represent the many and most of the world's poor, were determined that the wealthy, high-consuming nations of the Northern Hemisphere were not going to dictate their development agenda to them, or tell them what kind of environmental regulations they had to have and how much they could consume, at the expense of their own freedom of self-determination and their people's basic needs. In this context, "people-centered development" signified the rights of nations to define their own versions of what "harmony with nature" meant in practice.

This is a complicated history that I have briefly simplified. As in all international agreements, each principle in the Rio Declaration reflects a diplomatic compromise whose gains and losses will be viewed differently from different perspectives. To mention just one complication, what I have simplified as the over-consuming North and the people-rich but capital-poor South is a division that is mirrored within each nation, where there are similar divisions between rich and poor within each society. Every country of the industrialized world, too, has its "not-in-my-backyard" movement or environmental justice movement in which low and middle-income citizens demand a role in development decisions to ensure that they will address local communities' authentic needs. This history of community activism links Principle 1 of the Rio Declaration to Principle 10, which states that, "Environmental issues are best handled with the participation of all concerned citizens, at the relevant level."

People-centered Environmental Education

What do these principles of the Rio Declaration, and the history behind them, have to do with environmental programs in higher education?

First of all, the Rio Declaration and Agenda 21 are the guidelines that the nations of the world have agreed upon in order to move toward a new form of development, sustainable development, that we have to achieve if we are going to enjoy and pass on any viable quality of life on this planet. Therefore, all environmental programs need to be sharing and discussing these documents with their students. Years of effort have gone into their creation, but they are only as good as the continued pressure of people in and out of government to secure their implementation.

Secondly, I think that if environmental programs confront these principles of people-centered development and people's participation, they must face a self-examination. According to my own informal review of environmental program directories, most programs seem to assume that environmental problems are best solved by a technocratic elite. Like development planning that has focused on the production and consumption of military, industrial, and consumer goods and services, they seem to assume that its reverse--planning for sustainable development--is best achieved through the education of a scientific and managerial elite who will serve and influence those in power in government and industry, with little or no attention to facilitating community participation and action. To use another set of terms from the development debate of the 1970s, they educate people to work at the "center," in existing centers of power, rather than at the "periphery," in the rural towns and urban and suburban neighborhoods where most people live. In other words, the claims of people-centered development and the related principles of the Rio Declaration appear to go unheard and unheeded in most programs. But if the Rio Declaration is right--that to be sustainable, development must be people-centered--then this is a gross omission.

This argument is similar to the distinction between the "Two Meanings of Sustainability" that David Orr describes in the opening pages of his book Ecological Literacy. One, he notes, "reinforces a tendency toward a global technocracy and a continuation along the present path of development, albeit more efficiently. The other view requires a rejuvenation of civic culture and the rise of an ecologically literate and ecologically competent citizenry who understand global issues, but who also know how to live well in their places" (p. 1).

I am *not* saying that courses in the natural sciences, management, and technology are not an important component of environmental education. I *am* saying that these courses need to be balanced by an equally strong investment in education to understand and work with other citizens in the university region, in students' home localities, and in study-abroad opportunities. Without this balance, programs are not adequately acknowledging and addressing the challenges inherent in sustainable development. The 1997 NAAEE report on Environmental Education: Academia's Response by Kormondy and Corcoran observes that some programs face pressure from administrators who want to turn environmental studies into environmental sciences, but these pressures need to be resisted.

This principle is echoed by conclusions from the International Conference on Educating for a Sustainable Future sponsored by UNESCO and the government of Greece in December 1997. Noting that environmental problems have complex physical, social, economic, and political causes, the conference document advised that, "The traditional primacy of nature study, and the often apolitical contexts in which it is taught, need to be balanced with the study of social sciences and humanities." This reorientation implies that:

> Students need to learn how to reflect critically on their place in the world and to consider what sustainability means to them and their communities. They need to practice envisioning alternative ways of development and living, evaluating alternative visions, learning how to negotiate and justify choices between visions, and making plans for achieving desired ones, and participating in community life to bring such visions into effect. (Educating for a Sustainable Future, p. 24)

(It should be noted here that the United States is not a member of UNESCO. Nevertheless, representatives of the environmental education community in the United States contributed to the conference; and nothing prevents U.S. colleges and universities from taking leadership in implementing these recommendations, or in urging national membership.)

These recommendations can be carried down through the different levels of environmental education, from graduate programs, through undergraduate, through secondary and primary school. Environmental education for children and adolescents as well as for college and university youth (and therefore also the training of environmental educators for these age groups) needs to be similarly balanced between science and a humanistic and practical education for human understanding and cooperation.

A Model of University-Community Cooperation

As an example of what I am suggesting, I am going to briefly describe a program that is university initiated and that draws upon university support. I know that there are many other programs that depend upon similar collaborations among universities, communities, governments, and international agencies, but as this is the one in which I am personally involved, I will use it as my example. As I describe it, I will emphasize different structures of university support that have made it possible. Its reach, however, goes far beyond university walls. The other wing, so to speak, that makes the project fly is a strong network of support within urban neighborhoods and city governments. By serving children and adolescents in low-income neighborhoods around the world, it has created numerous opportunities for university students' participation and learning.

The project is called Growing Up in Cities. It was originally conceived in 1970 by the urban planner Kevin Lynch as part of the participatory, people-centered movement of that time. Just as the series of conferences that the United Nations convened in the 1990s on issues of environment and development, social development, women in development, population, and human settlements can be seen as efforts to put new momentum behind important ideas from the 1970s, this project is a similar effort. Growing Up in Cities was a project of the Man and His Environment Programme, which was initiated by UNESCO in 1968 and eventually assimilated into the Man and the Biosphere Programme. From the beginning, Man and His Environment was designed to be a multidisciplinary project--and here I quote--"on the manner in which man has shaped his environment and what he can do to avoid waste, pollution, and unnecessary destruction of scarce natural resources." To address these ends, the program focused "on man as a whole, the creation of favorable social relationships in a human environment, the prevention of alienation and attention to social and mental health on a community scale."

These words are worth rereading, because they do not refer to the usual way in which problems of waste, pollution, and the destruction of scarce natural resources are addressed, inside or outside of higher education. Clearly, these words reflect a conviction that one approach to environmental problems *must* be people-centered.

Within this context, Kevin Lynch conceived Growing Up in Cities to address the environmental needs and contributions of young adolescents. From the beginning, the plan was to work within low-income areas undergoing rapid change, where children's ideas and participatory programs to engage children could have an effect on policy-making and subsequent environmental conditions. Four national UNESCO committees funded the project for application in Argentina, Australia, Mexico, and Poland. At the time, however, there were no outside pressures on organizations like UNESCO or on city governments to acknowledge children's presence and potential; so, after finding out how young people used their urban neighborhoods and their ideas for improvements, the project never went beyond this research phase. The project ended with Lynch synthesizing the research results into a book of guidelines for urban policies and design that would be responsive to young adolescents' needs--a very different ending than the participatory action that he had envisioned.

Since the 1970s, two events have happened that have created a new foundation for work of this kind that are as relevant for environmental education programs as they are for Growing Up in Cities. A watershed event related to any kind of advocacy work for children is the Convention on the Rights of the Child, which was adopted by the United Nations in 1989 and which has been ratified by every member nation except the United States and Somalia. Somalia cannot ratify because it lacks an officially recognized government. That leaves the United States as the sole nation in the world that will not ratify it, due to the resistance of a few powerful conservatives. Nevertheless, the lack of official ratification by this country does not prevent people and institutions of good will--and I would hope that colleges and universities would take leadership here--from acting on the Convention's principles.

As I noted before, "children," in the terms of the Convention, are all people under age 18. The Convention contains three types of articles: articles related to the *protection* of children from harm, articles related to the *provision* of their basic needs, and a cluster of articles that define children's rights to *participation* in decisions that affect their lives. The quality of the environment in which they live is an issue that undeniably affects their lives. These rights to participation have been reaffirmed by Agenda 21, which makes strong references to the Convention in its chapter on "Children and Youth in Sustainable Development" and elsewhere. It was reaffirmed again at the World Summit for Social Development in Copenhagen in 1995 and at Habitat II, the "City Summit" on Human Settlements in Istanbul in 1996. In the words of the Preamble to the Habitat Agenda:

> The needs of children and youth, particularly with regard to their living environment, have to be taken fully into account. Special attention needs to be paid to participatory processes dealing with the shaping of cities, towns and neighborhoods; this is in order to secure the living conditions of children and of youth and to make use of their insight, creativity and thoughts on the environment. (paragraph 13)

The government of the United States has signed all of these conference agreements, so indirectly, it has officially endorsed the principles of the Convention on the Rights of the Child. Therefore, in educating students about these agreements, the Convention is an important legal background.

Many countries and organizations are trying to honor the principles of the Convention, Agenda 21, and the Habitat Agenda related to children and the environment; and this has created a new foundation of support for Growing Up in Cities which has enabled it to fulfill its original mission of moving from research to action. Another change is the growing recognition that more and more of humanity live in urban areas, so that cities and towns must be understood as a critical location for environmental change. A large proportion of this population is children: about 25% in industrialized countries such as the United States; about 35-50% in rapidly growing populations of the Third World. Many of these children are poor. This is the generation that will carry civilization and human responsibility for the earth into the future. For a number of reasons, they require as much attention as greenhouse gases, the ozone hole, biodiversity, or other issues that are currently featured in environmental studies curricula.

I will briefly mention the basic processes of Growing Up in Cities in order to illustrate ways in which universities and colleges can support such community-based action. Growing Up in Cities is a two-phase action-research project which is ideally suited to a university base, given universities' research emphasis. It is currently established in eight countries: Argentina, Australia, England, India, Norway, Poland, South Africa, and the United States; but a series of workshops in Amsterdam have begun to spread its model to a widening circle of cities. It is allied with one or two universities in each country, and brings together people from the disciplines of environmental education, psychology, anthropology, geography, architecture, and urban planning: disciplines that form important components of the people-centered side of environmental studies. Most of the research team leaders are professors, but one is a postdoctoral research fellow, two are doctoral students, and one (working with a more circumscribed version of the project) is a masters student. An abbreviated version of the project has been the term-long focus of an undergraduate class. Other team members include masters students and undergraduates.

What exactly does Growing Up in Cities do? It starts with networking--and then a major aspect after that is networking, more networking, and more networking. To move from research to action, it is essential to build an extensive coalition of sympathetic adults at the community and city-wide level, in and out of government. (I am using Growing Up in Cities as an example, but generalizations like this apply to all community-based projects.) Some of these people primarily care about the quality of children's lives. Others care about urban quality, but they recognize that environments that are better for children are better for all ages, and they see working with children as a lever to make things happen. What politician can resist an opportunity to declare support for an appealing group of children who are making reasonable demands and offering to cooperate to improve their community? Once support has been declared in public meetings and newspapers, over radio and television, it doesn't mean that the rest of the way will be easy, but the children and their allies *do* have leverage to actually make things happen.

After networking is underway, the second step is research. (This is another generalization that applies to all participatory projects.) Growing Up in Cities is based on the conviction that if programs and policies are going to truly represent a wide spectrum of community needs, they have to be based on the systematic information that only research provides. In our case, we engage young people in drawing and talking about the area where they live, interviews, group discussions, child-led tours, child-made photography, and other methods. We combine this qualitative material with maps, census data, and observations and records of life in local public spaces. We interview parents, community leaders, and government officials about their own perceptions of the children's lives, to understand whether their perspectives coincide with the children's views, and their levels of support for project goals.

Based on this background, and working with the children, we identify the children's priorities for improving their environments and plan concrete programs to implement the most feasible priorities. Then we go to work--pulling all the necessary network strings--in order to make things happen. We also conduct training to spread the project model.

What are some of our accomplishments? The mayors of Buenos Aires and Johannesburg have declared Growing Up in Cities a model for participatory planning with children. In South Africa, the squatter camp children have worked with a project architect to design and create a building where they can do homework together--a priority that the young people placed as high as toilets and running water. Beginning with the children, a whole process of integrated community planning has begun, involving parents as well. In Buenos Aires, children have carried out plaza improvements, and they have created an exhibit of photographs and commentary about their community which has hung in the city's main cultural center and formed the focus of public discussion about how to improve urban conditions for children. In Argentina, Australia and India, the project methods are forming the basis for formal and nonformal, community-based education; and in Australia, the children are working with a landscape architect and the city council to create a corridor for safe movement around their locality. In Oakland, California, the children created alternative models to renovate their housing development courtyard, which forms the single outdoor space in the fear-bounded world of most residents' lives.

What does all of this have to do with environmental studies programs? It is one example of what people-centered development means; it demonstrates that when people are given a chance to identify what they need, they give as much importance to safe, friendly places where children and other generations can meet and to positive community activities as they do to elementary physical needs. If development were to be reoriented according to these values, it would shift from an emphasis on the consumption of increasing quantities of natural resources to an intensification of the social and psychological dimensions of life quality: which is what a shift to sustainable development requires. The issues of equity and social justice that are integral to this project are the "second leg" of sustainable development, in addition to the protection of natural resources.

Students who have been involved in the project have had opportunities to travel and present their work at national, regional, and international conferences. Meanwhile, they are learning skills for multidisciplinary community-based work that they can carry with them into their future careers. They may not be learning how to make money out of community advocacy work; rather, they should be learning the reality that, as a rule, fees for work of this kind are small and irregular. Nevertheless, among all in the group, there is enthusiasm and commitment based on the personal and professional friendships and satisfactions that work of this kind brings. Students are learning how to catalyze and serve grassroots community organizing, which is a critical "town-gown" service that sustainable development requires. Many will move into jobs where experience of this kind will be highly valued. If universities encourage work of this kind and send more students into the world who know how to facilitate community action, they will influence private companies to be more supportive of community service as well. Enlightened companies know that what is good for communities is good for the surrounding environment of the company, that projects of this kind provide many opportunities for good public relations, and that the extensive city-wide and community-wide connections that they involve are bound to increase professional outreach and influence.

Mechanisms for University Support

How have universities supported this work? The ways that I am going to mention are not original, but the important point is that, in combination, they can have powerful effects.

a) **Fellowships**. Research fellowships for faculty and postdoctoral, doctoral, and masters-level students, based on in-house and outside funding, have been granted.

b) **Full and partial leaves of absence**. Our Argentinian work, for example, is co-directed by the head of an Argentinian NGO and a professor from North Carolina State University who has had many years of experience working in South America. To make it possible for him to participate, the university gave him a semester of partial salary, during which time he supervised upper-level students through correspondence and early and late-semester meetings, while he spent mid-semester in Buenos Aires, drawing the remainder of his salary from an Argentinian labor union that supports environmental and social justice causes.

c) **Recognition for community service**. This may sound like a simple matter, but at many universities, it implies a basic restructuring of faculty reward systems. It means that helping community groups achieve their goals needs to count as heavily as the individualistic accomplishment of a book, a paper, or a public space or building designed by a solitary architect. Faculty need to be encouraged to invest their discretionary time in this way.

d) **Student participation**. One of our site leaders is a doctoral student, another a masters student. Graduate and undergraduate students are invaluable assistants at most sites. In each case, their university department has encouraged them to create doctoral, masters, or undergraduate study projects of their own within Growing Up in Cities' larger context, or to make project involvement the basis of an internship. The students have received financial support from university scholarships or national or private donors.

e) **Project-based classes**. The University of California-Berkeley and North Carolina State University have used Growing Up in Cities as the basis for class projects.

f) **Faculty travel**. In this case, faculty at one site visit another, using university travel funds or outside funding, to consult at each other's sites and fine-tune collaborative plans.

g) **Small community grants**. Universities can play an important part by seeking and establishing funding for community development. The Institute for Urban and Regional Development at the University of California-Berkeley, for example, currently serves as a channel for funds from the U.S. Department of Housing and Urban Development for physical and economic improvements in Oakland neighborhoods. Money has been appropriated from this fund for the Growing Up in Oakland children to carry through their plans for their courtyard renovation. In Norway, our research leader at the College of Architecture has secured money from the Norwegian Broadcasting Corporation to implement some of the children's priorities in Argentina, India, and South Africa: an example of the important role that people in the North can play in channeling grassroots development money to the South. In each of these three countries, the amount of money is small--about

$10,000--but the amount of confidence and sense of individual and collective efficacy that it engenders is large.

h) **Links to outside agencies**. In the case of Growing Up in Cities, UNESCO has been an invaluable support, providing critical funding for general coordination costs like workshops and publications, maintaining the project web page, and widely publicizing the project model. The project has also been helped by Childwatch International, a Norwegian NGO which is given office space and facilities by the University of Oslo, while its staff funding comes from the Norwegian government. Therefore, it is an example of government-university cooperation. Childwatch maintains a network of "key institutions" around the world in the form of university departments and research centers which initiate and coordinate research and information projects on children's living conditions and the implementation of children's rights. Two of these institutions, the Norwegian Center for Child Research and the Australian Institute for Family Studies, have made important project contributions. Such a consortium can provide a strong foundation for attracting national and international funds.

i) **University-community alliances**. As I mentioned before, the Institute of Urban and Regional Development of the University of California-Berkeley is currently serving as a channel for redevelopment funds for the Berkeley-Oakland area. To increase its ability to benefit area youth and community programs, the university has formed a Berkeley Alliance in the form of a partnership among the university, City Council, and School Board in order to link the university's academic and technical resources to high priority community needs. Jointly coordinated by the Institute of Urban and Regional Development and the university's Community Relations Office, the university has committed staff and seed money, and the city has pledged staff support and in-kind contributions. The Alliance will also serve as a channel for outside funding. At the same time, it will provide many opportunities for effective applied research and for practical and service experiences for faculty and students. This is a model that merits reproduction.

To this list of ways in which higher education can facilitate people-centered development, I want to add one other method that is potentially, but not currently, part of Growing Up in Cities.

j) **Community centers**. The most stable form of support for community service and action-research is the establishment of permanent university-based community centers or urban studies centers. Centers like this often have proud records of accomplishment, but unfortunately, they also often have checkered histories of unstable support from university administrations. They demonstrate that, when it comes down to dividing budgets, service does not rank high on most university agendas. There are some excellent models of urban studies centers in England, which serve as resources for environmental research and organizing by local children and adults (for example, the Notting Dale Center in London described in Roger Hart's book Children's Participation). The community mental health clinics and law clinics connected to some university departments of psychology and law provide other administrative models.

In going through this list, I want to emphasize that my purpose has not been to focus attention on Growing Up in Cities by itself, but to use it as an example of the kind of multi-method approach that an international effort of this kind requires. Growing Up in Cities has been made possible not by any one of these methods in isolation, but by opportunities to draw upon all of these methods in a coordinated fashion. The message for universities is to plan multifaceted systems of support, if they want to support people-centered development. The first step to integrating people-centered development into environmental programs will often need to be a reevaluation of priorities. The second step needs to be networking to create an alliance of people who understand and value this approach, within other university departments, the university administration, the surrounding community, and government agencies. Once this is done, the opportunities for interdisciplinary cooperation in the service of people-centered sustainable development are only limited by the good will, energy, and resources of the people involved.

References

Arnstein, Sherry. (1969). A ladder of citizen participation. American Institute of Planners Journal, 35: pp.216-224.

Freire, Paolo. (1970). Pedagogy of the Oppressed, trans. Myra Bergman Ramos. New York: Continuum.

Goodman, Percival, & Goodman, Paul. (1960). Communitas. New York: Vintage Books.

Hart, Roger. (1997). Children's Participation. London: Earthscan Publications.

Kormondy, Edward J., & Corcoran, Peter Blaze. (1997). Environmental Education: Academia's Response. Troy, Ohio: North American Association for Environmental Education.

Lynch, Kevin (ed.). (1977). Growing Up in Cities. Cambridge, MA: MIT Press.

Orr, David. (1992). Ecological Literacy. Albany, NY: State University of New York Press.

United Nations. (1992). Agenda 21, Rio Declaration, and Statement of Forest Principles. New York: United Nations.

United Nations Centre for Human Settlements. (1996). The Istanbul Declaration and the Habitat Agenda. Nairobi: UNCHS.

UNICEF. (1990). Convention on the Rights of the Child. First Call for Children.

UNESCO. (1970). Final report on Interdisciplinary Symposium on Man's Role in Changing the Environment: Architecture and Urbanism for Growth and Change. (Planning symposium for Man and His Environment Programme). Paris: UNESCO.

UNESCO. (1997). Educating for a Sustainable Future. Paris: UNESCO.

Responding to Chawla, Charles Hopkins effectively continued to broaden the global vision and the concept of responsibility to youth. Charles Hopkins serves as an advisor to UNESCO's Educating for a Sustainable Future Project. He has a long history of involvement with UNESCO Canada and environmental education at the international level dating back to 1974. He is also the Executive Director of the John Dearness Environmental Society, a Canadian environmental NGO. Charles was previously with the Toronto Board of Education where he has served as Superintendent-Curriculum, and as a regional Superintendent of Schools. He was founder and principal of Canada's largest environmental field study center, The Boyne River Natural Science School and The Toronto Urban Studies Centre. He is currently also serving UNESCO as the Chair of an international project focusing on reorienting teacher training to address the inclusion of the concepts of sustainable development into education systems.

UNIVERSITIES AND YOUTH IN COMMUNITY-BASED SUSTAINABLE DEVELOPMENT

I realize that most of us in this symposium are from North America. However, because Dr. Chawla does spend time placing this question of institutional involvement in both the North American community and the international community, I too would like to begin with this broader, global response.

The issue of universities planning for appropriate sustainable development at the global level has massive implications for academia. Last December, I was in Thailand as the Asian countries reeled under the currency crisis. I was fortunate to be involved in some meetings with both university presidents (38 from Thailand alone) and in meetings with academia, government, UN agencies and the corporate sector. Strategies for sustainable development took on new meanings in this setting as the sectors looked for integrated solutions.

For most participants at the meeting, education for sustainable development (ESD) meant more basic education as children and youth were seen as an integral part of the scenario. As Dr. Chawla correctly points out, children (defined by the UN as those between 0 and 13 years) and youth (between the ages of 14 and 30) comprise nearly 30% of the world's population. Over 1.2 billion youth live in developing countries, and the majority, having faced a childhood lacking in basic needs, face bleak futures. While only 23% of the world's youth finish secondary/vocational school (usually seen as grade 10), that number is reduced to 9% in developing countries. The legitimate employment situation for youth is becoming increasingly hopeless. Even in industrialized countries, youth unemployment averages between 15 and 25%. In developing countries, that number is between 25 and 50%. Whatever jobs do exist are often menial, exploitative and ill-paying. Compounding this situation are the added problems of sexual exploitation and related harassment facing female youth.

Thailand has provided an average of six years of free public education; however, the IMF is stipulating that this must now be increased to 12 years. The United Nations Development Program (UNDP) described the various academic thresholds that public education needed to exceed in order to give nations the educated work force and informed citizenry to partake in a sustainable future. Much of the world's youth achieve an average of four years of successful schooling. This relegates those nations to an agricultural society. Six years allows some basic manufacturing. An excess of 12 years is required for a wide range of economic national freedom to allow manufacturing and the development of new secondary products. Academics planning to address the concept of sustainable development also pointed out that it was more than a matter of volume or quantity. They suggested that the essence of sustainability had to be woven into the curriculum, and that this was something that had to be developed from the very beginning of these prescribed reforms. There was great concern surrounding the question of who could provide the leadership if reform were to take place and how would these reforms would be achieved.

If we now look to how our own countries address sustainability, can we ignore youth at large in our own university and college planning? While we have largely done so to date, is it wise to continue in this manner? I say it is unwise if we think that we have a real problem. If it is mere busy work, then we can go on exacerbating the situation. How then do we view the problem of youth involvement? Is it a priority in our own universities? If our institutions are to relate and remain relevant to the communities in which they are located and if they are to seriously prepare students for the world both at their doorstep and beyond, then it would be ill-advised for programs within these institutions to remain insular.

I have long been a proponent of involving youth of all ages in their community. As a curriculum superintendent, I saw the power of university tutors working with inner-city youth. I saw hundreds of secondary school youth move on to university because their university tutor instilled the dream and the skills within those youth.

I have seen the university-based urban studies centers in the United Kingdom working with the disadvantaged youth to give them the confidence, the skills and the research understanding to combat the real local issues such as housing, transportation employment and environmental health. I am a strong proponent of training youth to make informed choices and to become the eyes and ears of their community. In 1978, I began the Toronto Urban Studies Center for these very reasons.

But I am also aware of how poorly we do relate to children and youth. Dr. Chawla mentions quite correctly the first principle of the Rio Declaration regarding the centrality of human beings to sustainable development. For those who try to envisage a democratic solution to achieving a process that would approach a sustainable future, ignoring the human populations or simply including them as part of some mechanistic fix is folly. Humans must be central to any democratic solution. My concern is how we relate to and treat this huge group of humans called children and youth, this group that for many countries of the E-9 (the world's nine most populous countries) is in excess of 50 % of the population.

Principle 21 of the Earth Summit Declaration states "The creativity, ideals, and courage of the youth of the world should be mobilized to forge a global partnership in order to achieve sustainable development and to ensure a better future for all." These are lofty words. Agenda 21 went on at Rio to identify Youth as one of the 40 major chapters or issues to be addressed in order to achieve sustainability. Rio held out hope for Youth, but when it counted, they again were abandoned. When it was their turn to speak, the audience exited, leaving Al Gore and one or two others to listen.

It was hoped that by the year 2000, 50% of the world's youth of both genders would achieve a Grade 6 education. It encouraged youth participation in the post-Rio process. Agenda 21 divided the recommendations into two main program areas:

a) *Advancing the role of Youth and actively involving them in the protection of the environment and the promotion of economic and social development*. In this context, governments are urged to open dialogue with youth and involve them in their own and UN decision-making.

b) *Children in Sustainable Development*. This program mainly calls on governments to enact their responsibilities for children's education, health and nutrition, etc., under various international agreements such as the Convention on the Rights of the Child (1989), and Education for All (Jomtiem 1990).

Chapter 25 noted the need to combat human rights abuses, particularly against young women and girls, to expand educational opportunities for children and youth "with overriding attention to the education of the girl child." However, the Chapter does not address such issues as street and working children; international trafficking in children as cheap labor, prostitution, and organ donors; children as the victims of war and armed conflict; drug abuse; and even rapid urbanization. Nor does the Chapter show the relationship of youth issues to other issues in Agenda 21.

This year in April, this Chapter 25 will be reviewed and nations will be asked to report the progress made at the Commission on Sustainable Development at the UN. Perhaps one or two nations will even have a youth delegate. We have yet to engage youth or to take them seriously, so I find this challenge from Dr. Chawla personally intriguing. Engaging youth is a skill set that seems to elude institutions whose very mandate is to work with children and youth, and the criticism lies not solely with the world's tertiary institutions. If universities are to seriously plan for a sustainable future and to take a leadership role in attaining sustainability, then they must engage youth at large, if for no other reason than to learn both from them and with them.

My concern regarding the involvement of children and youth, be they university youth or youth in the community at large, is how we engage them. UNICEF has prepared a wonderful chart which outlines about ten different degrees of various approaches that the establishment uses in engaging youth. It ranges from tokenism and photo-ops, through entertainment, parallel sessions, youth advisors (without a vote), to meaningful youth-led initiatives. It is very humbling to view that list, for we are all exposed in it.

I have had the opportunity to become involved by working with TG Magazine, a wonderful group of youth headquartered in Toronto but coming from all across Canada. These youth range in age from 16 to 25 and produce a range of information products for youth and adults, including an internet magazine and web-chats on various issues that are at the heart of a sustainable society. I have learned from these insightful youth that you do not talk to young adults about sustainable development. You talk about their issues such as livelihoods, drugs, safety and crime, housing, neighborhoods, spaces, relating, health and environment and all those things that are integral to sustainable development but seen by them as relevant, immediate youth issues. Working with them has only begun to show me how powerful and vital youth could be to their academic institutions. However, we need to train our resident institutional experts to work "with" youth and not "on" them. All this is to say that Dr. Chawla's linking of Principle 1 -- "human-centered development" -- to Principle 10 -- "Environmental issues are best handled with the participation of all concerned citizens, at the relevant level" -- needs to also take into account how we engage these citizens. We must not simply engage youth as the planters of trees and the removers of litter.

Further into the paper, I was truly pleased to see the issue of the vision and approach to sustainability mentioned. The one approach that I hear a great deal is the tremendous potential of impending technical fixes. Eco-efficiency, which is in itself a positive step, is often substituted for sustainability in the world of industry. Maurice Strong and Stephen Schmidheiny of the Business Council for Sustainable Development are two such key actors who use eco-efficiency and sustainable development interchangeably. Dr. Chawla refers to David Orr's book Ecological Literacy to build a case for the wider components of true ecological understanding and the ability to utilize this wisdom. I concur completely.

At another series of meetings, in Bangkok in December, about 1200 individuals from 53 ASEAN countries spoke of their approaches to education and innovation for sustainable development. One country outlined its planning to produce "x" thousand mechanical engineers, "y" thousand chemical engineers, so many doctors, teachers, etc. It was a truly mechanistic solution. The other participants were appalled and said so. For them, the cause of the collapse of their nations was this belief that engineering could somehow run the complexities of life. Their belief in the centrality of spirituality and humanness had been reinforced by the plight of the people now that the engineers and "educated professionals" had left for "greener" (as in hard currency) pastures. Planning for sustainability included the education of professionals most certainly, but the need for widespread public understanding and participation was also critical if a recovery was to be achieved and a similar crisis avoided.

This recognition of widespread public understanding identified by Dr. Chawla in her paper has been recognized on numerous occasions as the critical next step by our world leaders. Beginning with the forward of Our Common Future, the report of The World Commission on Environment and Development, Mrs. Brundtland identified education as a critical factor in achieving the Commission's goals:

> The Commission is addressing governments, directly and through its various agencies and ministries. The congregation of governments, gathered in the General Assembly of the United Nations, will be the main recipient of this report .... But first and foremost our message is directed towards people, whose well-being is the ultimate goal of all environment and development policies. In particular, the Commission is addressing the young. The world's teachers will have a crucial part in bringing this report to them. (Gro Harlem Brundtland, forward to Our Common Future)

I could go on quoting the recognition afforded education as a critical factor in achieving sustainability. Throughout Agenda 21, the only word used more often than education is the word government. I know that as environmental educators, you need little reassurance that you have much to offer in the pursuit of sustainability. UNESCO as the Task Manager of the combined international work program in this regard is focusing on several fronts. Teacher education is one of those fronts, and I am pleased to ask you to consider the reorientation of teacher education to address sustainability as a major part of your institution's planning with regard to sustainable development.

As you are likely aware, the Commission on Sustainable Development (CSD), comprised of 54 elected nations, was established to monitor the progress of both nations and the international institutions of the UN and beyond to fulfill the hopes of Rio. The CSD, in reviewing the chapter on Education, Awareness and Training in 1996, called for a special work program, one of only four such requests in the entire review of all 40 chapters. This was yet another indication of the importance afforded this undertaking. This was reaffirmed at Earth Summit II in 1997, and will again be addressed next month in the CSD in New York. In each gathering, from Rio to the impending April round, the nations call for the reorienting of all education to address sustainability.

However, if education per se is to be reoriented, then teacher training both at the preservice and inservice level needs to be addressed. This undertaking is now underway under UNESCO leadership. The first step was a Consultation held in Thessaloniki in December, 1997, when ten teacher education institutions from various regions of the world met to offer advice to UNESCO on the way forward. Most institutions were represented by a dean and an accompanying faculty member who had expertise in the area of ESD. The report of the meeting offers insight to UNESCO regarding the complexities of approaching the thousands of institutions worldwide, and the enormity of reaching well over 51,000,000 teachers.

One of the key recommendations that relates closely to Dr. Chawla's appeal for a balanced approach involving the sciences, the humanities and practical education was the recommendation from the Thessaloniki Consultation to explore the use of the "strengths" model regarding the reorienting of both teacher education faculties and the world's practicing teachers. The "strengths" model approach recognizes that when one sees the tremendous range of ESD concerns and content, rather than try to train enormous numbers of professionals, we try to engage the strengths that already exist in their inherent expertise. Language arts teachers can focus on media literacy. Biology teachers can work in their field and sociologists can assist in theirs. There will still remain a need for transdisciplinary work to lead the way in focusing and mobilizing the responses. However, thinking that current resources will suffice for the massive inservice work required to try traditional inservice and train trainer programs is unrealistic. I invite all of you here who are involved in teacher education to consider helping us at UNESCO with this enormous task. Our plan has many aspects, including working with national governments and regional institutions such as the OAS. We also plan to develop an internet site where innovative practices re-educating for sustainable development will be posted and shared. And yes, there will be a youth site where children and youth can take part and develop new strengths and skills.

Dr. Chawla's point that youth and children deserve as much university attention and recognition as the other sustainability issues of greenhouse gases, biodiversity and similar environmental problems is worth noting. It is a solid point; however, I again remind all of us to learn with and beside youth. The development of the Children's Version of Agenda 21, written by approximately 1000 youth from 100 countries, is a classic example of the tremendous capability of youth to capture adult issues with clarity and straightforward honesty. Youth want to do more than close the refrigerator door and turn off the water when brushing their teeth.

The following is an excerpt from a report filed by three young high school students after working with some university students collecting data in a UNESCO MAB forest plot as part of their secondary school volunteer program. These three youth reported to scientists at the recent Ecological Monitoring and Assessment Network meeting. After sharing their ecological findings, they then went on for about ten minutes telling the scientists what working with them really meant to them. The following is but a small part of one of the most moving talks about the future of the planet that these scientists had ever heard from a young person. Beyond the very credible gathering of data, this work

> . . . has also given us the chance to do hands on work with the environment. That's something we no longer receive in our education system today. The closest that a lot of the kids in my school ever get to a forest is pictures in textbooks or CDs. Trust me. This doesn't let you really experience the true beauty of the forest. Because what I love the most about Backus Forest is not the scenery and the animals that I see in the forest, but the feeling. It is so peaceful. You don't hear the cars and horns and lawnmowers that you hear in town. The only noises you hear in Backus are the rustling of the leaves, the odd

> bird singing and the bad imitation by one of the students trying to answer that odd bird.
>
> I've noticed that this project not only benefits the students but it's also good for the adults helping us. It lets a lot of them, who have been working with the advanced science community, touch base with the younger generation. It gives them a chance to pass on their knowledge. And right now, that in my opinion is the most important tool in saving our environment. The knowledge has to be passed on so that more people realize the current state of our natural environment and the importance of improving and maintaining it. I think that it also reassures them that there will be people to carry on their work after they're gone.
>
> (Christine Rickley, Brad Slade, and Nick Wilson, Glendale High School Tillsonburg, Ontario)

What insight and what contributions these youth make by working alongside the researchers!

In conclusion, I want you to consider one of the eternal truths that works so strongly against youth. It is aging. As youth develop the confidence and maturity to work alongside adults, they surely lose their place within the youth movement and the movement starts all over to find new recruits. Think back. How long did it take you to become a recognized leader in your own field? How many of us achieved that (other than in our own mind) in the first five years? That is the challenge facing youth leaders. Where would we be without mentors? That is why they too need mentors, and who better than those of us who are contracted by society to do this?

Those are but a few of the reasons why our institutions do belong in the community and the community in us. It is related to the very essence of our being and our future as humanity. If that is not part of our institutional mandate, then let's acknowledge it and move out of the way.

The audience was enlivened at midafternoon by the vigorous responding address of Eric Pallant, Professor and Chair of the Environmental Science Department at Allegheny College. Pallant has been instrumental in creating a department whose success and reputation for exceptional quality are based on excellent teaching and innovative approaches to hands-on education; nearly fifteen percent of Allegheny students major in Environmental Studies or Environmental Science and approximately forty percent of all Allegheny students take at least one environmental science course.

ALLEGHENY COLLEGE AND MEADVILLE, PENNSYLVANIA COLLABORATE TO IMPROVE EDUCATION, THE ENVIRONMENT, AND THE ECONOMY

Colleges and universities typically interact with the public by way of extensive arts programming and athletic events, but colleges and universities are capable of, and in fact ought to be, doing more. They should devote a portion of their considerable intellectual resources to creating environmental, economic, and socially just improvements in their communities. In this article I will explain how Allegheny College -- a four-year, liberal arts college for 1800 undergraduates -- has taken that leap to bring social and environmental justice to its community. Contemporaneously it is enhancing the education of its students and its neighbors.

Building on the long established strength of its Department of Environmental Science, the college launched a community outreach group called the Center for Economic and Environmental Development (CEED) (http://ceed.alleg.edu). CEED's goal is to help revitalize the stagnant northwest Pennsylvania economy, but to do it with concepts of environmental sustainability integrated into the planning process. Project directors are faculty who collaborate with their students so that CEED's work gets done in classes, internships, and seminars. Members of the watershed community of industrialists, farmers, artists, entrepreneurs, planners, government bureaucrats, development specialists, industrialists, bankers, and non-governmental workers are invited to participate in the projects that matter to them. By bringing together the community and the College, CEED is promoting two outcomes: 1) The community gains access to teaching in sustainable community development; and 2) Allegheny students have the opportunity to work with members of the community, providing them with a kind of practical education that complements and then exceeds book learning. These students will become civic leaders in the 21st century and will have greater real world experience upon graduation than students educated only in classrooms. Equally important, and this corresponds to Louise Chawla's premise, the role of Allegheny College in education extends beyond the campus and beyond the 18-22 year old age bracket that makes up Allegheny's normal clientele.

Students and faculty at any college are extraordinary gatherers of information and CEED relies upon them to bring creative ideas to our region. A full class of students scouring the World Wide Web, the library, their e-mail connections, and using the phone can funnel a lot of first rate ideas or data to one location in a huge hurry. At many research universities, this kind of information reaching the top of a funnel too often drains into research papers, which, to push the funnel analogy a bit further, are deposited into bottles, sealed, and placed on a shelf to collect dust. At CEED we think of the funnel differently. Students and faculty are responsible for pouring ideas and information into the funnel, but in contrast to a more traditional research model, citizens in our community are also expected to assist. More importantly, we envision the funnel being located over a table, rather than a bottle, so our research leads to actions, not just research papers, which flow across our region.

The Region

Northwest Pennsylvania is home to some of the most important biological resources in the Commonwealth. Wetlands, forests and large expanses of open space dominate the landscape. The American bald eagle, once threatened with extinction in the lower 48 states, nests with increasing frequency in the marshes and riparian forests of this region. French Creek and its tributaries provide habitat for more species of fish and freshwater mussels than any other stream in the state. The natural beauty and resources of the region, combined with a lower than average cost of living, make it one of the most attractive places to live in Pennsylvania.

Nevertheless, the French Creek Valley faces a challenging future. The region experienced significant economic decline in the 1980s as several major industries departed the region (Talon Zipper, Conrail, and Avtex Corporation). Fifteen percent of our region's people subsist below the poverty level; the state percentage is 11, and nationally the proportion is 13 percent. Economic distress leads to short term solutions that undermine environmental resources: forests are sold prematurely by landowners seeking quick cash, and suburban sprawl has increased as local townships compete for desperately needed tax revenues.

CEED's focus is to help communities find ways to combine economic development with environmental preservation. Specifically it pursues six broad objectives: community planning; sustainable practices in agriculture and forestry; watershed protection; pollution prevention and strategic environmental management for industry; extensive environmental education; and a community energy plan to encourage conservation.

The participation of the community is distinctive. By involving community leaders in this project, we are sharing with them cutting-edge environmental and economic thinking; teaming them with invigorating, ambitious, well-trained environmental science faculty and students; placing them in a scenario where student-supported research labor is available for their use; and bringing them into workshops as stakeholders who will be invested in a successful outcome.

It's a gutsy move by the college. Getting involved in the community raises the prospects of Allegheny aggravating someone when CEED makes its opinions known over issues like suburban sprawl and industrial effluents. Many of its spokespeople (students) on these controversial issues are not even old enough to buy a legal drink. But the college is balancing this risk with a dose of self-interest. Foremost is the belief that one of the best ways to teach students is by involving them in genuine problems where they can both learn from and become experts in the community. As the community goes, so goes the college. The President of the college, Richard Cook, put it this way. "Long term economic success depends on a healthy environment and the preservation of resources. Our region must adopt a sustainable strategy that advances growth while taking into account the needs of future generations." The President of Allegheny is perceptive. If northwest Pennsylvania's economy fails to rebound, his ability to recruit excellent faculty and full freshman classes is likely to wither with the crumbling infrastructure and abused environment.

Louise Chawla has expertly described in this volume how colleges and universities can expand their horizons to enlist urban children as allies in the struggle for a more just and equitable future. Though CEED is also working with school children, creating a variety of opportunities for them to learn the principles of sustainability, I wish to present here a model for how a college can collaborate with older members of their communities. Taken together, Chawla's call for mixing college personnel with younger community members, and the following description of the Meadville Community Energy Project (http://merlin.alleg.edu/mmaniate/twostories/now.html), the reader should come away with a vision we hold as a paragon for CEED. A College can be the chief regional educator for sustainability for all ages and abilities, Kindergarten through CEO and City Council, simultaneously improving the quality of education delivered to its region as well as its traditional college-aged students.

The Meadville Community Energy Project

In the Spring semester of 1997, Allegheny professor of Environmental Science and Political Science Michael Maniates asked his junior seminar to kick-off a campaign to save energy and money for the town of Meadville, Pennsylvania (pop. 13,900), Allegheny's hometown. If there was energy being wasted unnecessarily, the logic went, it would not only be bad for the environment in terms of surplus air pollution and greenhouse gases, but it also would mean lost money. The average Meadville resident is not rich. Frankly, the average Meadville resident is poor. Median personal income is $10,900 per year. Money spent on heating bills leaves the community like hot air through a broken window in winter. It fattens purses held in distant corporate headquarters for utility companies generating gas, oil, and electricity in far off places.

Maniates' syllabus spells out his expectations. "This will be real-world energy analysis, politicking, and implementation at its finest. I'll [Maniates] adopt the role of advisor and consultant. I'll help and guide you, but I won't do the work for you, and I won't step in when things get messy and confusing. You must together take responsibility for making a process of *group* data collection and analysis, and community organizing work. Welcome to the real world of team projects." The major deliverable for Maniates' class was a comprehensive report tailored for a group of Meadville public officials to demonstrate that energy conservation made sense for their community. Compare the assignments for this class with the expectations of an average college seminar. No exams. No fact cramming. In their stead, real work for a real audience.

Maniates used The Community Energy Workbook (1995) as his text. The first step was to figure out how much energy was being used by the town and in what sectors: residential, transportation, industry, and business. The class figured how much it cost for that energy, who was paying for it, and how many working days it took the average citizen to pay for his or her energy bill. If there was to be any hope of saving the town some money, or to think of it in economic multiplier terms, how much money might be recirculated in the local economy, Maniates and his students would have to calculate what it would take to initiate the least expensive and most politically palatable conservation measures. Northwest Pennsylvanians can be stalwart in their opposition to government intervention, so new regulations were ranked lower on a list of recommendations than voluntary measures.

The work took a semester and the findings were shocking. The percent change in median household income from 1979 to 1997 was negative 15.2%. The per capita energy expense today is nearly 20% of the community's total personal income. The energy freedom day, that is the day on which the average resident had worked enough hours to pay off his or her energy bill (analogous to the tax freedom day) is February 18; the rest of Pennsylvania on average has paid off their energy debt in virtually half the time, January 25. Rental stock makes up 51% of Meadville housing. The majority of Meadville's homes were built more than 55 years ago and most of those houses have not seen major investments in insulation, modern appliances, or new windows. Students presented their findings to a town meeting they organized themselves. It was attended by a handful of notables such as the City Manager, the Meadville Building Code and Regulation Officer, and the Editor of The Meadville Tribune.

Maniates kept at it in a second seminar for a new set of juniors in the Fall of 1997 and was assisted by a core of students from the first group who were so engrossed in the project they couldn't let go. If the goal of the first seminar was to provide the blueprints for a new machine, the second seminar's goals were to construct it and turn it on. Like the first seminar, The Community Energy Workbook was used extensively, but it was complemented by a series of readings on collective action. Most notable among the texts was Saul Alinsky's Reveille for Radicals (1946). Maniates' objective was to be certain that students understood how collective action could be used to bring about change in society. The difference between his seminar and nearly all the others dedicated to political theory held on campuses around the country is that Maniates' students were asked to put their theory to practice. This was a discussion class immediately followed by a series of phone calls and visits to Meadville political leaders and organizers in order to enlist their support. While the class was busy collecting poignant case studies of similar towns which had made significant energy savings and reaped the benefits, they were also gathering participants from the Meadville Redevelopment Authority, churches, the Mayor-elect, all six members of City Council, representatives from the gas company and electric company, a few landlords (the majority were obstinately opposed to participation), Marquette Savings Bank and Northwest Bank (both interested in making low-interest loans available to the community), real estate agencies, the Center for Family Services, the Salvation Army, and The

Meadville Tribune.

The Fall 1997 town meeting was held at the Days Inn conference room and again was organized and presented by college juniors. More than 50 people attended although several cancelled at the last minute due to heavy snow. At its conclusion, the President of Allegheny College leapt to his feet and told me "I've seen a lot of professional presentations that weren't half this good." Deputy Mayor, and landlord, Fran Richmond said, "it's excellent to see collaboration between the city and the college. There's a lot of energy and expertise over there." Conversation among the participants lasted nearly two hours beyond the last slide.

While it may be several years before we are certain how much energy can be saved in Meadville and how much money will consequently remain to recirculate, several successes can already be documented. There are now three Working Groups which integrate Allegheny students and Meadville residents around issues of energy conservation. One, the Policy Working Group, includes landlords, representatives of renters, like the housing director at Allegheny, a City Councilman, and the publisher of The Meadville Tribune. This group has begun implementation of a Five Star rating system for rental housing using a nationally recognized home energy rating system, or HERS. Landlords who invest in a lot of insulation and energy efficient refrigerators, for example, will be able to advertise in the newspaper with five green stars above their listing. Fewer energy saving devices, and the paper publishes fewer stars with the listing. Tenants will pay more for rent, but after the energy bill is tabulated, the gross payout should be less. Everybody and the atmosphere win something. A Financing and Weatherization Working Group of energy consultants, energy suppliers, and bankers is devising methods for providing low cost and low interest energy audits and weatherization. Furthermore this group is working with local banks to make low interest loans available to landlords aiming to get more green stars for her or his rental. Finally, a Public Awareness Working Group integrates education and energy issues with other programs for sustainability promoted by CEED. Maniates' students act as research assistants and coordinators on all three Working Groups.

Ellen Micoli described how her experiences expanded her education. "I learned lessons I'll never forget. The frustrations and ambiguities of working in the community taught me things you can't get from books or discussions. A woman at one public meeting I gave a presentation to was very negative. She questioned our data and our motives. It was very frustrating, but we checked over our data and it was sound. That experience was not something that could have been reproduced in a class exercise. I now understand about community organization in ways that move beyond what I've read. I was better prepared the next time I gave a presentation to the public." Professors get much better work from students who believe that a good paper will get more than an "A"; students try a little harder if they believe a well written term paper might actually get the Mayor to make favorable policies.

David Orr's books Earth in Mind (1994) and Ecological Literacy (1992) explain why this kind of education works. As Orr suggests, the self-appointed role of many elite colleges and universities is to train technocrats and bureaucratic experts who tell the public what to do. The Meadville Community Energy Project, in contrast, is about activating and organizing citizens to make their own decisions. Maniates' class is, in its purist sense, a promotion of Jeffersonian democracy, a revival of active citizenship (Bellah et. al, 1991). It works for students because the education is active and experiential, not passive (Dewey, 1938). Craig Frampton described what he gained from the class. "Everyone should have to work outside the college as a prerequisite for graduation. We applied theory to see what really works and anyway, jobs are about working with people, not theory. When the landlords refused to work with us, we could have quit because the easiest solutions to our problems were blocked. We interviewed every landlord in the community, but rather than think our project was doomed to failure, we figured out other ways for success, like organizing tenants. Our project took on an edge of environmental justice. We figured out how to organize renters. It wasn't as simple, but the net result is that we solved our problem and our ideas are far more developed." Students from Maniates' seminars, like the others that ES professors teach for CEED, and like Chawla's students, will surely carry the lessons of their experiences far longer than any facts they might have memorized for exams or processed on computers for final papers. These students will emerge with tools for being active, engaged citizens in whatever communities they move to.

Nuts and Bolts

Louise Chawla's "Mechanisms for University Support" is an excellent summary of how administrators can facilitate the actions of colleges and universities interested in improving their communities. Our experience with CEED has provided a few lessons which could be appended to Chawla's list.

- Think outside the conventional box imposed by syllabi and classrooms. Extend the classroom beyond the campus.
- Trust that the process of solving environmental problems will provide the basis for a good education for students. By invoking audiences for their work beyond their professors, students will learn to research, write, critique, imagine, create, interact, and organize in ways that will exceed expectations generated by conventional assignments. Students are more interested when they know their work will serve a purpose.
- Choose projects that are initiated by the faculty and students. Expect those projects to be long-term and create avenues for ongoing work: internships, independent studies, single-time offerings of new courses, seminars with general titles so the project at hand can be chosen at the start of the semester.
- Involve the public at the earliest possible times. Years ago I got a call from the local sewage treatment authority asking me and my students to investigate alternative methods of disposing sewage sludge in order to avoid the landfill costs. My seminar students drew up a list of alternatives and highlighted composting and co-composting with the leaf and yard waste collected by the city every fall. During their final presentation to a half dozen city and county bureaucrats, a number of problems were raised, like the fact that the leaf collecting union had already proven itself incompetent, according to the City Manager, because their tractor drivers were scooping up clay and adulterating his leaf compost. Unbeknownst to us the compost turners were enemies of the City Manager who was having difficulty selling their contaminated compost. Had we included the City Manager and spoken with the leaf collection crew at the outset, our recommendation might have been taken more seriously, solutions to their clay problem might have been generated, and stakeholder investment in a successful outcome would have been greater.

Joe Galbo is proof that Allegheny College matters to its community. Galbo is the city tax assessor and Chair of the Democratic Party in Crawford County. Galbo's response to being asked to work with students on the Public Awareness Working Group was "what took them so long? The Meadville Community Energy Project has broken down the barriers between students and the public. The community has received the students very warmly and learned that the students are very enthusiastic. We have observed that the students are real people and the students are educating Meadville. Just as important is that the students are getting to know us. They are getting beyond stereotypes and getting a great education by trying to assist Meadville. This should have been done a long, long time ago."

References

Alinsky, S. (1946). Reveille for Radicals. Chicago, IL: University of Chicago Press.

Bellah, R.N., Madsen, R., Sullivan, W.M., Swidler, A., and Tipton, S.M. (1991). The Good Society. New York: Vintage Books.

Dewey, J. (1938). Experience and Education. New York, NY: MacMillan Publishing Company.

Hubbard, A. and Fong, C. (1995). The Community Energy Workbook. Snowmass, CO: Rocky Mountain Institute. 270 pp.

Orr, D. (1992). Ecological Literacy: Education and the Transition to a Postmodern World. Albany, NY: State University of New York Press.

Orr, D. (1994). Earth in Mind: On Education, Environment, and the Human Prospect. Washington, D.C.: Island Press.

After yet more working group meetings, a social gathering on the beach, and a banquet, the participants heard a final keynote address, this one an engaging, thoughtful presentation by Milton McClaren, Associate Professor of Education and an Associate Member of the Faculty of Science at Simon Fraser University. From 1994-97, he was Director of Field Relations and Teacher In-Service Education for Simon Fraser University's Faculty of Education. He is responsible for the SFU Tele-Learning Centre located in Kelowna, British Columbia. The Tele-Learning Centre is a site for research and development concerning the educational application of computers to distance education. Milton McClaren is a former Dean of the Division of Continuing Education and Director of the Professional Development Program (Pre-Service Teacher Education) at SFU. He is the author of numerous papers, reports, and of twenty-four books.

ENVIRONMENTAL EDUCATION IN AN INFORMATION AGE: CONFUSION, INFORMATION, OR UNDERSTANDING?

Human beings are an essentially communicative species. In fact, our capacities for communication might be seen as defining our humanity. The word communication means to establish commonality, to create shared meaning, to participate in the experiences and understandings of others. It shares common roots with commune and community. All imply an ability to cooperate, to coordinate effort directed at the attainment of common purposes and the establishment of common meanings. Cooperation is an essential element of human competence. Through communication and cooperation, we can often achieve more than we can accomplish individually, or we can reach goals which are unattainable for individuals. Community is not a cosmetic notion employed to sell real estate: we are more powerful, healthy, and intelligent in effective communities than we are on our own. Among primal peoples to be cast out of the community is effectively a death sentence.

Today it is frequently claimed that there is an on-going technological revolution in our communicative capabilities (Dyson, 1997; Kelly, 1997; Tapscott, 1997). This revolution rests on two pillars.

First, the advent of cheap, powerful computing capacity embodied in a wide range of common devices has made great information processing and telecommunications power available to many at low cost -- at least considered from the perspective of the developed, first world. Second, the revolution is accelerated by the fact that the development and dispersion of affordable computing power has occurred at the same time as remarkable developments in low cost international and long distance telephone and telecommunications services, which have made available high capacity, high speed, low cost global telecommunications.

The two fields of development have acted synergistically to create the current computer-communications revolution. However, technological revolutions are also societal revolutions because they change not only tools but also the procedures and organizations in which the tools are embedded (Franklin, 1990). Like many others, environmental educators are trying to understand the significance of this revolution for their work and daily lives. Environmental education is concerned with the critical and creative examination of fundamental questions about relationships between human cultures and the biogeosphere on which our species depends. The World Wide Web (WWW) may facilitate and empower the collective construction of environmental knowledge and understanding at the level of the entire human species, or it may act to separate and dislocate humanity from the ecosphere and direct our attention away from the growing seriousness of environmental problems while nurturing a generation of "ecological yahoos", to use David Orr's striking term (1992). Which course is taken will depend to some extent on how well environmental educators appreciate the significance, potential applications, and possible dangers of the new global communications infrastructure for the field.

In this paper, I attempt to outline the nature of the technological revolution focusing not on hardware or software but on human communication within the context of the emerging technological environment. I describe some ways in which the development of a global, widely accessible, multi-media interactive communications system may represent an asset or a liability for environmental education. I also offer an analysis of the problems created by the current tendency to equate information with knowledge and understanding. Finally, I invite environmental educators to explore a highly speculative proposal about how the continued development of virtual environments might affect the future course of human development and evolution.

I propose that environmental educators should seek to use the opportunities created by information technology (IT) in ways which nurture widespread understanding of our current environmental situation and the most effective and informed consideration of the options available to us as a species. However, educators must also be aware that information technologies, if misused, can nurture powerful misconceptions, great confusion, and even violence both to humans and the environment.

The Implications of the Information Technology Revolution for Human Communication

Humans and their societies have always had a coevolutionary relationship with technology. In the broadest sense (Boulding, 1969), a technology is simply a way of doing something - whether it be plowing a field, going to Mars, or praying. In this sense, human organizations can also be seen as technologies. Technology is not culture-free, objective, or value-free; technology is inextricably connected to status and gender. Who gets to do what, and who has access to particular tools or procedures, must all be considered in any critical analysis of technology. If technology is a way of doing something, and we are moving into an era of globally networked computer mediated telecommunications, the question to be asked is: what is it that we are doing, and what significance does it have for environmental education (or perhaps more fundamentally for human-environment interactions in general)? Both Tapscott and Kelly, cited above, maintain that the information technology revolution is essentially about communication, and to a lesser extent, information. The Economist put it this way in a 1995 feature article:

> The Net will suffer plenty of growing pains, and it may not change the world as much as the cyber-Utopians would have us believe: compared with the richness of real life, even the best on-line "virtual spaces" are cartoons. But it is here to stay, and it will allow people to exercise one of their most basic desires: to communicate. This they will be able to do on an unprecedented scale: globally, openly, to one person or many. In that sense, the Internet will almost certainly have a stronger impact than the PC alone. PC's put computing power in the hands of ordinary people; the Internet gives them something compelling to do with that power (other than play games). How important this revolution will eventually turn out to be is as yet impossible to say. A reasonable guess might put it ahead of the telephone and television but behind the printing press and the motor car. (The accidental superhighway, 1995. p.4)

This comment reinforces the view that, in spite of the relatively recent development of software tools that permit interactive, multimedia communication across the Internet (the so-called browser software which enables the World Wide Web) humans have always been interested in interactive, multimedia communication. We are an existentially communicative species. In spite of their high tech characteristics, the Internet and World Wide Web are means of supporting this very primal, ancient, high touch human attribute.

If we were to step back in time ten thousand years or so to join a band of Homo sapiens living as hunter-gatherers or shifting cultivators, we would find a lot of communication going on. There would be a variety of forms of communication in use at any given time and they would change as the group's situation changed, or according to tradition or mythic and religious requirements. The members of the band would mainly be in communication with other members of the same group. But during the course of a year the band might make accidental or purposeful contact with others: to trade, to raid others, or simply for seasonal assemblies among relatives in different bands. Communication in human groups is about the sharing and establishment of common meaning. In the imaginary band I've described, communication is functional and purposeful, which is not to assign communication purely prosaic or practical roles.

In spite of the global scale and remarkable capacities of the network and its accessory hardware and software tools, the network can be understood by exploring its ability to meet the same basic communicative purposes of the imaginary band of early hunter-gatherers. In other words, we need to understand in what ways global telecommunication systems affect the primary functions of human communication such as:

cooperation on tasks (facilitating shared work and joint effort);
reinforcement of relationships;
renewal of group membership including initiation of non-members or the young;
instruction of the young or of novices;
the development of ideas;
the reinforcement of identity (as in sharing the group's stories);
authentication of experience and viewpoint;
appeal to supernatural forces; and finally
access to cultural resources.

Although this list is likely incomplete, it includes many significant communicative purposes. It is also worth noting that communication need not be restricted to "verbal" exchanges. Given that the band in my example had probably not yet developed written communication, that form was likely not included in its communicative patterns, although symbols such as pictographs, carvings, ornaments, icons, and petroglyphs were probably in use. However, non-verbal communication including practices such as mutual grooming, whistles, drumming, rattles, and so on would likely be part of the group's repertoire. It is also probable that dance or some form of structured movement were used as a communications medium. In short, the primal band of hunter-gatherers were communicating in many media and were surely networked in a complex web of shifting interactions. Multimedia is not a concept restricted to electronic environments. Things have changed with the development of modern communications systems, but perhaps not as much as some of the heralds of the infotech revolution would have us think.

The claim is often made that, the more people in widely separated geographies and cultures and in different circumstances "talk" to each other regularly, the more they will appreciate the universals of the human condition and thus the less likely they will be to war with each other. Additionally, some see the development of intensive, wide spread, high capacity telecommunications networks as means of "disintermediating" or eliminating go-betweens and middle persons, so that individuals can go directly to first sources for services, information, and resources (Kelly, 1997; Tapscott, 1997). Even the structures of government, it is claimed, can be disintermediated. Instead of electing representatives, people will be able to represent themselves in civic, regional or national on-line legislatures. At the very least, elected representatives can be held much more directly accountable to their electorates. It is questionable whether politicians and political institutions fully recognize the possible impact of information technologies on the very nature of the political process itself.

These are hopeful and optimistic views. I would very much like to subscribe to some of them, but there is more to communication than simply "chat," debate, or discussion. If communication is to create the sort of shared meanings and enhanced understandings that can defeat prejudice and stereotypes, uproot entrenched suspicion and hatred and help humanity decide about the major issues of our time (including transnational or global environmental concerns like global climate change, ozone depletion, and species and habitat loss), we will need make sure that the full spectrum of our communicative capacities are enabled by the global infrastructure. The refinement of ideas or development of consensus may require precisely the sort of skilled mediation which is proposed for elimination in many of the scenarios of IT proponents. The worst possible way to employ any technology is simply to do whatever it makes possible, without any sense of larger purpose, or criteria for decision making. This is technological sleep-walking as Ursula Franklin (1990) has aptly termed it.

While the formats and technologies of communication, and certainly its speed and scale have been transformed by the emergence of modern information and communications technologies, the essential purposes and functions of human communication remain the same. We want to share ideas and experiences. We want to benefit from the experience and learnings of those before us. We want to find companionship, and compare our life experiences with those of others. We want to work together on ideas and projects. Sometimes we even hope to establish communication with forces deemed greater than ourselves or beyond our immediate experience and understanding. We want to make sense of things, to discover meaning and to share our discoveries with others. The initiation ceremonies of the Australian aborigine and the on-line discussion forum dedicated to the latest virtual reality game are not as different as they might seem. All communication is interactive. Even during introspection and reflection we are interacting with the content and flow of our own thoughts and consciousness. I turn now to a consideration of how some of these communicative purposes might be empowered or diminished in the context of environmental education within the WWW context.

The Significance of Global Telecommunications Networks for Environmental Education

Bearing in mind the list of communicative purposes developed above, it is possible to define a number of issues for consideration in regard to the application of the WWW and Internet as a medium of and support for environmental education. In this section I do not have the space to connect the purposes of environmental education to the entire set of communicative functions which I have listed, but I will attempt to relate some of the major purposes to the ways in which environmental educators are using the WWW and Internet.

Environmental educators have long been interested in the potential of the Internet for their work. Initiatives like the Rouge River Project initiated by Bill Stapp and his co-workers at the University of Michigan or our own Southern Interior Telecommunications Project (Teles & Duxbury, 1991) at Simon Fraser University used early Internet formats to enable students to compare the findings of environmental monitoring efforts and exchange ideas about possible corrective measures. More recently, GLOBE (Global Learning and Observations to Benefit the Environment) has involved students in a number of countries as participants in ground truthing satellite based information about local climatic and soil conditions and vegetational changes. Similar initiatives are underway in many other regions of Canada, the U.S., Australia, and Western Europe as well as in lesser developed countries where students have access to the Internet (Parker, 1994). Some of these projects also entail students accessing on line references and resources and making direct contact with scientific and technical experts.

The development of the World Wide Web has attracted an array of environmental organizations onto the Internet. Although many of these groups do not have education as their primary purpose they publish a wealth of information about environmental issues and provide forums for the expression of a range of views about human-environment interactions. Additionally, they frequently offer learning resources from their WWW-sites. For example, one of the most popular web-based index and search services, Yahoo.ca (the Canadian version of Yahoo in the U.S. with essentially the same format) currently lists under "Science," for Earth Sciences, 2769 links to on-line publications, with 294 links under Ecology. Under "Social Science" there is a heading for "Environmental Studies," with 68 entries. In the index for "Society and Culture" there is an "Environment and Nature" sub heading, currently containing 2120 links to environment related web publications. Society and Culture also has a separate sub-heading for "Conservation," with 233 links. It is evident that environmentalists have discovered the WWW as a medium for communication and the distribution of information.

One of the important purposes of communication is to permit people to gain access to the collective experience of others expressed through stories, dances, songs, music, literature, graphic arts, engineering and architecture, science and technology. Many people imagine the Internet as a vast electronic library or multimedia encyclopedia. Given the use of both paper-based, CD/ROM, and on-line encyclopedias in schools, that is a familiar way of thinking about the Internet as a repository of human knowledge and experience. It is, however, important to note that there is an important distinction between an entry in a library catalog and the actual work itself. The dream of having every written work produced by humankind available digitally via the Internet is still far from realization. Even so, the amount of information which is accessible is amazing considering the very short history of the Internet and WWW.

If global information networks can support communication connecting people to cultural resources and to an array of human experiences, they also offer the potential for many more people, everywhere on Earth, to add directly to the total inventory of human thought and expressions. Whether or not this potential will be realized is problematic. But the freedom to not only access books and other works but also to publish them is becoming more and more ubiquitous. However there is a distinction to be made among data, information, knowledge and understanding. A plethora of information (an information explosion) does not automatically equate with a concomitant expansion of human knowledge and understanding. Thus, a critical issue faced by all educators in a time of exponentially increasing information and globally networked communications is to distinguish between content coverage and the development of educated understanding. Unfortunately, many modern curricula, environmental and otherwise, seem driven by coverage rather than attempting to develop deeper and more thorough knowledge of essential concepts and major ideas.

The metaphor of the WWW/Internet as a sort of global electronic encyclopedia raises another issue which should be a concern of environmental educators. It never occurred to me as a young reader to question whether the encyclopedia makers' view of the world, and of knowledge about it was an apt or accurate reflection of reality. All databases, inventories, catalogues, and encyclopedias reflect the assumptions of their creators concerning what should be included, or left out, about what priority to give to different topics, and about how knowledge is created (and by whom). They are physical expressions of the epistemologies of their authors and editors.

In many ways the content and organization of the Internet also reflects underlying epistemologies, which are seldom made explicit to its users. Because the Internet is not organized like a library, the aid of Internet indexes and search engines is almost essential for any serious research (Maes, 1995). But search engines and on-line catalogs are created by software engineers, designers and editors. They are not neutral or objective. They reflect the views of their creators. Although the WWW is an element of the Internet and the Internet is global in scope, the majority of WWW publications, and most of the Indices, link sites, search software and catalogues are created in the developed, western world. Many software designers and engineers are male, as were many of the early users of the Internet, although this is changing fairly rapidly. English is the major language on the net (and in the whole realm of computing). These facts make it necessary to urge students and teachers who intend to use the WWW for environmental education to view its organization, presentations, and content with all their critical faculties in operation. Certainly students should be taught to apply the same sort of critical thinking to the WWW as to conventional print materials or those published in other media.

As a medium for environmental education, the Internet/WWW also offers the potential for communication related to cooperative tasks and projects. Jacob Bronowski (1978) once termed science, "the act of communication by an entire culture". Developing skills in effective, clear communication has long been a major goal of school programs while the ability to replicate clearly communicated procedures and methods to verify findings characterizes experimental science and has regularly been reflected in the goals of science education. Thus, many environmental educators have turned with enthusiasm to the potential of the Internet and WWW as a means of permitting students working on environmental projects to share research findings and environmental information with others and to compare notes on process and problems in a highly immediate and interactive fashion. The global scale of the net makes it possible to link students who are widely separated by geography in discussions of common projects. The immediacy of net-based telecommunications can be a great asset.

Cooperative learning activities through which students discover authentic audiences for their work, and real reasons for performing experiments and making measurements would seem to offer excellent opportunities for educational enhancement. Local environments provide an ideal venue for data collection, monitoring, and action projects by students in the K-12 system. Moreover, the scientific community has taken an interest in the possibility that measurements and observations made by students can contribute to data sets that are important to understanding phenomena such as global climate change. By participating in WWW-supported international environmental information gathering efforts students have opportunities to become members of communities of practice and to share their findings not only with other students, but also with scientists working in several fields. Those experiences could make the learning of scientific procedures more relevant and at the same time help students appreciate and understand the global information network itself.

Nevertheless, there are a number of areas of potential difficulty for educators who wish to make effective use of the Internet as a means of supporting cooperative projects and learning. Research on early uses of the net by schools highlight the importance of careful planning of on-line projects (Levin, Rogers, Waugh, & Smith, 1989; Parker, 1994; Riel, 1995). Because many schools still have fairly primitive computers and slow speed or limited net connections, teachers often try to use email as the primary support for cooperative task work and idea development. Thus projects often take the form of electronic pen-pal assignments between two classes. Even where these projects have the luster of communication between students in different countries, they frequently falter because the communication is not purposeful, so students quickly lose interest. In other instances, the projects about which information is being shared are poorly planned or unengaging (Rogers, 1994). Excellent technology will not compensate for a poorly planned or meaningless project.

However, there is research evidence to suggest that the on-line environment can foster collaborative knowledge building and nurture significant changes in student and teacher roles in the learning process whereby students begin to rely more on their own resources and interactions with peers rather than viewing the teacher as a living information bank (Riel, 1995). Other research (Newman, Johnson, Cochrane, & Webb,1996) has indicated that students in on-line collaborative learning environments are more willing to submit ideas, show higher levels of critical thinking bring in more and richer outside examples, do more linking of ideas and make more important points than in comparable face to face environments. In the area of free-flowing idea generation on the other hand, the same authors found less fluency and activity by on-line students than in regular classroom settings. They attributed this to the fact that the demands of keyboard entry tend to constitute a physical barrier to the sort of rapid unrestricted idea production which are characteristic of approaches such as brainstorming.

It is appropriate to note some cautions concerning collaborative on-line environmental monitoring projects. The successes of projects like the Rouge River Project and GLOBE have created general interest in using students in the K-12 system as "data collectors" within the scope of large scientific research programs. Scientists have discovered that, if properly trained in the protocols of information collection and monitoring, and supplied with standardized equipment, students in the K-12 years can be effective and committed contributors to information about a number of environmental factors including local weather, water quality, vegetation type and coverage, and soil type and conditions.

Unless the students are active participants in the overall research process, or at least understand it, they are likely to derive little long term educational benefit from their contributions and may lose their enthusiasm to continue. In some cases, for example to be of benefit to understanding the phenomena of global climate change, data must be gathered for many years. Not only will students need to be committed to the entire process, but so will teachers. Studies of long term environmental enhancement projects, like the Salmonid enhancement projects supported by the Department of Fisheries and Oceans on the west coast of Canada, have shown that on-going contacts between participating classroom teachers and the scientists and technicians involved in the research and management phases of the program is essential to maintaining and renewing commitment (Staniforth, 1987).

Concerns about the proliferation of network based environmental monitoring programs involving students have led me to formulate a set of general guidelines for projects of this type (McClaren, 1998). The guidelines represent a first attempt to address issues surrounding the epistemology and ethics involved in using students in environmental monitoring. They address issues concerning the ethics of data collection and use, the way in which students are made fully aware of the purposes of data collection, and the use of the data collection process as a support for general learning. It follows that schools involved in monitoring networks should have regular contact with the people using the information; and they should, if possible, be able to ask them questions about their work and thinking. In this way, science becomes a human activity involving real men and women. By being able to talk with researchers about how they use information and what they think about it, students gain insights into the nature of scientific expertise-information that is lacking in many text and media presentations of science.

Moreover, local environmental monitoring programs conducted through schools should not be used as an excuse to justify not involving students in assessing the need for local and personal environmental action projects, designing such projects, and implementing them. Where network-supported monitoring becomes a replacement for student action projects, students are sent the implicit message that only "experts" (who are likely far away from their own communities) are capable of actually doing anything. I believe we need to give the use of students in environmental monitoring projects, network-based and otherwise, more consideration than they have so far received. I believe we also need to do more research to find out exactly what students learn from, and feel about their involvement in environmental information gathering processes.

The WWW/Internet environment is also a potentially rich environment to support communication related to the development of ideas, or to the formation of knowledge building communities. Riel's (1995) work on Learning Circles suggests that when students have an opportunity to connect with students outside their own schools and classrooms on common projects or problem foci, they can make powerful contributions to each others' ideas and provide effective and caring criticisms of their work. Projects like Wired Writers demonstrate how student authors can richly contribute to each others' work especially when connected with on-line mentors who are working writers and poets (Owen, 1993; Dickie, Owen, & Owston, 1995). Software designers and cognitive scientists are becoming increasingly interested in how the WWW environment can be directly designed to facilitate group problem solving, decision-making, consensus building, debate, and idea development as well as discussion. The work of Marlene Scardamalia, Carl Bereiter, and their colleagues and students at the University of Toronto (Bereiter & Scardamalia, 1996; Hewitt & Scardamalia, 1996) is of direct relevance to educators interested in the use of the WWW and other networked environments as supports for knowledge building and idea development.

Scardamalia and her co-workers claim that computers offer a medium within which students can "...store their knowledge artifacts and search through libraries of similar artifacts created by their peers" (Hewitt & Scardamalia, 1996). They define a knowledge building community as any group of individuals dedicated to sharing and advancing the knowledge of the collective. While scientific research teams might be considered as prototypical examples of such communities, they are also represented by film societies, medical teams, engineering work groups, and even many families. They note that what is defining about a knowledge building community is a commitment among its members to invest their personal resources in the collective upgrading of knowledge, a process described by Perkins (1992) as the social distribution of intelligence. "It is a dynamic, decentralized, and generative community of practice in which all participants simultaneously strive to upgrade the knowledge of the collective. Or, more fundamentally, it can be thought of as a self-improving system" (Hewitt & Scardamalia, 1996). Scardamalia and her co-workers are developing a software tool to facilitate community knowledge building. Known as CSILE (Computer Supported Intentional Learning Environment), it is a pioneering example of how the WWW might be used to support communication as a means of developing ideas and extending the intelligence of entire communities (Hewitt, Scardamalia, & Webb, 1997).

However, it is noteworthy that many examples of on-line knowledge building communities graphically illustrate the major differences between education as content coverage and education directed at the development of understanding. In virtually every example of programs where students and teachers engage in collaborative learning more time is taken for intensive and serious in-depth exploration of the focal issue or skill than is typically allocated within contemporary school curricula.

Environmental problems and issues offer students and teachers many opportunities for relevant and meaningful idea development, cooperative learning, and knowledge-building. Environmental problems are often complex. The work of Kempton, Boster, and Hartley (1996) on environmental values and American culture suggests that while many Americans consider themselves to be environmentalists and are genuinely concerned about problems such as ozone depletion and global climate change, they do not have effective action strategies and often reason about the problems through the lens of inappropriate or flawed conceptual structures. Other research, such as that conducted by Rosalind Driver and her colleagues (Driver, Gusene, and Tiberghien, 1985; Driver, 1995) and The Private Universe Project at the Harvard/Smithsonian Center for Astrophysics has shown the power and persistence of misconceptions concerning the workings of the world. Scardamalia and her colleagues have shown that even young children, using tools such as CSILE which promote collaborative knowledge construction can form rich and accurate models of complex phenomena such as heat, electricity, magnetism, light and optics.

Surely these approaches should be given full consideration as means of addressing popular misconceptions and limited understanding concerning the environment. In a real sense, the challenges of our current environmental situation demand that the entire human community engage in collective knowledge building.

Software tools are being developed which can greatly assist in the knowledge construction/idea development aspects of network communications. However, like many other technological innovations, their potential will only be realized if the social systems which are integral parts of the technology, also change. New technologies in conventional school cultures are typically either not implemented, or if adopted, fail. For school culture to change teachers will have to change their ideas and assumptions about that culture, but there will be no encouragement for them to do so unless the larger society grants teachers permission to move toward the development of learning environments (and in fact models of learning itself) which are fundamentally different from those now in operation in the cultural mainstream.

Many classroom teachers welcome access to the Internet not only as a way of gaining access to print and other on-line resources not available in most schools, but also as a way of getting in touch with experts in various subject areas of the curriculum. In this way teachers often hope not only to connect students to the knowledge and experience of experts, but also to permit them to develop a greater understanding of how experts actually work, and the nature of that work. Good examples of this use of the Internet are found in projects like Ask-an-Expert in which a series of on-line conferences were established by Simon Fraser University in British Columbia. Each conference was moderated by an "expert" in a particular topic. Thus, one conference entitled Dr. Spider was moderated by an expert on Arachnids, another titled Dr. Fish was convened by a teacher who was also an expert in stream enhancement and salmonid fish, still another, Dr. Bones, addressed student questions about fossils and forensics (Gareau, 1990).

There can be problems with the Ask-an-Expert format unless it is used wisely. Obviously, even the most willing and cooperative scientist might find herself overwhelmed by email messages from students. Thus it is often advisable to set up on-line conference formats in which questions are posted to the conference rather than directly to the expert so the conference moderator can sort through them. Another approach is to create time delimited conversations where a conference is established in which an Expert will be available "on-line" (usually asynchronously) for a specific period during which teachers and students are asked to submit well formulated questions.

The importance of preparing questions so that they are both worth answering and answerable, cannot be overemphasized. Good moderators in Ask-an-Expert type forums perform a valuable service sometimes by not answering student questions, or getting an expert to do so, but by redirecting the question to the student and getting the student (or class) or even all the classes in the conference or circle, to do further work to make the question more meaningful. The immediacy of the on-line environment provides a powerful means of initiating students into communities of practice by putting them in contact with people who have more advanced skills and experience in these fields or who have had particular life experiences (war veterans, pioneers, immigrants). This attribute supports the communicative purposes of instructing novices and the young, and also development of ideas, reinforcement of relationships, as well as reinforcement of membership and identity.

The use of the Internet to access experts creates another problem: verification of authority. There is an oft-used catch phrase about the Internet: "on the Net, no one knows you're a dog." The statement captures the democratic aspects of the on-line environment, an environment where people participating in on-line discussion groups are evaluated on the merits of what they say, and not on their age, race, gender, financial status, or where they live (none of which are evident in the typical on line forum). However, not everyone in cybertown is a nice character: there are con men and women, racists, terrorists, eccentrics, and people who are just plain crazy. The WWW has provided some of these with access to a global audience, an audience of hundreds of thousands who don't know that the author/speaker has been standing on a soapbox in his/her local town square for the past 15 years giving speeches which no one takes seriously.

While there are refereed journals and edited publications on line, there are also many publications which have no sort of selection process for authors and points of view. It is relatively easy to identify purveyors of pornography on the net. It is not so easy to identify individuals and organizations which publish on the WWW under authoritative-sounding names and titles but spread misconceptions and misinformation regarding environmental issues, social concerns, feminism, human rights, and religious freedoms or offer plain nonsense as fact. These matters are of concern to environmental educators in that they clearly indicate the need for teachers and students to develop good critical thinking skills concerning the content of the WWW and the credibility of those who produce it, just as they should do for conventional media.

Some schools are so concerned about the possibility that students will access inappropriate material on the net that they restrict use of the Internet computers in the school to teachers, or even only to the librarian or technology teacher. Some jurisdictions have tried to solve the problem by setting up education gateway sites controlled by school boards or education departments through which all school software browsers access the Internet. Of course, the Internet links accessible through these gateways are regulated and restricted. But the issues associated with any other form of censorship still apply: who decides, and what selection criteria do they employ? A school authority which views environmental education or environmentalism as a distraction from sound basic education might eliminate any but the most sanitized environment related content from its selected and authorized links via its gateway. Education of students' critical faculties is preferable to censorship, no matter how benign it may seem. The development of the capacity for critical thought should be at the core of the agenda of environmental education in an era of global networks.

For environmental organizations and agencies which publish via the WWW, the issue of credibility is very important. Reputable organizations make sure that their content is of the highest quality, which does not mean that it has to be scrubbed clean of all possible controversy, but rather that attention is given to a range of views, various research findings, and to the place of different views in the court of opinion. If a group advocates particular environmental positions or policies it should indicate this on the top or opening "pages" of its WWW sites. In that way the reader at least knows in advance the purposes of the organization or individual publishing the material. Students and teachers need to learn to look for these statements, and they need to learn to assess content for emphasis, slant, bias, omission, and other indicators of focus and intention. Where "data", that is supposedly unprocessed environmental information and statistics, are found at a WWW site the user needs to ask how the information was collected, by whom, how up to date it is, and how it has been processed, if at all.

It is also vitally important to understand that, in the age of digital imagery, almost any picture can be "enhanced" or altered in a wide range of ways. Some of this is beneficial or harmless, but it can also be quite misleading. Some WWW sites present the views and research of experts. The best of these clearly describe the credentials of the experts and some even indicate the limits of their expertise-a highly credible approach. In other cases WWW sites which publish research papers also provide bibliographies of works done by the authors, sometimes with hyperlinks to other on-line versions of their work. Where research is sponsored or supported by a funding agency, or corporation that fact should also be stated in the context of WWW publications. It is important to know who paid for the research which is presented. All of the foregoing are familiar to teachers and librarians in the context of conventional print materials. But, the novelty and multimedia capacities of the Internet can cause users to get caught up in presentations and suspend normal critical judgment.

Perhaps organizations like NAAEE could raise the general level of environmental and EE WWW publications by developing a set of publication guidelines and quality standards or by reviewing sites and providing an electronic icon indicating their review, if not endorsation. In the final analysis, the intelligent use of the WWW requires critical and attentive readership and the development of those faculties should be at the core of school programs in all fields.

The Internet has been seen by educators as a medium for instruction almost since its inception. The development of the WWW as a multimedia, high capacity, interactive network has reinforced hopes of using the net as a means of greatly enhancing access to and support for learning. A distinction should be made between the use of the net as a support or supplement for conventional, face to face classroom based instruction and the actual delivery of complete instructional units, courses, and programs entirely via the WWW. To date, while the number of courses and programs delivered via the net is constantly growing, its main use has been as a supplement for more conventional instruction.

The potential of the WWW as a means of providing access to expertise, mentors, and resources has been addressed above. In many parts of the world schools are under equipped, while teachers are untrained or have very limited educational preparation. Library resources are often unavailable or very limited. Even in developed countries small rural schools and schools in poor inner city neighborhoods lack resources, can only offer restricted programs, and have difficulty attracting the best teachers. The advent of the WWW as a medium for instruction has the potential to create wider educational opportunities for students and to provide better support for local classroom teachers - but only if access to the required technologies can be made affordable. For environmental educators, the WWW offers a chance to provide teachers with access to environmental curricula and learning resources which could never be purchased by their schools. It also provides a means of quickly and conveniently reaching a large audience of teachers for in-service education related to environmental education and environmental issues. For students it may mean the opportunity to take classes with highly educated teachers and authorities in environmental studies and sciences; it may mean having access to courses in environmental science, environmental studies, ecology, oceanography, earth sciences, and other environmental fields, or not.

There are, however, several problems which must be addressed in order to realize this potential. First, instructional design is in many ways an infant science. It is very difficult to capture the nuances of the best free-flowing, highly interactive and adaptive classroom instruction and student-teacher interactions in on-line learning environments. The work of researchers like Scardamalia, mentioned previously, has promise but much remains to be done before net-based instruction attains the characteristics of excellent classroom teaching.

Second, classroom teachers and university professors are typically not computer technologists or software designers. There is a need to create teams and work groups which include content specialists, expert teachers, and excellent software designers and engineers. In most educational institutions these partnerships are difficult to arrange, especially where face to face instruction is given the highest priority and the development of on-line courses is seen as optional, if not as a needless distraction. Third, much formal education is currently institutionalized, in that it is provided to students by teachers employed by school systems, colleges, and universities. The development of Internet based courses and entire degree and credential programs offers the potential to disintermediate formal education. The student can go directly to the program or course which most meets his or her requirements and offers the highest quality content and instruction. But for this to happen there will need to be development of a system of arrangements for portable transfer of credit. The beginnings of this trend are to be seen in the Western Governors University, an agreement which enables students at any university or college in the consortium to freely transfer and accumulate credits for courses taken at any member institution to a program leading to a recognized degree.

Thus, while the potential of the net as a means of increasing access to high quality education is great, many on-line courses are still little more than electronic versions of lecture notes with a few exercises and on-line tests added. However, corporate interest is growing in the educational application of the WWW, and it is to be expected that more and more programs will be made available through this medium. Environmental educators should be prepared to exploit this opportunity to further the availability of high quality environmental learning experiences for all societal sectors and age levels.

There is a difference between learning, instruction, and education. To be educated implies accessing, understanding, and thinking critically about human experience, past, present and in the possible future. Education entails the development of certain habits of mind as well as the acquisition of ideas and concepts. It also involves the ability to participate in a range of discourse and to move from one form of discourse to another. Education is not a state-it is a life long process. It requires the capacity to critique, transform, construct, and emancipate (Wals, 1993). The new internet-based media may support instruction and learning, but whether they have the capacity to nurture educated minds remains open to inquiry.

In closing this paper, I wish to raise two issues for all educators, and environmental educators in particular, to consider in the context of the new communications media. The first concerns the relationship between data, information, knowledge and understanding; the second is a speculation on the consequences of virtual reality for future human and human-environment development. I will deal with each far more briefly than it deserves.

Data, information, knowledge, understanding and wisdom

There are important differences among data, information, knowledge, understanding and wisdom. The claim that there has been explosive growth of information is apt only as long as the assumption isn't made that there has been a concurrent and automatic explosion of knowledge and understanding. Data and information may be necessary for the development of knowledge and understanding, but they aren't sufficient by themselves. I believe that there can even be a negative relationship between quantity of information and understanding. Understanding, rather than mere content recall, is a hallmark of the educated mind. It follows that, if a surfeit of information can obstruct understanding then it is equally destructive to educational development.

Many contemporary curricula are loaded with information presented in the form of predigested information packages often through school texts. Concepts, facts, skills, and attributes are mixed in a sort of curricular stew. The emphasis is on coverage-while time, the critical element required for the sort of learning experiences which could lead to personal knowledge and understanding, is lacking or in very short supply. As students progress from the lower grades to college and university programs, the content scramble accelerates. And, as more and more content is published electronically on the Internet and WWW, the opportunities for debate, criticism, questioning, and reflection may get even rarer. Many educators are fully aware of this. They know that the emphasis on content without knowledge and understanding leads to what Whitehead (1929) termed "inert knowledge", knowledge that the student can recall and apply only in the context of specific test questions which are soon forgotten. Students also often recognize that they are being short changed, but they have learned that the test scores count, and what can be tested on tests is not reflection, critical inquiry or the capacity for transfer or innovation, but content recognition and recall, or application to well known, familiar problems. The final element in the progression from data to understanding and beyond is wisdom, a word lacking from essentially all modern curriculum goal statements and even from the mission statements generated by schools and colleges. In a crude way, wisdom might be seen as knowing what, knowing why, knowing when, and knowing whether. It requires a platform of content, skills, and understanding, but it also encompasses moral, ethical and spiritual dimensions. It requires imagination and empathy as much as knowledge and understanding. While modern educational institutions seem to be nervous about describing the development of wisdom as an educational purpose, indigenous peoples typically saw it as the major purpose of instruction of the young and the goal for life long development. The consequences of our emphasis on being smart rather than wise are abundantly evident in the quality of much contemporary political and business life. Will the development and general use of the WWW as an environment for communication and learning foster education and the development of understanding and wisdom at the individual and community level? This question should be kept constantly in mind as we regard the growing influence of the Internet on our lives.

The Virtual Snare

Technological optimists and cyber enthusiasts view the coming of the WWW as a major step in human evolution. For them, the step is positive. Humankind is freeing itself from its biological constraints and moving on to a new reality created and controlled by humans, in which Homo sapiens' next evolutionary steps will be taken. Problems in human-environment interactions are temporary and will be addressed technologically (Ausubel, 1997). A brave new world awaits us. Reality is no longer only experienced directly, but through the filtered, enhanced, distorted, mediation of editors. We live in a mediated world. Technologies are becoming biological. The biological is becoming technological (Hillis, 1998).

In Dawn Over the Earth, Thomas Berry (1991) offers an alternative perspective. He claims that humankind is approaching a fundamental crossroads, a choice between the ecozoic and the technozoic. By progressing down the ecozoic pathway, we will become a more "bio-logical" species, in the richest sense of the term. On the other hand, if we choose the technozoic path, we will regard ourselves as the triumph of evolution, and turn our technology to the modification and control of our own genome (and those of other species), and to the subjugation of the earth solely to human needs. A direction offered us in the range of technozoic options is that of living increasingly in electronic virtual worlds, worlds I will refer to as comprised of anthropogenic (human-made) information. As we move down this path we progressively replace the world of biogenic information, the world which nurtured us and all the other elements of the fabric of life, the world in which our species coevolved, with a manufactured, closed, self referencing anthropogenic world of our own making.

Homo sapiens is a very inventive species. We have shown ourselves to be capable of generating a host of ideas and inventions. But are the deep wellsprings of our creativity to be found in human constructs or are they generated by the interaction between ourselves and our ideas and the rest of the biological and geophysical world? The most sophisticated information system on this planet is not digital, but biochemical. It is represented by the accumulated genetic information not only in the human genome (which we now propose to reengineer), but also in the genomes of all our fellow species. This system of information has demonstrated both its capacity to create and its capacity to learn continually throughout the development of life. Evolution itself is the mechanism of learning at the species level. It is slow, but sure, and it is always co-developmental because the evolution of one species is inseparable from that of the others. The entire current community of life on Earth is a learning community.

Figure 1 should be considered a highly speculative view of the possible future of our species if it becomes evolutionarily trapped in the virtual snare of a manufactured world created within the limits of our understanding, thereby cutting our links with the great school of nature. This world will at first seem rich, as rich as human creativity can make it. But as our species moves further away from the wellsprings of total biological creativity and evolution to live in a self referencing, human constructed virtual reality, we will cut ourselves off from the sources which can renew our creative energies and nurture our own further evolution. Even if we completely describe our own genome, and those of some other species, we still will not understand the symphony of life. It will be as if we could gain an appreciation of Beethoven's Ode to Joy by dissecting the sound frequencies made by a single instrument during one moment of the performance with no appreciation of the concept of music per se. Ultimately the technozoic pathway will result in a devolution of humankind.

I have a lot of confidence in the creative capacities of life as a whole. Even though we have done serious damage to some of the processes which operate in the biogeosphere and certainly changed others, life as a whole is still strong. Because most of the other species will not be trapped with us in our virtual snare they will continue to learn in evolutionary terms (as long as we don't drive them into extinction). The game of evolution can only be played by those who stay in it. In Figure 1, I provide for the possibility that some portion of humankind may also escape the virtual snare and evolve into a different form of humanity, if that is even the right term. I've given this evolved human possibility the name Homo extensis. Homo gaiana might be better.

Clearly Figure 1 is speculative. If it serves as a cautionary tale, it will have performed a service. It is not my intent to become misanthropic about our own species. We have great potential. But the record of evolution is rich in examples of other species, all admirable in their own ways, which failed the test of time, by making bad choices (in a biological sense) over the long term. The challenge for environmental educators is a familiar one. In a world where more and more people live without regular, rich, extended contacts with the biotic world and where they have less and less opportunity to experience processes which were not created or controlled by humans directly, they face the challenge of inviting students into first hand engagement with the ultimate sources of human creativity at the species level, with rich and powerful sources of inspiration and encouragement, as well as the sources of our physical and spiritual well being. Ultimately, our interests and those of the rest of life are the same. In a world rich in powerful and engaging human systems for communication and information, the task of environmental educators is to make sure there is a balance so that humans appreciate when it is simply time to turn off the machines and go for a long walk in the woods or fields. If this balance can be maintained, we will have woods and fields in which to walk, and the colors of our computer screens will seem less brilliant than those of the sunrise. Both our technological and our human inspiration will be nurtured by the balance. It is an educational challenge worth taking.

References

"A Private Universe." Harvard Smithsonian Center for Astrophysics (Producer). (1995). Eliciting student ideas. [Videotape]. (Available from The Private Universe Project, The Annenberg/CPB Math Science Project. Boston, MA). (Summaries of some of the videotapes produced by the project can be found at:<http://www.learner.org/channel/pu/pup4.html> and at <http://www.learner.org/channel/schedule/universe/Seeme.html> The video, titled "A Private Universe," is available for US$39.95 by mail order from: The Annenberg/CPB Multimedia Collection P.O. Box 2345 South Burlington, Vermont 05407-2345 USA or by faxing them at (802) 864-9846. In the US the toll free number is: The Annenberg/CPB Math and Science Collection: 1-800-965-7373.

Ausubel, J.H. (1996, Summer). "The liberation of the environment." Daedalus, 125 (3), 1-18.

Bereiter, C., & Scardamalia, M. (1996, September). "Beyond Bloom's Taxonomy: Rethinking knowledge for the knowledge age." Poster session presented at the symposium Operational Thought and the Democratization of Knowledge, Piaget Centennial Conference, "The Growing Mind," Geneva, Switzerland.

Berry, T. (Speaker). (1991). "Dawn over the Earth: Our way into the future." (Cassette Recording). Boulder, CO: Sounds True Audio.

Boulding, K. E. (1969). "Technology and the changing social order." In D. Popenoe, (Ed.) The Urban-Industrial Frontier. New Brunswick, NJ: Rutgers University Press.

Bronowski, J. (1978). Magic, Science, and Civilization. New York: Columbia University Press.

Bush, V. (1945, July). "As we may think." The Atlantic Monthly. [On-line] Available at: <http://www.isg.sfu.ca/~duchier/misc/vbush/>

CSILE. Computer Supported Intentional Learning Environment. [On-line]. Available: <http://csile.oise.on.ca/>

Dickie, C., Owen, T., & Owston, R. (1995). The Learning Highway: A Student's Guide to Using the Internet in High School and College. Toronto, ON: Key Porter Books.

Driver, R., Guesne, E., and Tiberghien, A. (Eds.) (1985). Children's Ideas in Science. Milton Keynes (Buckinghamshire), UK : Open University Press.

Driver, R. (1995). Young People's Images of Science. Bristol, PA. : Open University Press.

Dyson, E. (1997). Release 2.0: A Design for Living in the Digital Age. New York: Broadway Books.

Franklin, U. (1990). "The real world of technology." CBC Massey Lectures. Toronto, ON: CBC Enterprises.

Gareau, M. L. E. J. (1990). "A Case study of XChange, An electronic network used by educators and students in British Columbia." Unpublished master's project. Simon Fraser University, Burnaby, BC, Canada.

Global Learning and Observations to Benefit the Environment. (GLOBE). [On-line]. Available: <http://www.globe.gov/>

Hewitt, J., Scardamalia, M. and Webb, J. (1997, March). "Situative design issues for interactive learning environments: The problem of group coherence." Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Hewitt, J., and Scardamalia, M. (1996, April). "Design principles for the support of distributed processes." Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Hillis, D. (1998, January). "The big picture." Wired 6 (01), 38.

Kelly, K. (1997, September). "New rules for the new economy. Twelve dependable principles for thriving in a turbulent world." Wired, 140-143, 186-197.

Kempton, W. , Boster, J. S., & Hartley, J. A. (1996). Environmental Values in American Culture. Cambridge, MA: M.I.T. Press.

Knowledge Forum . Learning in Motion Corporation. [On-line]. Available: <Helpdesk@Learn.motion.com> (This is the commercial version of CSILE).

Levin, J. A., Rogers, A., Waugh, M. L., & Smith, K. (1989). "Observations on educational electronic networks: the importance of appropriate activities for learning." The Computing Teacher. 16, no pages.

Maes, P. (1995). "Intelligent Software." Scientific American, 273, (3) 84-86.

McClaren, M. (1998, Spring-Summer). "Beyond substituted experience: environmental monitoring as a resource for educational development." Green Teacher, 55, 6-11.

Mee, A. & Thompson, H. (Eds.) (1911). The Book of Knowledge. The Children's Encyclopaedia. London: The Educational Book Co.

Montreal Protocol: [On-line]. Available: <http://www.unep.ch/ozone/mont_t.htm>

Nelson, T. H. (1987). "Literary machines: The report on, and of, Project Xanadu concerning word processing, electronic publishing, hypertext, thinkertoys, tomorrows intellectual revolution, and certain other topics including knowledge, ideas, and freedom." Swarthmore, PA.: Author.

Newman, D.R., Johnson, C., Cochrane, C., & Webb. T. (1996). "An experiment in group learning technology: Evaluating critical thinking in face-to-face and computer-supported seminars." Interpersonal Computing. 4 (1), 57-74.

Orr, D. W. (1992). Ecological Literacy. Education and the Transition to a Postmodern World. Albany, NY: State University of New York Press.

Owen, T. (1993). "High teach: Learning from the experiences of wired writers." Unpublished master's thesis. Simon Fraser University, Burnaby, BC, Canada.

Parker, T. La Quey. (1994). The Internet and schools: A survey of networking activities. [On-line]. Available: <http://www.sunsite.unc.edu/cisco/tracy-article.html>

Perkins, D. (1992). Smart Schools: From Training Memories to Educating Minds. N.Y.: The Free Press.

Riel, M. (1995). Learning circles: Virtual communities for elementary and secondary schools. [On-line]. Available: <http://lrs.ed.uiuc.edu/Guidelines/Riel-93.html>

Rogers, A. (1994). How to design a successful project. The Global Schools Network. [On-line]. Available: < http://lrs.ed.uiuc.edu/Guidlines/Rogers.html>

Rouge River Project. [On-line] Available: <http://www.motor-city.com/rouge/>

Somerville, R.C.J. (1996) The Forgiving Air. Understanding Environmental Change. Berkeley and Los Angeles, CA: The University of California Press.

Staniforth, S. J. (1987). "Planned change and environmental education: An implementation study of 'Salmonids in the Classroom.'" Unpublished mater's thesis, Simon Fraser University, Burnaby, British Columbia, Canada.

Tapscott, D. (1996). The Digital Economy. Promise and Peril in the Age of Networked Intelligence. New York: McGraw-Hill.

"The accidental superhighway. A survey of the Internet." (1995, July 1) The Economist, 18 pages.

Teles, L. and Duxbury, N. (1991). "The networked classroom: An assessment of the Southern Interior Telecommunications Project. Phase 1: August 1990-August 1991." Burnaby, BC: Simon Fraser University.

Wals, A.E.J. (1993) "Critical phenomenology and environmental education research." In R. Mrazek (Ed.) Alternative Paradigms in Environmental Education-Monographs in Environmental Education and Environmental Studies. Vol.VIII, Troy, OH: North American Association for Environmental Education.

Western Governors University. [On-line]. Available: <http://www.westgov.org/smart/vu/vu.html>

Whitehead, A. N. (1929). The Aims of Education and Other Essays. New York : New American Library.

After another salubrious sleep, the Sunday dawn was greeted by many participants in a journal writing workshop, or on beach walk, or in a meditative sunrise gathering. Phyllis Hannon, Director of Environmental Seminars at Spalding University in Louisville, Kentucky, captured the spirit of the morning.

Sunrise on Sanibel Island

As we sat silently on the cool sand keeping our eyes turned to the east, a sliver of orange peeked above the horizon. We early birds had gathered for a sunrise service on our last day together on Sanibel Island. A hazy sky blurred the rising sun except for a few brief moments of brilliance. A strong wind off the ocean churned up a choppy surf and the vibrant sound of the ebb and flow of the waves along the shore. It was a perfect setting for reflecting on several selections from Gift from the Sea by Ann Morrow Lindbergh. Early morning shell gatherers, shore birds scavenging for their breakfast, solitary walkers were living images of creatures drawing peace, strength and sustenance from the ocean. In this setting, we shared easily with one another experiences, songs, and prayers. For a short period in time we experienced once again what the sea has to teach us: "The waves echo behind me. Patience-Faith-Openness, is what the sea has to teach. Simplicity-Solitude-Intermittency ... But there are other beaches to explore. There are more shells to find. This is only the beginning." The shells we found and carried back to home and work place are reminders of what we absorbed from our inspiring Sanibel Island experience.

The Symposium resumed with a well-received response to McClaren on technology, K-12 education, and environmental education by George R. Davis. He is Associate Professor and Director of the Regional Science Center at Moorhead State University. The MSU Regional Science Center is a program which provides science and environmental education to area K-12 students and teachers, college students and the general public.

STANDARDS-BASED EDUCATION AND ITS IMPACTS ON ENVIRONMENTAL EDUCATION

This is a symposium addressing academic planning in environmental programs at the college and university levels. Each one of us occupies a particular niche at our home institutions. The niche I represent is that of a teacher educator who contributes to the preparation of K-12 teachers in science and environmental education. This paper will explore the current revolution in K-12 education and its impact on the preparation of teachers to deliver effective environmental education. It will also describe what constitutes effective environmental education, and what role technology might play in such an education.

K-12 education in the United States is going through a major revolution which is redefining what constitutes the education of a high school graduate. Foundational to this revolution is the Goals 2000 program of the federal government. Started under the Bush administration in response to a bevy of critical reports on the status of K-12 education (starting with the Nation at Risk Report in 1983), the Goals 2000 program was organized with a group of state governors working with the federal government. The chair of the governors' group was Bill Clinton. Richard Riley, the current Secretary of Education, also participated in the governors' group. The Goals 2000 program was passed into law early in President Clinton's first term.

For our purposes the most significant impact of the Goals 2000 program was the creation of national standards documents. As of this date two of these standards documents, the National Science Education Standards (NRC, 1996) and the National Geography Standards (GESP, 1994) provide the foundation upon which an effective K-12 environmental education program can be built. The North American Association for Environmental Education has just completed a series of Guidelines for Excellence in Environmental Education. Currently, the guidelines for environmental education materials have been published with other guidelines to come later (NAAEE, 1996).

These standards documents, while being made available for volunteer use by states and school districts, represent the "800 pound gorilla" in education today. The "gorilla" is somewhat larger in Minnesota. Minnesota has created the Minnesota Graduation Standards (MN-CFL, 1998) which defines what standards all Minnesota students must address to receive a high school diploma. The standards and assessments have been tested and implemented in parts during the last three years. The Fall 1998 ninth grade class will be the first group of students who will be required to earn their diploma by demonstrating command of the knowledge and skills as described in 24 standards across ten learning areas. In addition, they are required to demonstrate competency in reading, writing and mathematics as measured by a series of standardized tests.

The reality of these standards, as representing what Minnesotans believe to be the important knowledge and skills of a high school education, is now starting to attract the attention of teacher educators as well as environmental education providers across the state. The clear message is that, if we in teacher education do not prepare teachers to be competent and comfortable in a standards educational environment, we will be out of the teacher preparation business in about three years. For those of us who deliver environmental education programs to K-12 students and teachers, it is clear that we will need to be delivering or preparing teachers to deliver standards-based environmental education or we will be out of business in five years.

I believe we are up to the challenge. We in environmental education have come to better understand and share agreement on the characteristics of an effective environmental education for students. The Belgrade Charter of 1976 and the Tbilisi Declaration of 1978 helped us define the scope and purpose of environmental education. It turns out, of course, that what characterizes good environmental education also constitutes good education in general. We have been working on understanding what characterizes effective education for at least 100-150 years. It is my contention that this historically grounded and well researched paradigm is well represented in the standards documents I listed earlier and provides for environmental educators the best opportunity to hard-wire an effective integrated environmental education for K-12 students since World War II. We now have an opportunity to have environmental education be integrated into the mainstream of the K-12 curriculum.

To realize our dream of environmental education as a main-streamed, hard-wired, integrated part of a standards-based curriculum, we have to make a fundamental change in how we prepare teachers to deliver environmental education instruction. Up to this point in time, we have prepared teachers to teach environmental education by using various in-service education models. All of the nationally distributed programs (such as Project Learning Tree, Project Wild and Project WET) utilize an in-service model as their primary method of preparing teachers to use their curricula. While such in-service models never did reach a majority of teachers, they are going to reach even fewer teachers in the future. One reason for this is the demographic fact that K-12 teachers are retiring in greater numbers today than any time during the last 30 years. New teachers are coming into the profession at a faster rate than teachers are being in-serviced by any national voluntary environmental education program. The answer to this need to prepare all teachers to integrate effective environmental education into a standards-based curriculum, coupled with the reality of the growing ineffectiveness of the traditional in-service delivery models, is to include a quality environmental teacher preparation strand into the pre-service preparation of K-12 teachers. Successfully designing and maintaining an effective pre-service environmental education program is a major project awaiting environmental teacher educators.

The designing of such pre-service teacher preparation programs has been the task of ten teacher education institutions in Minnesota during the last three years. These ten institutions prepare over seventy percent of the K-12 teachers in Minnesota. The task is still underway because of the major redesign of all teacher education programs in Minnesota. Not only do we have to respond to the need to produce K-12 teachers who are prepared and comfortable to teach in this new standards-based environment, but we have been required by our State Board of Teaching to adopt INTASC standards-based teaching license programs.

These mandated changes are both a blessing and a challenge in our effort to integrate into our teacher preparation programs the environmental education strand needed by education majors to be able to effectively teach environmental education. They are a challenge in the fact that the mandated changes in our teacher licensure programs put a strain on the number of credit hours our universities allow us to use for teacher education. All Minnesota state universities must work within a 128 semester credit maximum and there is no room to add courses to an already full four year teacher preparation program. Therefore, our environmental education strand must be integrated into a series of existing courses in both the liberal arts and teacher education methods. Such integrated programs are harder to maintain because responsibility to maintain the integrity of the program is shared by a large number of professors.

The blessing is that the standards-based programs call for skills and knowledge for all teachers which mesh very well with a quality environmental education preparation. However, this meshing is best realized only in our elementary and early childhood programs as well as our secondary social studies and science programs. We are blessed in Minnesota because in addition to the fact that the national standards describe skills and knowledge which contain important parts of a quality environmental education program, we Minnesota environmental educators worked long and hard with the State Board of Education to adopt as part of the Minnesota Graduation Standards the K-12 environmental outcomes from our 1993 GreenPrint for Minnesota: State Plan for Environmental Education. GreenPrint (MEEAB, 1993) is a cradle-to-grave environmental education program for all Minnesotans. It was developed over a three year period with funding provided by the 1990 Minnesota Environmental Education Act.

Now that I have described the task before us in environmental education and environmental teacher preparation, let me describe the characteristics of an effective environmental education program:

a) Environmental education must be constructivist-based and developmentally appropriate. This characteristic stands on a strong research base and is the one characteristic which has deep roots in the history of environmental education. Environmental education is an amalgam of nature-study, conservation education, outdoor education, natural history education, object teaching, progressive education, elementary science education and resource use education going back in some cases to the 1890's in this country (Minton, 1980). One of the best descriptions of this characteristic can be found in a document called: Learner-Centered Psychological Principles: Guidelines for School Redesign and Reform (APA, 1993).

b) Environmental education must be interdisciplinary as it relates to the other knowledge and skills students are learning. While this runs contrary to the traditional practice of education, especially in secondary schools and at the college level, it is the practice called for in the standards documents.

c) Environmental education must be ecologically based. Our Graduation Standards call for all Minnesota students to understand ecological systems. The study of systems as well as ecological systems is called for in both the National Science Education Standards as well as the National Geography Standards. Ecology is not just another science to be added to a long list of science topics. Callicot said it best:

> Ecology is not just one science among many; it is a habit of mind and a way of experiencing. The end result of a genuine ecological education is a complete re-orientation of a person to his or her surroundings.
> (Callicot, 1989)

d) Environmental education must be based in the local eco-region of the student, but must extend beyond the local as the local cannot be understood without the context of the global. This characteristic matches very well with the learning model in education which calls for instruction to start with the world (what the students know) which the students bring to school, round out that world with local experiences, and then move the students' experience and understanding to an ever larger and more sophisticated world as the students move through school.

e) Environmental education must contain substantial and appropriate experiences in the natural and human impacted environments. Many of the environmental education outcomes cannot be achieved in the four walls of the regular classroom. Some experiences need to be gained in the students' urban community, including city parks, school yards, sewage treatment plants, etc., as well as truly natural outdoor sites away from the city. Today's K-12 students do not generally have rich experiences investigating their outdoors, whether it be in their city or a natural area away from the city. Aldo Leopold called for such experiences in Round River from the Sand County Almanac (Leopold, 1966). In Minnesota, state bonding money and private foundation money have been made available during the last three years to greatly expand the capacity of outdoor education sites around the state to provide more access for Minnesota K-12 students to have significant outdoor education experiences. The Minnesota Graduation Standards give permission to school administrators to use funds for student access to outdoor education sites.

f) Environmental education must bring students to develop an environmental aesthetic and ethic which forms the basis of a personal commitment from which action can be taken. Students must be educated to both an aesthetic through perception, and to an ethic through consideration and reflection. They must be shown how to engage in productive action preferably in cooperation with others, however controversial that action may be. This characteristic also finds a warmer home in a Minnesota standards-based curriculum than a traditional curriculum. Several of the Minnesota standards call for students to participate in Service Learning projects. Early on the projects are more teacher selected and designed. Later, during high school, projects become student selected, designed and carried out. It is the marriage of the Boy Scout Eagle project with school work. While Service Learning projects are not all environmental projects, a good share of them are. Finally, the Minnesota Graduation Standards also mainstream the arts. The new standards recognize the value of an art education for all students, giving increased value to a aesthetic education for all students.

The standards documents give us a new definition of what a K-12 mainstream education is in Minnesota, if not the country (most states are in the process of establishing a standards-based K-12 curriculum). I have endeavored to show that a quality environmental education for K-12 students is very much in concert with the type of education the standards require.

The final question I will explore in this paper is the question of tools. Do we as educators have the tools needed to deliver this type of education to our students? The short answer is that we do have one tool. While not sufficient, it is critical to our ability to deliver a quality standards-embedded environmental education to our students. The tool, of course, is the microcomputer.

The possible roles of the microcomputer in this new standards-based educational paradigm have been well described by McClaren (1998); therefore, I won't repeat his points here. I do, however, want to focus from the standards-embedded environmental education point of view on what possible roles the microcomputer might play and the issues that surround those roles.

a) **Student access to information.** The use of the Internet and CD-ROM already promises to provide students with a greater amount and more up-to-date information about a wide variety of environmental topics for study. The traditional mass education textbooks were never very satisfactory in their ability to provide such information. A variety of paperback books worked better, but still suffered from lack of coverage and the ability to remain up-to-date. As the student's role moves more to asking questions rather than answering questions, access to the Internet and electronic card catalogues from area libraries makes finding up-to-date information on a wide variety of topics very important. The investigation of topics of student interest will no longer be limited to textbook information, what the teacher knows, or what print resources the school library provides.

b) **Teacher access to information.** While we do need to provide the bulk of the environmental education of teachers in their pre-service teacher education program, there is still some important knowledge that must by its very nature be provided at the teachers' school sites. Local outdoor education sites, information about local flora and fauna, and local resource people are unique to where the teacher teaches. A regional or state Web site can easily provide such specific information. Minnesota provides SEEK, a state-wide environmental education Web site, which provides such information for teachers and links to other environmental education sites. In addition, teachers, as life long learners, benefit with their students from the information found online with the microcomputer.

c) **Interactive investigations of remote study sites (urban or natural), or simulations of environmental problems.** In this new standard-based education world, time and space are still limiting factors. There are important natural and urban places to visit for which time and/or money is not available. Many excellent CD-ROM interactive investigations and explorations are available and they have a legitimate role to play in a quality environmental education program. Such programs are superior to the old non-interactive movie or video. What some environmental educators fear is that such programs will replace all outdoor experiences because CD-ROMs cost less and are less work than study at outdoor education sites. CD-ROMs will never replace experiences in outdoor education sites, but does have a role in allowing students explore (to a limited extent) other urban or natural outdoor sites after they have studied at local and area sites.

The use of CD-ROM based simulations which allows students to experience and investigate events which in real time (weeks, months, years, centuries, etc.) are too long to study directly. There is much debate as to the wisdom of using such programs. Much more careful research has to be done on what students are really learning from such simulations. However, if we are studying important concepts, it seems that simulations can offer a way to investigate the topic rather than having to rely on the traditional method of just being told the outcome. The problem with simulations is that some are misleading which produce student misconceptions, often grounded in the simulations' oversimplifications of the topic.

d) **Student-to-student sharing of information.** One of the most powerful uses of the microcomputer and the Internet is the ability for classes of students from different schools to collaborate on an environmental investigation through the sharing of data and analysis. The most well known and researched of these are water quality testing programs such as those conducted through the GREEN Project and the Illinois Rivers Project. The Globe Project also uses the microcomputer in this way. In the past, the availability of only e-mail in a majority of participating schools has caused student-to-student sharing to be limited, but with the rapid wiring of schools for Internet access potential of this use should soon be realized.

We environmental educators have our work before us. While much has been accomplished in the past, much is yet to be done. The best opportunity to hard-wire environmental education into the mainstream education of all K-12 is now. Our challenge is to take the best of what we have done in the past, and add to it new and well tested experiences, information sources and techniques made possible by new tools, to produce an effective environmental education for our students so they will adopt a sustainable relationship with mother earth.

References

American Psychological Association. (1993, January). Learner-Centered Psychological Principles: Guidelines for School Redesign and Reform. Washington, D.C.: Author.

Callicot, J.B. (1989). In Defense of the Land Ethic. Albany, NY: State University of New York Press.

Geography Education Standards Project. (1994). Geography for Life: National Geography Standards 1994. Washington, D.C.: National Geographic Society.

Leopold, Aldo. (1949). A Sand County Almanac. New York: Ballantine Books.

McClaren, Milton. (1998, March). Environmental Education in an Information Age: Confusion, Information, or Understanding. paper presented at the Symposium: Academic Planning in College and University Environmental Programs. Ft. Myers, FL.

Minnesota Department of Children, Families and Learning. (1998). Minnesota Graduation Standards. St. Paul, MN: Author.

Minnesota Environmental Education Advisory Board. (1993, June). A GreenPrint for Minnesota: State Plan for Environmental Education. St. Paul, MN: Author

Minton, Ty. (1980). The History of the Nature Study Movement and Its Role in the Development of Environmental Education. Ann Arbor, MI: UMI Dissertation Services.

National Research Council. (1996). National Science Education Standards. Washington, DC: National Academy Press.

North American Association for Environmental Education. (1996). Environmental Education Materials: Guidelines for Excellence. Troy, OH: Author.

SEEK. [online]. 1998. Available: http://www.seek.state.mn.us/ [1998, February 1, 1998].

Also thoughtfully responding to McClaren was Mary Paden, senior associate and director of the Environmental Education Project at World Resources Institute (WRI), a foundation-funded policy-research institute in Washington, D.C. that focuses on global environment and development issues. For seven years she was managing editor of the *World Resources* series, desktop references on global environmental issues published every other year by WRI. Ms. Paden has served on the Education Working Group of the President's Council on Sustainable Development, on the Education Committee of the International Development Conference, and as a member of the Commission on Education and Communication of the World Conservation Congress (IUCN).

INFORMATION TECHNOLOGY AND ENVIRONMENTAL EDUCATION: SEPARATION OR EQUALIZATION?

Mr. McClaren is right that there is danger in living in cyberspace. Cyberspace can provide temptation (that can become addiction) to escape from reality. Ultimately what is real is the Earth: land, water, air, fire, animal and plant life. Humans have spent thousand of years surviving in Nature, fighting it, conquering it, and now might be in danger of losing touch with it altogether.

But the good news about cyberspace is that it is part of an information economy based on ideas and electronic signals, not wholly on resources extracted from the Earth. For the first time in history the economy can grow with little or no material input. This breakthrough may mean that we no longer have to choose between environment and development: we can have both, perhaps with more modest consumption, but a greater wealth. A recent report by the American Electronics Association, based on government statistics, shows that the field of information technology--computing and telecommunications--is the nation's largest industry and is growing fast.

Unlike a return to simple living, the new technological and information society requires a sophisticated infrastructure. Ironically, this infrastructure can both separate us from Nature (and reality of the Earth) and save the save the Earth from our ravenous appetites.

But why can't we overcome this escape urge and learn to both love the Earth and leave it for the next generation?

The real power of the information age lies in its promise to democratize the world, once certain technical barriers are overcome. Putting the wealth of the world's knowledge into the hands of the people is bound to have a democratizing influence. Achieving equity in information must certainly lead to equity in other areas, thus the flow of information through cyberspace may lead to a more equitable and more sustainable real world.

Channeling this flow of information will require a new role on the part of educators and organizers, who previously spent much of their time acquiring and transmitting information. They must now become guides who teach students how to locate, evaluate, and analyze the overabundant information. Fortunately cyberspace also provides help to college professors in research, in suggestions for syllabi and soon even chat rooms to discuss the frustrations of interdisciplinary teaching. Which of our multiple intelligences can be reached through cyberspace is just beginning to be explored. Information technology can't do everything, but we are fortunate to live during the interesting times when its many uses are being explored.

New Role for Educators: The Guide

The dangers of cyberspace duly noted, I must confess that I love computers. I love the Internet. I love the Information Age. I think it is the best thing since refrigeration. The Internet opens the world of information to everyone. It makes research so easy. Time previously spent physically trudging around to libraries can now be better spent surfing websites and talking with experts on-line. The Internet gives us both information and communication at the click of a mouse. Educational software gives us more data and information than anyone ever dreamed of having access to. These advances in information and communication technology have completely changed the role of educator from the *source* of information to a *guide* to help students learn how to gather, sort, evaluate, interpret, and internalize the flood of available information. Education was never just information, but for many years information transfer was a central part of education.

According to a recent survey by the Arlington County Virginia Employment Center, the top ranked desirable job skill is "analytic thinking." Employers want employees who know how to sort through vast amounts of information, solve problems, make decisions, work in teams and come up with creative solutions. These are skills long emphasized by environmental educators, and now stressed in educational reform. It is the flood of information in large part that makes these skills important.

This change in their role from information provider to guide is humbling to many educators. As gatekeeper to the information, one is in control. Now the gate is open and teacher and student have access to the same information. The teacher as guide must show the student how to navigate through the information, how to analyze it, evaluate it, and make decisions based on it. The teacher doesn't have all the answers anymore.

The TV news is awash with opinion polls, economic indicators, and market surveys. Any citizen needs some analytic skills just to understand the news. Citizens with the ability to analyze, to ask the right critical questions of the methods, and to make decisions--even when faced with uncertainty-- will make for a stronger democracy.

Teaching Quantitative Analysis Skills

Mr. McClaren stresses the computer's role in communications, but there is still much room for expansion of the use of its computing skills in education. A subset of critical thinking still is skill at quantitative analysis: how to make sense of data; how to use data to prove or disprove a hypothesis. In my school days, such skills were not taught until the graduate school level because it was assumed that only researchers needed to know how to think analytically and to evaluate their data. Fortunately, data analysis skills are now included in many middle and high schools, because the Math and Science National Voluntary Standards include data analysis skills. In developing educational materials at the World Resources Institute over the past decade, we have followed the opportunities for data analysis presented by computer technology. WRI develops an extensive database of country level data for 170 countries on environment and development topics. We publish an updated database every two years in the World Resources Report and we use this data in our Teacher's Guide to World Resources series. In the early guides (1990-92) we used the data to create graphs to show students trends in energy consumption, population growth, etc. These graphs were included as transparency masters in a teacher's guide, along with text telling the teacher how to explain them to students. In 1998, we are working on a piece of educational software that contains the entire WRI database in a modified GIS program. This software, *DataScape*, still shows students some maps and graphs of important trends (along with pull down explanations), but it also allows students to do original research in doing statistical comparisons and analysis as well as mapping and graphing any of the 450 variables. The software is called *DataScape* because it allows students to explore the "landscape of data" around the world and to see this data both geographically and over time.

A second part of *DataScape* allows student to input their own local environmental monitoring data on a local map, and then do the same analysis that is possible with the WRI data for the world. The purpose of this section was to help bring the analytic power of GIS to an easier level. Thus it could be useful to school water, air, and other types of environmental monitoring programs, such as Global Rivers Environmental Education Network (GREEN), Riverwatch, and Global Learning and Observations to Benefit the Environment (GLOBE). Many of these programs have standards methodologies for collecting data. Some have standardized reporting formats. GLOBE has a standard map that visualizes the data reports. But none has a standard analytic and mapping capability that we hope *DataScape* will provide.

By using *DataScape* with an environmental monitoring project, students must both go to the field to collect the data at least several times to observe how things change over time; and they can use the best GIS tool (ArcView, used by most GIS professionals) to analyze their data. These data and maps can be posted on the Internet or communicated with other schools. And students using *DataScape* for local projects can switch over to the world database at any point to see how their locality fits into the big picture. This welding of global and local consciousness was the goal of early environmental thinkers such as Buckminster Fuller and Barbara Ward. Computer technology can help.

The Virtual University

Business and technical schools have pioneered on-line degree programs and a major effort is taking shape in the west to create an on-line university.

On-line learning seems best suited (by accounts of students) for busy professionals/parents who want to upgrade their professional skills. No one thinks they will replace the ambience, the socialization, and the maturation process of the four-year liberal arts college. The 1996-97 National Center for Education Statistics report shows that 43 percent of U.S. college students are 25 or older, many with careers and families, creating a substantial market for on-line professional degree programs.

A Washington Post article describes a computer class session from a student's point of view:

> Some days [Dorothy] Hennessy, 33, does what many other parents only dream of: she saunters up to her bedroom (after work) puts on her pajamas and turns on her computer to log on to the on-line course she's taking to get her MBA through Strayer College.
>
> Classes meet twice a week on-line from 6:15 pm to 10 PM. Hennessy logs on to the school's web page, heads for her classes page and fires up a special program.
>
> The instructor delivers a brief lecture in voice and text, reviewing assigned chapters and quizzing students. Students respond on their keyboards; often, small groups break off into separate chat rooms to discuss the issues at hand.
>
> Hennessy says all this typing is more interactive and more effective than courses she's taken on campus: "I am learning more than I would if I was sitting in the back of the class....The computer seems to bring people out of their shells."
>
> " Hennessy says the on-line degree program is the only way that she--as a single mom--would be able to get a masters degree. She says she would never be able to pay tuition plus a babysitter in order to attend a traditional program.

Another article in the Chronicle of Higher Education (Feb 27 98 p. A25) describes on-line teaching from a professor's point of view. In reference to an award from his students commemorating his style on the blackboard, the article's subtitle reads "Smokin' Chalk Bob learns to teach his first on-line course." How does a professor with 21 years of highly interactive classroom teaching experience convert to the keyboard?

Looking over the log of which new students have signed on and spent time in his web based text pages, Robert Norton of Colorado Community College said, "It's like we're all in a cave and it's really dark and we're feeling around saying: are you there yet?" But once the links are established, he has more fear of being overwhelmed by e-mail than of being abandoned in the dark.

In Colorado Community college's approach to on-line teaching, the professors set up on-line quizzes and construct hypertext syllabi. They send their work to a consulting company in Denver, "Real Education," which transforms their lesson plans into web pages to which only professors and registered students with passwords will have access. The web pages include the syllabus and 16 weekly units that include audio or video files, as well as text from the professor including notes and examples and a list of useful web sites. In addition, there are chat rooms for real time discussions and "threaded discussion"--a series of e-mail messages organized by discussion topic. CCC is in Denver. One of Mr. Norton's students lives in Durango, four hours away on the other side of the Rocky Mountains.

Western Governors' University

The wide open spaces of the U.S. west have inspired a new consortium called Western Governors University. Its sponsors are betting that far flung professionals eager to advance their education will to support a huge virtual university that will use technology to deliver a rich variety of courses over that vast landscape and help reign in the costs of higher education.

The Chronicle of Higher Education reported in February 1998 that 21 colleges and corporations will provide courses that students can take via computer or other technology. Those who pass a series of tests in competencies defined by WGU will receive the appropriate degree or certificate. WGU is enrolling about 100 students in two pilot programs this spring--an associate of arts degree program and a certificate program in electronic manufacturing technology. WGU is set up as a private non-profit corporation headed by a board of trustees. It has set a fundraising goal of $30 million by 2003, and expects to be in the black by 2005 with an enrollment of 95,000 students.

Although virtual universities probably won't sponsor real field trips to a wetland, this type of cyber-class is quite suitable for many types of courses about sustainability. It offers a huge new audience of people with shared interests but incompatible geography (virtual learning communities). It offers many college and professional level courses in both technical environmental training and very tailored courses for businesses and specialty degree programs. Even high schools are getting on-line courses: the Concord Consortium in Vermont is developing on-line high school courses in sustainable development. Such courses might not otherwise be available to schools without specialized academic resources.

At the professional level, WRI is discussing the idea of working with universities in developing countries to tailoring courses on environmental economics or sustainable forestry to mid level professionals or decision makers. The potential for cyber classes in developing countries will become enormous as infrastructure and technology improve and become more accessible.

So far, it is apparent that cyber-classes have the advantages of reaching far flung learning communities, providing a focused body of material for discussion and learning, and offering convenience for busy professionals. Clearly they have the disadvantage of lacking the collegiality and campus life that is part of the maturation process of college, the face-to-face contact so important for feedback about whether students understand the discussion, and a more limited capacity to address multiple intelligences. As more of these classes are created for diverse situations, research will be needed to determine their effectiveness relative to face-to-face reality.

Growth and Equity

The aspects of information technology that make it attractive from the point of view of sustainable development are its potential to generate wealth without the heavy use of material resources and the democratizing effect of making information widely available. Full discussion of these issues is beyond the scope of this paper, but a few data can be presented.

The United States and other developed countries, of course, are leaders in information technology growth. High-tech industries are becoming a major driver of U.S. economic growth. A recent report, Cybernation, by the American Electronics Association, regrouped Department of Commerce statistics to create a new category of industries involved in computer or software manufacture and telecommunications. This group of "information technology" industries generated $866 billion in sales in 1996--up 57% from 1990. It generated 6.2 percent of the nation's output of goods and services in 1996 and employed nearly 4.3 million workers, who earned wages 73 percent higher than average.

Some developing nations are showing signs not only of following the pattern of shifts in income generation from agriculture, to industry, to service (including information technology) sectors, but of leapfrogging past some industrial development directly to information technology and services.

Of course, the fast pace of this growth has so far benefited mainly developed nations, and within developed nations, mainly the wealthier citizens. In the U.S., both income and race are factors in whether students have access to computers both at home and at school. According to U.S. Bureau of Census figures, only 6% of students (aged 3-17) in households of under $10,000 income have access to computers, while 56% of students in homes with incomes of $50,000-74,999 have access. Looking at school computer access by white, black and Hispanic students, we find that 63% of white students have computer access at school compared to 51 percent of black students and 53 percent of Hispanic students. At home, 36% of whites, 13% of black, and 12% of Hispanic students have computer access, according to Census Bureau statistics.

But these inequities must be viewed against the trends which show an enormous increase in computer availability in schools over the past 15 years, a trend that will continue. In 1983-84 , there were an average of 92 students per school computer, compared to an average of 7 students per computer in 1996-97, according to Market Data Retrieval statistics.

Such inequities exist on an even larger scale worldwide. As of 1997, half the world's population had never even made a telephone call, let alone logged onto a computer. At the June 1997 Global Knowledge 97 Conference in Toronto, national and world leaders stressed both the gap in information technology and the enormous promise of this technology, in terms of economic growth and democratization.

In a plenary speech at the beginning of the conference, Kofi Annan, UN Secretary General, noted that conference delegates were about to begin a global conversation to discover new ways to make information an agent for change and a tool for prosperity. He noted that, because development, peace and democracy are no longer the exclusive responsibility of government, global organizations, or intergovernmental bodies, the democratizing power of information produces the opportunity to effect change and alleviate poverty in ways previously unimaginable.

Annan stressed that knowledge is power, information is liberating, and education is the promise of progress in every society and family. "Information and freedom are indivisible. The information revolution is unthinkable without democracy and true democracy is unimaginable without freedom of information."

He noted that communications and information technology have enormous potential for sustainable development, but the information gap has become the new dividing line between the "haves" and "have nots." He stressed that the UN system must ensure that the gains of the information revolution are placed at the service of developing countries. He outlined a number of policies and incentives that would promote this effort, such as foreign investment in information technologies, liberalization of government control and censorship, and pilot projects in interactive, long distance learning, telemedicine, telebanking, and micro-credit schemes for small entrepreneurs.

Clearly, closing this info-technology gap (or tech-knowledge gap) will be a major challenge for the leaders of the 21st century.

References

Archey, William T., President of CEO, American Electronics Association, Testimony before the Senate Subcommittee on Manufacturing and Competitiveness, April 23, 1997.

Blumenstyk, Goldie. "Western Governors U. Takes Shape as a New Model for Higher Education," The Chronicle of Higher Education, February 6, 1998.

"Technology Counts," special edition of Education Week, Vol XVII, No. 11, November 10, 1997: "Money Matters," p 7; "Computer Availability over Time" Figure, p 8; "The Race Factor," Figure, p. 9.

Gardner, Howard. (1996). Intelligence: Multiple Perspectives (Orlando, FL, Harcourt Brace College Publishers).

Gibbs, Hope Katz. "Can Distance Learning Go the Distance?" Fast Forwards section, Washington Post, January 30, 1998 pp 36-37.

Guernsey, Lisa, "Trading a Classroom for a Keyboard and Eye Contact for E-Mail: "Smokin' Chalk Bob" learns to teach his first on-line course," The Chronicle of Higher Education, February 27. 1998 P A25.

International Institute for Sustainable Development, Sustainable Developments, A daily report of the Global Knowledge 97 Conference, Vol. 7, No.2 June 32, 1997.

Lohr, Steve, "Information Technology Field is Rated Largest U.S. Industry," The New York Times, November 18, 1997.

Strong, Ted, Executive Director of the Columbia River Inter-Tribal Commission, Personal Communication, San Francisco CA, October 1994.

Young , Jeffrey R., "Students are Unusually Vulnerable to Internet Addiction, Article says," The Chronicle of Higher Education, February 6, 1998, p A25.

Following the final responding addresses, working groups met for the third and last time. The nature of discussions varied substantially from group to group. According to conference evaluations, participants greatly valued the opportunity to respond to the formal program and discuss its implications with others in the same type of programs as their own.

Collette Hopkins brilliantly facilitated the largest working group. Dr. Hopkins serves as Associate Director for Partnerships for the Research Center for Science and Technology of Clark Atlanta University. She directs several national and international projects including an Education for Environmental Sustainability Project at seventeen Historically Black Colleges and Universities and Minority Institutions, a Rainforest Educators Workshop in Peru, Costa Rica and Belize, and a USAID funded University Development Linkages Project in Toamasina, Madagascar.

ENVIRONMENTAL EDUCATION IN TEACHER EDUCATION PROGRAMS

The group began by identifying exemplary models and practices related to preservice environmental education. It was generally agreed that the best models, in addition to focusing on exemplary teaching practices, are those which provide real life experiences for preservice teachers. Exemplary teacher education programs develop teachers who, in turn, provide such experience for children. It was agreed, however, that exemplary teacher education programs are not easily identified and that standardized criteria for their identification do not exist.

Concerns about the general lack of and inconsistent quality of preservice environmental education were discussed. Issues were raised relative to the merit of including environmental education in existing state level certification programs.

Additional issues relative to the inclusion of environmental education in the state standards discussion were also addressed. At the center of these various issues and concerns is the general lack of consensus within and outside the field of what is "environmental education" and, therefore, how it would be fashioned in teacher education programs. For example, the issue of science content in preservice environmental education was raised. Does environmental education become an add-on or would it be integral to all teacher education programs? What are the differences relative to Pre K, K-5, middle and high school teacher education preparation or is it the same? Is it generic and global or specific and local? How does the impact of teacher shortage or diversity affect the attention to preservice environmental education? Is it affected by the urbanization of public education? Where does environmental justice fit in the discussion of preservice environmental education? What are the issues which confront private and parochial teacher preparation programs?

It was noted that there appear to exist no universal criteria for identifying exemplary teacher education environmental education programs. It was recommended that one of the action items for NAAEE might be to establish a set of criteria (as well as to review existing regional and local criteria) by which exemplary teacher education environmental education programs could first be identified and then nationally recognized. In other words, through the establishment of such criteria a process could be developed from which model teacher education environmental education programs could achieve national status. It was further suggested that this process alone could result in the furthering of the national discussion of the necessity for teacher education environmental education programs.

Dr. James L. Elder, Jr. facilitated the working group with members from the greatest diversity of schools. He is the Founding President of The School for Field Studies (SFS), currently the country's leading environmental studies field program for undergraduate students. He recently conceived and successfully conducted the first "debt-for-environmental education swap." Dr. Elder has held long-standing appointments to several boards of directors and advisors including the North American Association for Environmental Education and E2: Environment and Education. He has been active in numerous national conferences and fora on environmental education and environmental studies. He is also a member of the Social Venture Network and the IUCN Commission on Education and Communication.

ENVIRONMENTAL STUDIES IN LIBERAL ARTS COLLEGES

This participant-directed session met to discuss the role of environmental studies (ES) within academia. This was an open discussion with little attempt to reach conclusions or consensus. Nonetheless, a common theme emerged from the discussions. Most if not all participants viewed themselves and their ES programs as fundamentally involved in an effort to *build better communities.* To explore this perspective further, the group broke into three subgroups, each of which dealt with an aspect of community building. Key points made in each of the three subgroups are summarized as follows.

Students and Communities

More and more environmental studies programs recognize the potential pedagogical value of actively involving their students in the local community's environmental problems and challenges. Students highly value the chance to interact with and help real people attempting to address real problems. This process can take the form of a service learning project, participatory action research, fieldwork, or other closely related methodologies. What are some of the objectives that such methodologies have in common?

As teachers involving our students in the local community, session participants felt that we need to teach students how to:

become part of a community
make a contribution
effect change at the local level
live in a community as a citizen
approach a community not as a teacher but as a participant/partner in the change process
listen to community members
watch how environmental issues are resolved in a community, using opinion, emotion, passion while lacking the skills and science for sound resolution.

The Problem of Disenfranchised Youth

We often feel as though we are teaching to the converted. Students who enroll in ES programs usually already have a well developed commitment to environmental. How can we move beyond this audience to attract students new to environmental issues?

We need to acknowledge that, for many of today's youth (especially urban youth), safety issues can be a larger concern than environmental degradation. They often feel powerless to take on environmental concerns when they are confronted daily with violence in their neighborhoods. How can we as educators recognize these legitimate concerns and at the same time raise the level of attention and involvement in environmental issues?

Some suggested ideas were:

start where these students are,
ask them what they need,
focus on air quality, food quality, health and safety,
focus on empowerment (both personal and political),
move from personal empowerment to collective empowerment (e.g. students
    running a public meeting),
reinforce a connection to nature/community through different disciplines - dance, art,
    music, literature, humanities,
use role models (such as Scout leaders) to speak about environmental problems in their communities
involve multigenerations in environmental programs,
teach the value of collective (vs. individual) action,
try to connect youth to the environment with spirituality (via literature?).

The Problem of Experts/Specialists

As knowledge has increasingly become specialized over the past century, especially within academia, experts and expertise in general have come under attack. Many feel that the increasingly arcane knowledge held by many experts is not balanced by an understanding of the big picture. Many experts are perceived to lack understanding of the larger forces and processes at work in the real world, which transcend boundaries of academic disciplines. Others feel that the real issue with experts is how they leverage their expertise to gain power and authority. How can this be appropriately addressed in an ES program?

We need to:

acknowledge that experts are needed,
show students how to communicate with appropriate experts,
develop a system to coordinate, communicate and use community knowledge as a balance to expert knowledge,
produce ES graduates who will be BOTH experts and good communicators,
ensure that new, much needed experts are expert translators/communicators between the scientific experts and the public.

The Problem of being an ES Faculty member in a traditional academic community

Faculty in traditional academic communities receive few rewards and indeed sometimes punishment for conducting essential aspects of ES programs such as community work. Many participants felt that measures such as building environmentally sensitive buildings on campus, while powerful steps forward, are not enough. The higher education system itself has to change. How can we institutionalize some of the innovations taking place in ES programs so they live beyond charismatic, visionary faculty?

The business sector is well aware that radically new products demand radically new production methods. If we in ES expect to produce a new "product", in the sense that we are trying to fundamentally redefine what it means to be college educated, then why do we think that we can produce a new product using the old methods of "production"? Despite some changes in the content of what is being taught to a liberal arts student, the generally utilized pedagogy of higher education has not changed significantly in over a century. Our attempts in ES to utilize a different pedagogy thus come into major conflict with the evaluation and reward systems built into the old pedagogy.

This subgroup was a bit at a loss for how such a large degree of change might be accomplished. We recognized the need to develop new evaluations systems - but how do we best assess this type of nontraditional learning? We recognized the need to "shift the system that shifts us" by better educating our administrations about the goals of ES programs and how they can advance the institution itself - but we struggled to find effective strategies for such an effort. One concrete suggestion was made for a push to abandon tenure, which can be viewed as counterproductive to establishing a system which values innovation and creativity in teaching.

Jim Lester and Tony Cortese co-facilitated a hard-working group which envisioned a sustainable university. Dr. Lester is Director of the Environmental Institute of Houston, and Professor of Environmental Science, University of Houston, Clear Lake.

Anthony D. Cortese, Sc.D., co-facilitated the working group and also the final plenary session on future directions in the field of environmental studies. Cortese is President of Second Nature, a nonprofit organization whose mission is to catalyze a worldwide effort to make environmentally just and sustainable action a foundation of learning and practice at all educational levels. Tony was the first Dean of Environmental Programs at Tufts University where he developed and coordinated thirteen university-wide environmental programs and was the

Commissioner of the Massachusetts Department of Environmental Protection from 1979-84. Dr. Cortese was recently elected as a Fellow of the American Association for the Advancement of Science (AAAS).

The notes were kept and the text was written by Edward J. Kormondy. Dr. Kormondy retired in 1998 as Senior Vice President of the University of Hawaii and Chancellor and Professor of Biology of the University of Hawaii-Hilo and University of Hawaii-West Oahu. He is author of the landmark Concepts of Ecology and over sixty research papers. His long, distinguished career continues into retirement; he recently completed service as President of the University of West Los Angeles.

ENVIRONMENTAL SCIENCES IN UNIVERSITIES

In order to conceptualize a vision for a university (*sensu latu*) dedicated to sustainability, the purposes of such a university were addressed first. This was followed by a crystallization of the vision of such a university and of the issues involved in achieving the vision. Identification of the skills members of the sustainable university community should have or develop rounded out the discussions. What follows are the focal points of the deliberations.

The purposes/functions of a university dedicated to sustainability include: generating and disseminating information in the context of current and future technologies; increasing the quality of life of individuals and society; providing leadership and modeling for sustainability in the operations of the university itself; questioning prevailing paradigms, commenting on society, and conducting bold experimentation; changing or reinforcing knowledge, skills, and values to *live* and *lead* a just and sustainable future; providing a forum for debates, discussion, and dialog in the development of societal policy; and helping local, regional, and global communities towards sustainability.

The vision of a university dedicated to sustainability is that of a responsible citizen connected to the local, regional, and global community, generating information and utilizing appropriate pedagogy to foster knowledge, skills, and values for sustainable living. In effect, it is an ecosystem consisting of interrelated and interconnected components (physical, biological, sociological, economic, political, legal, etc.).

The goals or strategic directives in achieving the vision include: empowering the community to function in a participatory process; facilitating the community to evaluate the definition of the quality of life; transforming universities so that they become leaders in investigating and implementing sustainability; providing an open forum for exploring alternatives in the development of public policy; sustaining academic freedom in the questioning of prevailing paradigms, especially as to how the world works and our role in it; adopting research and pedagogical approaches that will advance the pursuit of a sustainable society; and understanding and minimizing the local, regional, and global ecological footprint.

Issues in achieving the vision are numerous and at times complex. Although this may lead to conflicting goals regarding sustainability, connecting with the local, regional, and global community is paramount, especially for those institutions that have traditionally been inner-directed. Developing two-way communication among/within communities is essential, but this will challenge traditional boundaries (between, e.g., faculty and administration, one discipline and the next). Other issues in achieving the vision are: developing flexibility in instructional models to facilitate the learning process (e.g., case studies, simulations), providing active, experiential learning that addresses "real world" problems (e.g., internships, apprenticeships), and encouraging the skills that will allow for life-long learning; confronting the discipline-based traditions with a broadened, interdisciplinary content that includes "real world" skills that will foster sustainability; moving from the traditional model in which faculty toss potatoes into empty sacs - the students - to teaching students how to grow their own potatoes over their lifetime; modifying faculty development and the reward system to foster sustainability; having universities themselves become models of sustainability in their institutional practices; adjusting accreditation standards to accommodate changed and changing academic paradigms; developing research projects that foster interdisciplinarity; and confronting a possible conflict of academic freedom with the goals of sustainability.

The skills to be developed in a university dedicated to sustainability beyond the fundamental ones include: employing systems thinking, that is recognizing the interdependence and interrelatedness that obtains within natural and human-constructed systems; understanding how the natural world works as well as its ecology, evolution and co-evolution; understanding the interdependence of population, consumption, culture, social equity, health, and environment; developing the capacity to deal with the ambiguity of the unknown and unknowable, as well as multiple points of view; assessing the ecological footprint; understanding how economic, technical, design, and scientific strategies affect sustainable development that mirrors and lives with and in natural systems; and fostering a broader view of personal success and achievement. In addition, different members of the group supported the following additional skills: understanding how social, cultural, legal, market, and governmental frameworks affect the distribution of wealth, power, and opportunity for all humans, and how power and opportunity affect humans' interactions with their environment; developing skills for responsible social and political action and encouraging individual participation in the processes through which decisions are made that affect sustainability; and identifying non-material ways to fulfill needs for security, belonging, personal development, and happiness that transcend materialism.

WHITHER? A LEARNED SOCIETY FOR FACULTY IN COLLEGE AND UNIVERSITY ENVIRONMENTAL PROGRAMS

James L. Elder

To understand where the field of college and university environmental programs might go from here, we need to consider our common future from a number of different perspectives. Our spheres of influence can be viewed as a series of concentric circles, not all of which were discussed during this final session.

The innermost circle, where we often have the most influence, involves our individual work: our classes and programs. The next circle outward involves our immediate environment: our campuses, their buildings and operations, and our home institutions that support us. The next most immediate environment, and thus the next circle, is the community in which our institutions reside. Our professional community, including the field of environmental education, can be considered the next circle. These last three circles were the topic of most discussion during this session. And finally, the outermost circle would be the role of our profession within the larger sphere of society.

The first three circles – program, institution, community - had been the focus of much of the symposium until this point; the professional circle was the primary focus of this last session. We are beginning to realize the need to concern ourselves with developing new institutional structures and support. We need to promote college and university environmental programs within the donor community, as the Funders Forum on Environmental Education has begun to do. We need to support those organizations that are trying to help build the profession, such as the North American Association for Environmental Education. And we need to explore creating new institutions to address the many gaps that exist within the college and university environmental program community.

For example, faculty in the process of developing new environmental programs have historically often had to find their own way, with few models or references to fall back on. This can be an inefficient and expensive way to create a new program. Few formal networks exist for college and university environmental program faculty to share their experiences and help each other improve on course design and execution. Indeed, few if any texts on college and university environmental program teaching methods or strategies have been published to date.

As another example, comprehensive studies are needed on the educational *and* environmental impact of college and university environmental programs. This would help address the lack of credibility of environmental programs with some traditional educators, with those conservationists and environmentalists who are skeptical of the impact of environmental education upon the environment, and with potential funders which are often crucial to the development of college and university environmental programs.

It is time to consider establishing a national college and university environmental initiative or society. Such an organization could provide critical support and training to new faculty and programs, disseminate materials, and provide models. It could help establish and coordinate faculty networks, and could conduct evaluation/impact studies. As enrollment in college and university environmental programs continue to gain historic highs and as the small list of funders for environmental programs begins to increase, the timing for such an initiative seems right.

One critical need is clear. college and university environmental programs, however narrowly or broadly it is defined as a field, needs a stronger, more vibrant and supportive sense of *community.* Very few supports exist for college and university environmental programs professionals, especially relative to older, more established fields and disciplines. And one way or another, the task before us in going forward is to find ways to build and encourage that community.

The final session of the Symposium began to tackle this question of the need for a stronger college and university environmental community as well as the possible creation of a new initiative, such as a society, to meet this need. As outlined by participants in this session, some thoughts on the possible functions of such an initiative follow.

Communication

An essential aspect of building any community is to create new vehicles for communication within the community membership. At the moment, few such vehicles exist for college and university environmental programs on the national level. Opportunities to share ideas, experiences, problem solving and success stories are limited. Possible vehicles to facilitate this are a newsletter, electronic bulletin board, national/regional conferences, resource clearinghouse and professional journal.

Partnerships

As college and university environmental programs touch so intimately upon so many other fields and disciplines, discussions and linkages should be sought with other professional societies such as various science organizations and the Ecological Society of America. Also, college and university environmental programs have an unusually active number of student groups, which present a wonderful opportunity for connections and linkages.

Professional Development

Over the past decade, the number of environmental programs has grown tremendously (by 50% according to some accounts), and new programs continue to be established with some frequency. Often environmental programs draw heavily upon faculty from other disciplines and fields. Such faculty are new to the pedagogy and tremendous breath of college and university environmental programs, and they often need guidance. Thus, nurturing and supporting both junior and new colleagues is a critical need to be met by any new society. Opportunities to publish, to learn about job openings, and to network are essential for the development of new faculty members.

Quality

College and university environmental programs operate without an accrediting body or any formal standards. Thus there is a need to insure quality and excellence through such mechanisms as mutual program review, brokering faculty exchanges, and technical assistance.

Leadership

How can we actively and forcefully position college and university environmental programs to take their proper role as a critical agent of change in both the environmental movement and higher education? College and university environmental programs represent a synthesis of the best of both fields, not a diluted version of each. College and university environmental programs hold a vision of the future which the world desperately needs. Our challenge is to find new ways to help realize that vision, globally and locally.

Organizational Options

Before the symposium ended, participants briefly considered several organizational options for meeting these needs. The general consensus seemed to be that, while a new initiative of some sort was needed, building an entirely new organization or society was perhaps premature at this point. As the North American Association for Environmental Education (NAAEE) has existing structure in place to support college and university environmental programs, the group felt we should, at least initially, work within NAAEE to build a new college and university environmental program initiative.

To this end, the Nathan Cummings Foundation has generously agreed to fund NAAEE to conduct a followup planning process. This grant supported a meeting of ten college and university environmental program leaders to continue the momentum begun on Sanibel.

AFTERWORD

Anthony Cortese

The NAAEE sponsored symposium on environmental education and education for sustainability in undergraduate Liberal Arts education in colleges and universities was an excellent initiative at a critical time for society by the largest and most well known international network of professionals and students working on higher education. It helped to fill a critical void for faculty and some administrators who have been conducting environmental and sustainability education for three decades. These and other college and university leaders have had few fora to help (a) define the critical need for and challenges of such education, (b) some of the exciting new ideas and programs that have been emerging, (c)network with each other to learn from and support each other and (d) to be a critical mass of voices to promote the rapid expansion of such efforts. The participants felt very strongly that environmental education and education for sustainability in higher education is critical for responsible citizenship and leadership for a just and sustainable society in the 21st century.

The Need for a New Human Perspective

This need for a new human perspective has also been the consensus of the majority of nations who signed the Agenda 21 action plan for sustainable development at the UN sponsored Earth Summit in 1992, the US President's Council for Sustainable Development in 1995, dozens of other leading scientific and industrial groups and civil society. These groups and the symposium participants believe that society will need an unprecedented change in human thinking, values and action--a "paradigm shift" so that humans can live in harmony with both natural systems and each other. They all call for a large and rapid effort in formal and non-formal education to accomplish these goals which must be accomplished in the next 20-30 years. Despite their efforts disturbing global environmental, health, social and economic trends continue to accelerate. For example, in its annual Human Development Report released in September 1998, the UNDP stated "Globally, the richest 20 percent of the world's population (in the highest-income countries) account for 86 percent of total private consumption expenditures--the poorest 20 percent a mere 1.3 percent." [1]

Special Role for Higher Education

Higher education needs a special focus since it prepares most of the professionals who develop, manage, teach in and influence society's public, private and non-government institutions. Institutions of higher education bear a profound moral responsibility to increase awareness, knowledge, skills and values that equip individuals in all fields of endeavor to pursue life goals in a manner that sustains human and non-human health and well-being, now and in future generations. Higher education is one of the significant but largely overlooked leverage points in creating a just and sustainable society. This all the more significant in the U.S. since two-thirds of all the K-12 teacher positions will be replaced in the next eight to ten years.

Society has conveyed a special charter on institutions of higher learning. Within the United States, these institutions are allowed academic freedom and a tax-free status to receive public and private resources in exchange for their contribution to the health and well-being of society through the creation and dissemination of knowledge and values. They have the mandate and diverse skills to develop the intellectual and conceptual framework for achieving this goal. They have the unique freedom to develop new ideas, comment on society, engage in bold experimentation, as well as contribute to the creation of new knowledge. They must play a strong role in education, research, policy development, information exchange and community outreach and support.

The Challenge for Higher Education

The symposium highlighted many examples of schools and community-based programs around the world that are making important strides toward the necessary changes, primarily through environmental studies (in their broadest definition) programs. In his keynote speech, David Orr laid out the challenge of academic planning for environmental education in the 21st century calling for wholescale change in pedagogy, the design of buildings and operations and relations with the local, regional and global communities - both human and non-human. His demonstration of the new Oberlin Environmental Studies Center which is one of the most environmentally friendly buildings on any campus was reinforced by Rocky Rohwedder's discussion of the pedagogy of place and the modeling of sustainability through campus buildings and landscape. The addresses by Loise Chawla and Charles Hopkins picked up the Orr challenge and demonstrated how academic planning can be a catalyst in community youth development and in K-12 education.

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[1] UNDP. (September, 1998). Human Development Report.

The work on standards-based environmental education at the K-12 level for the training of future teachers discussed by George Davis and Mary Paden helped set up a working group discussion led by Collette Hopkins. This is critical given that 20% of the world's population is under age 16. Milt McClaren challenged all the participants to think of the effect of the exploding information technology on all education with a particular emphasis on environmental education. In picking up the Orr challenge he demonstrated ways in which the Internet could be both a positive and negative means for information exchange and education and, most importantly, how difficult it is to predict what the educational, social and political impacts will be on society and university planning for education in the 21st Century.

Many participants shared their experiences (and others about which they know) - both positive and negative - in their environmental studies programs. There are many more that can be found through the Alliance for Sustainability through Higher Education - a group of six NGOs working to help expand the capacity of higher education to make environmentally sustainable education and action a cornerstone of all learning and practice (see Second Nature's website - www.2nature.org). There is much to be encouraged about but the number and reach of the programs are not keeping up with the accelerating pace of negative global trends in all living systems.

Education and research about the interdependence of and a sustainable relationship between humans and the rest of the environment is not a priority in higher education. As David Orr has said, "The crisis of the biosphere is symptomatic of a prior crisis of mind, perception and heart. It is not so much a problem in education it is a problem of education".[2] To date, no engineering school in the U.S. (or, to my knowledge, internationally), except Georgia Institute of Technology, has made design for the environment, industrial ecology, pollution prevention or the relationship of technological development to sustainability the cornerstone of engineering education.

American medical students receive the equivalent of one day of training in occupational and environmental medicine in four years of medical school. Only 100 out of 700 schools of business and management in the North America have courses on business and the environment; the majority of the courses are electives. Only nine percent of teachers' colleges require a practicum in environmental education at the elementary level, and only seven percent at the secondary level.[3]

As a result, the general public has little awareness that a healthy natural environment is essential to our very existence. Generally, we see ourselves as separate from the natural world and are not cognizant that it provides all the resources which make life possible, absorbs our wastes and enriches our lives with its incredible diversity of plants, animals and other species. Much of the population has little idea about where goods come from and where wastes go nor of the destructive impact of pollution on human health. Many believe that natural and physical resources are free and inexhaustible and that the environment can assimilate all our pollution and waste. The general public has little idea that it is not just industrial enterprise, but the aggregate of all human activities that are irreversibly changing the earth, or that over consumption in developed countries and poverty in developing countries are as critical as population in determining whether we can achieve sustainable development.

The System Problem

Several structural aspects of most higher educational institutions contribute to the problem. Understanding the interactions between population, human activities and the environment, and developing strategies, technologies and policies for an environmentally just and sustainable future are among the most complex issues with which society must deal. These issues cross disciplinary boundaries making it very difficult to convene the skills necessary for effective teaching and research in educational institutions that are organized into and reward faculty for highly specialized areas of knowledge in traditional disciplines. Specialists are produced with little feeling of connectedness, and little understanding of the workings of natural systems, or even the place of their own discipline in the larger human and non-human world.

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[2] Eagan, David J. and David W. Orr, eds. (Spring 1992, no.77). New Directions for Higher Education: The Campus and Environmental Responsibility. San Francisco: Jossey-Bass Publishers. p.4.

[3] Gabriel, Nancy. (1996). "Teach Our Teachers Well: Strategies to Integrate Environmental Education into Teacher Education Programs," a Second Nature report prepared for W. Alton Jones Foundation. p.4.

The values and assumptions of, as well as the connections and conflicts among the disciplines which are enabling the current unsustainable and inequitable paradigm are largely invisible and infrequently discussed in formal education. For example, neoclassical economics views the economic system as separate from the biosphere rather than one of its subsystems. Engineers believe that most human based technology is an improvement over "natural technology" and feed economists' assumptions that science and technology can substitute for any resource we deplete or species--or ecosystem we destroy.

Environmental studies programs often struggle for respect by their peers, money, faculty, priority within their institutions, support from alumni, funders and accreditation organizations and sometimes future employers of their graduates. Moreover, there still tends to be a bias at many institutions that environmental studies programs should be environmental science programs despite the complexity of the issues that students must deal with when they graduate.

Future Direction for Higher Education

The consensus of all the discussions was that education must shift toward more systemic and interdisciplinary perspectives which encompass the complex interdependence of individual, social, cultural, economic and political activities and the biosphere. This will require comprehensive short- and long-term educational change, necessitating unprecedented leadership and commitment by colleges, universities and professional schools. These strategies are outlined in detail in a 1995 report to the U.S. President's Council on Sustainable Development developed by thirty-five international academic experts on sustainability and education.[4]

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[4] Report from the "Workshop on the Principles of Sustainability in Higher Education." Held under the auspices of the President's Council on Sustainable Development, February 24-27, 1995, Essex, Massachusetts.

From the stimulating and challenging discussions at the conference and the above report, a working session on the Vision of a university dedicated to sustaina ability that was facilitated by the author and summarized by Ed Kormundy the following direction emerged for me.

The content of learning must embrace interdisciplinary, systems thinking to address environmentally sustainable development on local, regional and global scales over short, medium and intergenerational time periods. Education must have the same "lateral rigor" across the disciplines as the "vertical rigor" within the disciplines.

The context of learning must change to make the human/environment interdependence and values and ethics a central part of teaching in all the disciplines rather than isolated as a special course or module in programs for environmental specialists. Environmental specialists and environmental studies graduates must be leaders in helping set the intellectual direction of universities. Environmental specialists are necessary but not sufficient to achieve sustainability because all people occupy ecosystems, consume resources and produce pollution and waste. All students must understand that we are an integral part of nature and that we are co-evolving with all the other species in the biosphere. This will require the curriculum to emphasize:

- systems thinking
- how the natural world (including humans) evolved and works
- the interdependence of humans and the environment including the relationships among population, consumption, culture, social equity, health, economy and the environment
- how to assess and minimize the ecological footprint of human activity
- the technical, design, scientific and institutional strategies and techniques that foster sustainable development including ways:
    - + to achieve a five- to ten-fold increase in energy and natural resource productivity
    - + to mirror and live within the limits of natural systems, e.g.,
        - * live off renewable energy[5]
        - * operate in a cyclical manner (where waste = raw material for other processes or activities)[5]
        - * utilize renewable resources at a rate less than or equal to the natural environment's ability to regenerate the resource
    - + remediate environmental damage and restore ecosystems
    - + preserve biological and cultural diversity
- social, cultural, governmental and economic frameworks for guiding just and sustainable development
- strategies to motivate environmentally sound and socially just behavior by individuals and institutions including non-material means of meeting non-material needs

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[5] McDonough, William. Dean of Architecture, University of Virginia.

Research must focus on the above and must help in the establishment of an ethos to stabilize population, assure the just distribution of the world's limited resources and promote social and economic values and policies that lead to a healthy and sustainable future.

Educational psychologists tell us that we retain 80 percent of what we do as opposed to 10 to 20 percent of what we hear and read. Therefore the process of education must emphasize active, experiential learning and real-world problem solving on the campus and in the larger community. For example, the learning experience for students should include:

- working on actual, real-world problems of communities, government and industry as part of the curriculum
- working in groups so that they will be able to effectively collaborate as future managers, leaders and change agents

Higher education must "practice what it preaches" and make sustainability an integral part of operations, purchasing and investments, and tie these efforts to the formal curriculum. The university is a microcosm of the larger community. Therefore, the manner in which it carries out its daily activities is an important demonstration of ways to achieve environmentally responsible living and to reinforce desired values and behaviors in the whole community. By focusing on itself, the university can engage students in understanding the "institutional metabolism" and ecological footprint of materials and activities. Students can be made aware of their "ecological address and footprint" and they can be actively engaged in the practice of environmentally sustainable living.

Moreover, the annual buying and investment power of the 3,700 U.S. institutions of higher learning ($185 billion in purchasing; $85 billion in endowment)[6] make them important players in creating market demand for environmentally sound and socially just goods and services and in supporting the local communities in which these institutions are located. Many colleges and universities engage in some of these activities, often because it saves money. A recent report of the National Wildlife Federation's Campus Ecology Program entitled: "Green Investment, Green Return," demonstrated that twenty-three projects in fifteen colleges and universities across the

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[6] Keniry, Julian. (1995). Ecodemia: Campus Environmental Stewardship at the Turn of the 21st Century. Washington, D.C.: National Wildlife Federation. p.xii.

U.S. are saving $17 million annually. These include projects in energy and water conservation, transportation, dining services, hazardous chemical management and recycling.[7] Under the direction of David Orr, with administration, student, community and external professional help, Oberlin College has designed one of the most environmentally sustainable buildings at any university. For example, no toxic building materials will be used in its construction; it is completely solar-powered and produces excess usable energy for the campus; it causes no air pollution and the effluent water meets EPA standards for drinking water quality.[8]

Making the Transition Through Higher Education

Can higher education help make the transition to a sustainable path within the twenty to forty year time frame called for by the UN, scientists and other prominent leaders? Jim Elder led a stimulating group discussion to help accelerate this effort by focusing on the issue of a "Learned Society for Faculty in College and University Programs". The group noted the expansion of environmental education programs from the traditional amalgamation of ecology and biology to environmental studies programs to global studies and education for sustainability. The group noted on a professional level, we need to develop new institutional structures and support among ourselves and from within and outside colleges and universities.

Without strong outside influence, higher education is not likely to change its direction far enough or fast enough. Historically, this is due to the isolation of higher education from many of society's problems and the overwhelming dominance of the disciplinary approach in learning and research. Strong, rapid and largely unprecedented efforts by all of higher education's stakeholders are necessary to help move the higher education system on a path to sustainability. Students, parents, alumnæ, prospective employers, organizations funding research and education (government, industry and foundations), accreditation organizations and the public, which are all consumers, clients or supporters of higher education's services, must work with the higher education system in creative ways to encourage education and research for sustainability.

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[7] Eagan, David J., et. al. (1998). Green Investment, Green Return: How Practical Conservation Projects Save Millions on America's Campuses. Washington, D.C.: National Wildlife Federation. p.5.

[8] Second Nature's EFS Profiles Database, http://www.2nature.org/programs/profiles.nsf

New Organizational Efforts - An Expanded Role for NAAEE?

In a final session facilitated by Jim Elder and the author, the participants discussed strategies for a stronger community among college and university environmental programs (no matter how narrowly or broadly they are defined), as well as the possible creation of a new initiative, such as a professional society, to meet this need. The participants discussed several organizational options to meet these needs. While a new organizational effort is sorely needed, the consensus was that building a new organization or society was premature at this point. They suggested that because NAAEE has some existing structure in place to support liberal arts-based college and university environmental programs and is a well known and respected environmental education organization, we should build upon that structure (at least initially). They also wanted to build on existing regional efforts, such as the North East Environmental Studies Group that meets annually, to build synergy with these and other programs.

These efforts discussed and developed at the Sanibel Symposium are very exciting and important and should be pursued with great vigor and speed. However, we must also not lose sight that they represent a tiny fraction of the effort that is needed to move higher education and society on a just and sustainable path in the next twenty to forty years. As we focus on strategies for education reform and local, national and international governmental policies for a just and environmentally sustainable future, we must remember that education for a sustainable relationship with our life support system is the sine qua non of a successful effort.

References

Finlay, Jennifer; et. al. (1998). Grey Pinstripes, Green Ties: Executive Summary. Washington, D.C.: World Resources Institute. p.7.

Meadows, Donella, Dennis Meadows and Jorgen Randers. (1992). Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future: Executive Summary. Post Mills, VT: Chelsea Green Publishing Co. p.7.

Talloires Declaration. http://www.ulsf.org/about/tallo.html

Sponsoring Organizations

The Symposium was co-sponsored and co-hosted by Florida Gulf Coast University and North American Association for Environmental Education.

The founding of Florida Gulf Coast University at the advent of a new century is a signal event. It comes at a moment in history when the conditions that formed and sustained American higher education are fundamentally changing, and at a time when rapid shifts wrought by technology and social complexities are altering the very nature of work, knowledge, and human relationships. As a public institution, Florida Gulf Coast University eagerly accepts the leadership opportunity and obligation to adapt to these changes and to meet the educational needs of Southwest Florida. To do so, it will collaborate with its various constituencies, listen to the calls for change, build on the intellectual heritage of the past, and plan its evolution systematically for the twenty-first century Integral to the University's philosophy is instilling in students an environmental consciousness that balances their economic and social aspirations with the imperative for ecological sustainability.

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The North American Association for Environmental Education (NAAEE) is a network of professionals and students working in the field of environmental education throughout North America and in more than 50 countries around the world. Since 1971, the Association has promoted environmental education and supported the work of environmental educators. There are many environmental interest groups, and many organizations dedicated to improving education; NAAEE uniquely combines and integrates both of these perspectives, and takes a cooperative, nonconfrontational approach to promoting education about environmental issues.

The Association is made up of people who have thought seriously — over lifetimes — about how people become literate concerning environmental issues. NAAEE members believe education must go beyond consciousness-raising about these issues. It must prepare people to think together about the difficult decisions they have to make concerning environmental stewardship, and to work together to improve, and try to solve, environmental problems.

NAAEE recognizes the need for a coherent body of information about environmental issues. Its members also recognize that information and analysis are only part of an effective education program. To be truly effective, this body of knowledge must be integrated into all aspects of the curriculum and into all types of educating institutions for the widest array of audiences.

In order to translate theory into reality, and provide tangible support for environmental education and environmental educators, NAAEE engages in a variety of programs and activities. Some examples are the annual conference at varying North American sites, an extensive publications program, the VINE (Volunteer-led Investigations of Neighborhood Ecology) Network, the Environmental Issues Forums (EIF) program, the Environmental Education and Training Partnership (EETAP), the Urban Leadership Collaboratives (ULC) program, and NAAEE’s National Project for Excellence in Environmental Education.

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The Nathan Cummings Foundation is rooted in the Jewish tradition and committed to democratic values, including fairness, diversity, and community. It seeks to build a society that values nature and protects ecological balance for future generations; promotes humane health care; and fosters arts to enrich communities. The goal of the Foundation's Environment Program is to promote study, education, and action on issues of environment sustainability, and to promote the development and implementation of effective programs and policies that support an environmentally and economically sound society.

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Additional financial support was provided by the School for Field Studies.

The School for Field Studies (SFS) is exclusively dedicated to teaching and engaging undergraduates in environmental problem solving. Since 1980, over 8,500 students have conducted hands-on field work in SFS programs around the world. SFS currently operates five field study Centers: The Center for Wildlife Management Studies in Kenya; The Center for Marine Resource Studies in the British West Indies; The Center for Wetland Studies in Baja, Mexico; The Center for Coastal Studies in British Columbia; and The Center for Sustainable Development Studies in Costa Rica. Students in fall and spring semester programs and intense 30 day summer courses at the six SFS Centers earn college credit for participating in field studies of challenging environmental dilemmas.

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Editors

Peter Blaze Corcoran is a Professor of Environmental Studies and Environmental Education at Florida Gulf Coast University, America's newest university, opened in 1997. He coordinates the University Colloquium, a course in ecological literacy required of all students. He is past President of the North American Association for Environmental Education. Long committed to the professionalization of environmental education, he has also served on the boards of Conservation Education Association, American Nature Study Society, and the New England Environmental Education Alliance. He is a former member of the National Environmental Educational Advisory Council to the Environmental Protection Agency. Research interests include the significant life experiences that lead to environmental concern, professional development and teacher education in environmental education, philosophy of the environment, and the intellectual history of environmental philosophy. He also writes on reform in teacher education, community education, progressive education, and spirituality in education. He speaks widely on international environmental education and has recently traveled to Austria, Japan, Greece, India, Slovakia, Fiji, Canada, Ukraine, England, and Western Samoa. He is involved with environmental education in Russia and the central Asian republics and is a founding board member of the Law and Environment Eurasia project in Almaty, Kazakhstan. He has a long-standing involvement in environmental education in the Pacific region and has recently been involved in projects in Fiji, Sri Lanka, Thailand, and Australia. He has taught at College of the Atlantic, Swarthmore College, and Bates College.

James L. Elder is the past Treasurer and current College and University Environmental Programs Section Chair of the North American Association for Environmental Education. His commitment to international environmental education led to founding The School for Field Studies (SFS) in 1980, now the country's leading international environmental studies field program for undergraduate students. Under his leadership, SFS grew to include six overseas field campuses in Australia, British Columbia, Costa Rica, Kenya, Mexico, and the Turks and Caicos Islands, a resident faculty of 24 environmental studies professionals, and an enrollment of over 700 undergraduates a year. As a result of his interest in creating new sources of support for environmental education, he recently conceived and successfully conducted the first "debt-for-environmental education swap" with the government of

Mexico. Mr. Elder received a B.A. in Philosophy and Religion from Colgate University, and was awarded an honorary doctorate from Barry University for his pioneering work in environmental education. He is also a former Watson Fellow. Mr. Elder has held long standing appointments to numerous Boards of Directors and Advisors, including *the Spaulding Educational Trust*, and *E2: Environment and Education*. He has authored several papers on environmental education, and been active in numerous national conferences and fora on environmental education and higher education. Mr. Elder recently resigned as President of the School for Field Studies, and is now developing a new NGO which will be active internationally in promoting environmental education for sustainability. As part of this process, he is currently consulting with a joint venture involving the Chinese Ministry of Science and Technology, which aims to develop a national system of environmental education in China.

Richard Tchen is a project coordinator at the Math Forum, a K-12 math education center on the Internet (http://forum.swarthmore.edu/) funded by the National Science Foundation. He serves the Math Forum as a webmaster, archivist, editor, program evaluator, and teacher workshop facilitator. Mr. Tchen graduated from Swarthmore College with a major in mathematics and a concentration in environmental studies. His experience in environmental education includes certifying to teach secondary level mathematics with the Radnor Middle School Watershed Program, and interning with the USDA Forest Service Environmental Education Outreach Program, for which he co-wrote "Branching Out to the Youth of America." A co-author of a young adult novel and a math picture book (both forthcoming), Mr. Tchen has had the privilege of collaborating with Dr. Corcoran on several projects, including co-developing the National Wildlife Week 1997 curriculum and its educator's guide, "Nature's Web: Communities and Conservation," for the National Wildlife Federation, and helping research and edit the North American Association for Environmental Education monograph Environmental Education: Academia's Response 1972-1997.

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Peter Blaze Corcoran
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