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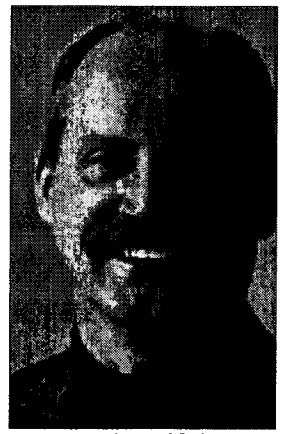
ABSTRACT

This article asserts that it is critical to understand the connections between human ecology and building ecology to create humane environments that show inspiration and creativity and that also serve diverse needs. It calls for efforts to: (1) construct an environmental education approach that fuses the three ecologies (natural, human, and building); (2) recognize trends toward physical learning environments that are not located in traditional schools; (3) include all stakeholders in the exploration of the physical environment as an extension of the curriculum; (4) expand the number and diversity of subjects benefiting from a comprehensive built environmental education curriculum; and (5) continue to seek ways to make visible how buildings function and how they are connected to the greater community and environment at large. (EV)

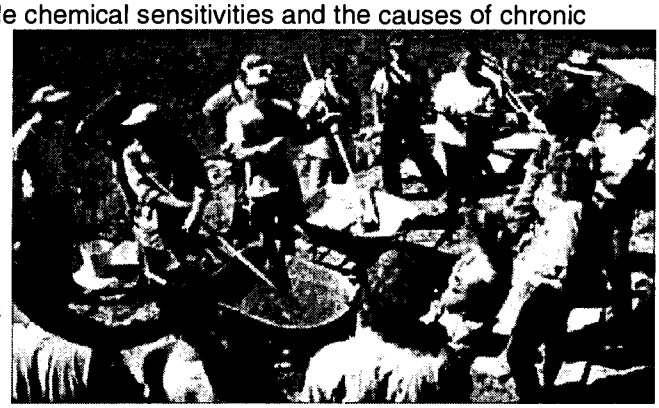
Empowering Learning Through Natural, Human, and Building Ecologies

Robert J. Kobet, AIA



Robert Kobet

Most human beings, particularly those living in developed nations, spend ninety percent of their time inside buildings. There is an emerging body of literature and growing number of case studies that indicate, that our ongoing and intimate relationship with the built environment has a direct bearing on our physical, emotional and spiritual well being. This is supported by many professions outside the design community, particularly whose services to and interactions with the built environment and building occupants deal directly and indirectly with those impacts. Among these are clinical ecologists, social psychologists, allergy specialists, and human resource managers. Their interests range broadly: from multiple chemical sensitivities and the causes of chronic illness in the built environment to human productivity and architecture as a means for companies to retain their most productive employees. In school environments, absenteeism, test scores, and teaching effectiveness are certainly influenced by physical factors such as daylight, air quality, acoustics, the psychology of color and views.



"It is critical to understa connections between h ecology and building ec if we are going to creat humane environments t show inspiration and cr and that also serve our diverse needs."

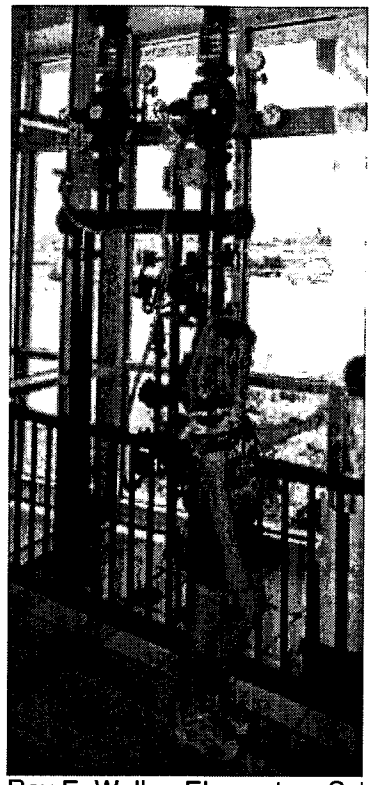
It is critical to understand the connections between human ecology and building ecology if we are going to create humane environments that show inspiration and creativity and that also serve our diverse needs. As the number and sophistication of studies examining the relationships between human factors and the quality of our built environments increase, discussion moves from the speculative and anecdotal to the statistically significant and clinically verifiable justification for high performance green buildings. And, while these studies are often controversial, they continue to grow in number and sponsorship, largely because the economics indicate the stakes are high, and the potential losses or gains are significant.

We now have irrefutable evidence that our development and building practices have a withering effect on the natural world and the biosphere that sustains us. Our reliance on an ever-dwindling supply of land, resources and energy supplies to support population increases and attendant development often fuels adversarial dialogue about development paths and resource use strategies. A byproduct of the otherwise industrial revolution was the formulation and distribution of chemicals, materials and effluents that now permeate the natural world. Many of these products find their way into our environment through the design and construction process. These issues were given worldwide attention in 1962 when Rachel Carson published her landmark work, Silent Spring. Her enormous

contributions to environmental awareness still form much of the basis of what passes for environmental education today; classical ecology or the study of living systems and their relationship with the environment in which they exist. In it the impact or encroachment of the built environment and other human activity on the natural world is seen largely as negative and often confrontational.

At the same time Rachel Carson was researching and publishing Silent Spring, Theron G. Randolf, MD, a Chicago physician, was treating a growing number of patients who were exhibiting symptoms of diseases he was able to attribute to their home and work environments. His 1962 publication, Human Ecology and Susceptibility to the Chemical Environment, chronicled a litany of negative impacts on human health that are specific to the built environment, including building materials and finishes. His work is not as well known or widespread as that of Rachel Carson, but it could be said that Dr. Randolf is the father of occupational medicine and built environmental education, at least as they relate to the impact of architecture on our health and well-being.

Even though we have a working knowledge of how the built environment impacts the natural world and our health and well-being, our knowledge of the built environment and the resource base we draw from to construct our infrastructure, communities, and buildings is almost absent from contemporary environmental education. To make matters worse, we are subject to national energy policies and conduct that suggest our standard of living and economic security can be maintained only if we continue our current patterns of energy consumption and resource depletion. Our popular culture is driven by an advertising industry that equates success with the ability to live as desired without accountability for the consequences to the environment or future generations.



Roy E. Walker Elementary Scl
more details

We are wired to build. It is what we do. Our cities and buildings prove our need to continue to create and construct, but they are also an indication, of our desire to congregate and a reflection of our cultural values. As William McDonough has said many times, if design is the first indication of human intent, our actions are inextricably linked to the consequences of what we do and how we do it. Of the built environment, it has been said we are in a race between education and disaster. As the dominant species and the only one which orders its environment on such a grand scale, we alone influence both the natural world and the built environment in ways that are at once obvious, perceptible, and consequential.

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The results of our design decisions are immediate and very often carry global consequences. In the long term they may very well determine if life as we know it will exist in the future. Therefore, it is critical we understand the relationships and interconnections among natural ecology, human ecology, and building ecology. Further, if we are to benefit from an educated citizenry capable of making balanced decisions about the world we will live in, K-12 environmental education should consist of courses, modules, and exercises integrated with a learning environment designed to be an extension of a curriculum that values the symbiosis between living beings and the milieu they inhabit. This premise should not be confused with current trends in high performance school design that advocate attributes like increased flexibility and the ongoing adaptation of appropriate technology that is continually evolving. And it strongly supports the design philosophy of swiftly moving away from the traditional classroom of the self-contained education box and favoring community-based learning, public/private partnerships, shared facilities, and distance learning.

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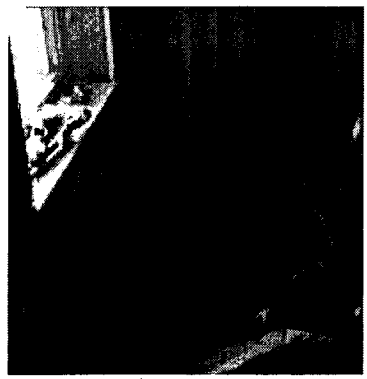
Empowering Learning Through Natural, Human, and Building Ecologies

Robert J. Kobet, AIA, *continued from previous section*

To enrich the formal learning experience, we must continue to expand environmental education by promoting an equitable emphasis on each of the three ecologies: natural, human, and building. Existing designs that recognize natural systems and include features that make them visible and accessible should be recognized as pioneers in the march toward more comprehensive and effective learning environments. In addition to these valuable works, we need to do the following:

"To enrich the formal learning experience, we must continue to expan environmental educatio promoting an equitable emphasis on each of th three ecologies: natural human, and building"

1. *Construct an environmental education approach that fuses the three ecologies.* The basic constructs of each are alluded to in contemporary K-12 education, but the connections are not put forth in an integrated manner. Course competencies and evaluation metrics do not require a comprehensive understanding of the connections between them. Most state environmental education standards, in fact, do not formally recognize the built environment as an integral part of the core curriculum. Unless this is changed, the inclusion of built environmental issues and topics will be very long in coming.
2. *Recognize trends toward physical learning environments that are not located in traditional schools. Increased flexibility, changing technologies, performance based learning, etc., are all compatible with the goals of built environmental education and learning environments that are an extension of the curriculum.* The tenets of sustainable design range from global to local concerns. Understanding the ecological footprint of a school, however the school is configured or defined, is as important and valid as basic energy concepts and recycling programs. Certainly there is more to learn from how and where a school obtains its resources and disposes of its waste than from collecting cans. Too often this study is relegated to environmental "clubs" and extracurricular activities. The K-12 learning sequence should be retooled to include the introduction and development of what the built environment is about.
3. *Include all stakeholders in the exploration of the physical environment as an extension of the curriculum.* The lessons from the pioneer schools that include rainwater harvesting and sundials should serve as the foundation for a much more comprehensive and robust approach to using school facilities and community learning venues as an extension of the curriculum. Learning environments premised on teacher/student ability to rearrange space and equipment to suit a variety of learning or program needs should consider involving the same stakeholders in other potentially more meaningful ways. For instance, a well-designed computer network capable of such things as multi-tasking and individual and group learning configurations is a good starting place. A computer network that enables students in a cluster to monitor energy flows through the school or learning community in real time has a great potential for learning and instruction. Information gained from the simple tracking of energy, material, and nutrient flows through the school could be incorporated into everything from



Learning with tools

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traditional math classes to the social sciences and economics. A school with static light shelves to optimize daylighting and control unwanted solar gain has value in explaining solar geometry and diurnal cycles. Allowing students to adjust exterior shading devices in response to seasonal changes has even greater value. Fabric awnings and other kinetic devices designed and constructed by students that define outdoor learning spaces and provide shelter have another, distinct set of learning opportunities.

4. Expand the number and diversity of subjects benefiting from a comprehensive built environmental education curriculum. Vocational education programs focusing on building trades can easily include a broad band of information pertaining to green building practices. Building science and construction trade courses that include green design concepts are an obvious place to start. Facilities defined by architecture that illustrate simple machines and solar and lunar geometry can provide a stimulating environment for teaching math, physics, and the sciences. School grounds that include community or school gardens can impact food service, culinary classes, and biology courses in ways that include active student participation and contributions.
5. Continue to seek ways that make visible how buildings function and how they are connected to the greater community and environment at large. Exposed structural systems carry specific opportunities. Color-coding truss members to indicate compression and tension can enhance the understanding of statics and the resolution of structural forces. Cable trays and access flooring, where appropriate, can serve to make visible how building services are distributed. Waste management can include on-site composting of organic materials and recycling programs run by student organizations. Implementing an allergy-free, nontoxic cleaning regimen holds a myriad of opportunities for a healthier learning environment and learning modules focusing on human ecology and physiology. Art programs that utilize non-toxic supplies and environmental themes, and chemistry classes that practice microchemistry can reduce negative impacts on the environment while increasing environmental awareness. Food service that promotes community-supported agriculture and local food purveyors can forge meaningful relationships with the community that students should know more about and become part of.

In order to accomplish the goals of moving toward an integrated approach to environmental education and architecture as an extension of the curriculum, several things must happen.

1. School administrators must advocate for changes in the existing course requirements, and evaluation methodologies. Agencies that set education standards must recognize the importance of understanding the built environment as a matter of social and economic responsibility. Those who teach or deliver education services should promote built environmental education through available channels: parent/teacher organizations, environmental education consortiums, conferences, and other public forums.
2. Teacher education programs and ongoing education requirements that include material specific to an understanding of the built environment are essential. Teachers willing to adapt their teaching practices and course offerings to take advantage of architecture designed to be an extension of the curriculum are critical to the using of high performance green schools effectively. Teacher training and internship experiences should include built environment education.
3. Foster partnerships in designing school facilities that enable a more thorough understanding and knowledge of course content, education standards and delivery methods. The design professional responsible for

Bluffsview School

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Mr. Kobet's career combines years of green design and architecture for the chemica sensitive with a parallel care teaching. He is a member of CEFPI and is assisting seve schools with various aspects high performance green sch design and the US Green Bu Council's Leadership in Ene and Environmental Design (LEED™) building rating sys

He is active in the US Greer Building Council and the AIA National Committee on the Environment. In addition to h professional practice Mr. Ko a member of the Carnegie M University School of Architec where he teaches a studio a elective in Sustainable Desig Development.

Mr. Kobet is the primary autl

the physical facility is a partner in the development of the curriculum. The teacher, in turn, will benefit from a working knowledge of what design professionals do.

4. Make architecture/curriculum development ideas a priority. Ideas discussed in charrette that never make it into the design are lost opportunities. Building features such as rain water harvesting, landscaping for energy conservation and wildlife habitat, the site as an arboretum, etc., are only valuable if they are fully integrated and implemented cost effectively.
5. Forge partnerships that will enable the outcome of the design process to be as comprehensive as possible. Some of these may already be in place. With others, it may be necessary to educate the potential partner about the purposes of the project. For instance, building control suppliers may be willing to supply the software or programming skills to monitor energy systems in real time in a classroom setting. Conservancies or local gardening clubs may be willing to participate if they have the master plan explained in a way that satisfies their mission and yearly budget.

The goal of the integration of architecture and environmental education is to empower learners to make informed decisions about the built environment and its impact on themselves and the natural world. If we are to win the race between education and disaster, it is time we revise the current education paradigm to include a greater awareness and knowledge of the all of the environments we create. It is the only way we can preserve the one that sustains us.

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the Commonwealth of Pennsylvania Guidelines for Creating High Performance Building, and has written or contributed to scores of artic and book chapters on the su of high performance architec sustainable design and built environmental education.

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