

How Can the Architect Contribute to a Sustainable World?

Proceedings of a conference
at Wingspread Conference Center, Racine, Wisconsin.
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Introduction

Buildings produce half of all greenhouse gases and account for one-sixth of the world's freshwater withdrawals, one-quarter of its wood harvest and two fifths of its material and energy flows. One in three buildings in this country, according to the USEPA, has less than healthy indoor air quality. By several estimates, we will double the size of the built environment over the next twenty to forty years. For these reasons there is a critical and immediate need to shift thinking on how the built environment is designed. To reduce environmental impact, protect public health and improve environmental equity and justice, we must change principles for building practice. Designers in general and architects in particular should play a high profile leadership role in this transformation.

Second Nature undertook to support this leadership strategy by developing a program to work with architecture and design schools across the country. We initiated the program by organizing and facilitating this conference at Wingspread, in Racine, Wisconsin in August 2001. It builds on the substantial and innovative foundation developed by others over the past decade. These include projects such as EASE at Ball State University, Vital Signs at University of California, Berkeley, the work of the Society of Building Science Educators (SBSE), the work of the Association of Collegiate Schools of Architecture (ACSA) and American Institute of Architects - Committee on the Environment (AIA-COTE).

We developed three overlapping goals for this conference:

- identify guiding principles for a transformed curriculum;
- develop strategies for engaging institutions in transformation; and
- identify resources that will inform and support a three to five year plan for comprehensive transformation of architecture core curriculum nationwide.

Up to now, most change in the architecture curriculum has been achieved on a fairly localized level. A number of schools have created the necessary context and leadership to accomplish much more, but we need to accelerate the degree to which schools are integrating sustainability principles into the design pedagogy. In order to create a context for a change in curriculum we felt that it was important to start the creative process of the workshop with a larger look at the role of the architect in society. From this would emerge a new untarnished description of a pivotal role for architects in the transformation to sustainability and a clearer template for requirements in the curriculum.

To achieve this we formulated a question to also serve as the title for the conference: *How Can the Architect Contribute to a Sustainable World?* This title suggested a number of specific "Big Questions" that had to be addressed. In the section following this introduction (Section I, p.6), we summarize the content of the small group discussions based on each of the "Big Questions" and identify from these discussions the guiding principles for a transformed curriculum.

Our second goal was to develop strategies for engaging institutions in the need for change. We invited participants to suggest topics of interest and to divide up into smaller

discussion groups accordingly. These discussions are summarized Section II (p.12) entitled "Making sustainable design a reality in architecture and design schools".

With over seven years of practical experience on college and university campuses, Second Nature has developed a philosophy for changing higher education institutions. We have found that developing a vision of 'a dynamically integrated campus' serves as the best foundation for any type of change that includes the ideas of sustainability. Consequently, the final set of discussions in this conference focused on "Connecting the Curriculum, the Campus, and the Community" and are summarized below in Section III (p.16).

Our third goal was to identify resources to support a three to five year plan for comprehensive transformation of the curriculum in all architecture schools. Based on commitments made by the workshop participants, we feel confident that we fully met this challenge. Some of these commitments are noted in Section II.

The conference began with a welcome and initial introduction to the conference by **William McDonough**, Principal for MacDonough Braungart Design Company and Chair of Second Nature's Board of Directors, and **Anthony Cortese**, President of Second Nature. Bill McDonough described some of his current work on transforming corporations using the fundamental ideas of sustainable design. Tony Cortese provided a context for the conference and the sustainable design program, and its relationship to Second Nature's mission in working with colleges and universities. Most of the remaining time was devoted to large and small group discussions.

Four plenary presentations were interspersed within the agenda. **David Orr**, Chair of Environmental Studies at Oberlin College and member of Second Nature's Board, invited participants to consider the responsibility of architectural educators to promote the ideas of ecological design more widely. **Tom Fisher**, University of Minnesota, gave an overview of the current status of architectural education within the framework of the profession as a whole. He suggested that it was important to examine the role of the designer against the backdrop of the full life cycle of a building. Understanding this makes it possible to undertake fundamental transformation in training new designers. **Vivian Loftness**, Carnegie Mellon University, outlined how new developments in sustainable technology open up new aesthetic possibilities in design. **Laverne Wells-Bowie**, Florida A & M University, using her knowledge of the cultural traditions of the Sea Island communities in Georgia, suggested that cultural traditions need to inform sustainable building and development practices.

Summary and Recommendations

1) **A fundamental redefinition of the Architect's role**

Fundamental definitions of the architect's roles and ambitions can be found in the work of the Roman engineer and the first architectural educator, Vitruvius. These definitions can be interpreted to include the concepts of sustainability:

- Commodity, usually understood as fitness for use, is broadened to mean effectiveness, in environmental, economic, and programmatic terms.
- Firmness, surpasses structural reliability and incorporates long term environmental sustainability, comfort, and longevity.
- Delight, moves beyond pleasure in aesthetics and embraces deeper meaning.

2) **The Architect as a leader**

The essential role of architect as leader has two complementary facets: vision and facilitation. This has to be infused into the education of students. Students need to be given the tools to design buildings that mimic natural systems and have the capacity to reconnect people to nature – "ecomorphic" buildings. A new definition of the architect needs to include being an agent of social change and an advocate for systems and ecological thinking. Design is fundamentally a generative art requiring generative impulses, hubris, to be balanced with regenerative impulses, humility.

3) **The larger context**

The ecology of architecture requires an understanding of living systems and basic science. Buildings need to be conceived as part of larger systems. This includes understanding the local and regional environmental contexts, the complex network of material and constructional systems and their impact, and the cultural, social and economic contexts. The building must also be seen as a snapshot of a single moment in these larger temporal frameworks and the lifecycle of the building in the longer timeline. This has implications in other disciplines and professions.

4) **Architecture and the other design professions**

The interdependency of different design disciplines (architecture, engineering, electrical, structural, transportation etc.) raises a number of questions as to how the sustainability agenda might transform the relationship between the academy and industry. Who drives the agenda in links between industry and the university or between industry and the architectural profession? Who are the producers and what is the process that they are using? Which industries produce buildings, construction products and communities? How can industry's drive towards sustainability have a positive impact on the academy?

5) **Changing architectural education**

Transforming architecture education means focusing on how to teach as well as what is being taught. Teachers need to expose students to the best ideas, exemplify commitment in their own work and expand the boundaries of the discipline and the profession. A primary requirement of moving architecture education beyond architecture is an understanding of design that goes beyond buildings. Central to this new vision is the conviction that architects are generalists, although this is often masked by the necessity of specialization. Architects

are also practical visionaries with an ability to project possibilities and to connect knowledge with action. A focus on process would help to counteract the current trend towards narrowing and specialization.

6) Incentives for Change

Three types of incentives are likely to have a transformative effect in design schools and the larger campuses where they are located:

- financial support;
- lectures and seminars; and
- changes to the accreditation process

Architectural and design schools are diverse in underlying philosophy, pedagogical approaches and ability to adopt innovation. It is essential to recognize that different schools are in very different positions with regard to an agenda for sustainable design. Supporting the adoption of sustainability ideas and content therefore necessitates a diverse set of strategies that enable individual schools to make meaningful progress in their own ways.

RECOMMENDATIONS

Connect the Curriculum, the Campus, and the Community

1) Transform the Curriculum

- 1.1) Strategies are needed for integrating sustainable design concepts in all four of the major areas in the architectural curriculum: History/Theory; Technology; Studio; and Professional Practice;
- 1.2) Create symposia at architectural schools to address cutting edge ideas and developments; and
- 1.3) Develop a course for all students on the idea of the Campus as a dynamically integrated sustainable community connected to a larger community.

2) Transform Studio Teaching

- 2.1) Find workable methods for breaking down the usual differentiation of the studio and the lecture;
- 2.2) Work on real life problems at different scales either on the campus itself or in the community at large. Begin studio with urban and regional-scale problems;
- 2.3) Develop adaptable ("portable") and preferably regenerative ("ecological") learning tools;
- 2.4) Support and enrich programs on "design/build" to ensure that they have ecological considerations;
- 2.5) Develop ecological footprint exercises and faculty training. Develop an icon for the eco-footprint to use on all projects similar to the use of the compass north arrow. Develop layered drawings to include Geographic Information System (GIS) information; and
- 2.6) Bridge the major disciplinary divisions in design training, using a three-dimensional approach to solving problems, addressing the issues of beauty, performance and ecological economics simultaneously.

3) Support Student Leadership

- 3.1) Create and offer workshops on activist strategies for students to help lead in the process of changing schools;
- 3.2) Support, encourage and participate with architectural students to change something with environmental impact on campus.

4) Support Faculty

- 4.1) Provide grants for research and course development;
- 4.2) Organize seminars for faculty on latest and best designs;
- 4.3) Organize workshops for faculty to share information and develop teaching materials together, on topics mentioned above under curriculum;
- 4.4) Create a lecture bureau with videos; and
- 4.5) Establish and maintain networks for exchanging ideas and information.

5) Support Information Dissemination

- 5.1) Facilitate the exchange and updating of information among faculty using the internet;
- 5.2) Coordinate and publish the work of "Living Labs" such as Intelligent Workplace at Carnegie Mellon University, and The Center for Maximum Potential Building Systems; and
- 5.3) Highlight and disseminate descriptions of the successful 'Institutes for experimentation' such as the work at University of Virginia, Carnegie Mellon, EASE at Ball State and the Vital Signs project at the University of California, Berkeley.

6) Use the Accreditation process to support change

- 6.1) Develop criteria for NAAB and NCARB; and
- 6.2) Work with schools to intensify these criteria.

7) Complete a comprehensive assessment of Architectural schools

- 7.1) Develop a unified self-assessment tool for all schools;
- 7.2) Encourage and assist individual schools to conduct a self-assessment to create a baseline of sustainability components in all aspects of curriculum and operations;
- 7.3) Produce an objective annual or biennial report that provides data and analysis of the status of architectural education with regard to sustainable design. School self-assessments can be used as a baseline and can also be used in aggregate to develop and publish sustainability ratings for all architectural schools.

8) Integrate students and faculty into the planning, construction and rehab of campus facilities.

- 8.1) Create links with campus administration, facilities management, buildings and grounds and other campus departments to use design school skills to green campus operations.

9) Rethink the relationship of space and new forms of learning.

- 9.1) Acknowledge the importance of the "in-between" spaces, as much between different disciplines and domains, as between separate buildings; and
- 9.2) Reduce the number of buildings to increase the flow of learning.

SECTION I Guiding Principles and Big Questions

1) What fundamentally matters in educating architects?

This group connected the traditional definitions of the architect's roles and ambitions from the Roman engineer and the first architectural educator, Vitruvius to modern day code standards, and reinterpreted them to today's needs including the concepts of sustainability. They represented three different understandings of the architect – the academic, commercial and public – as three fractal triangles. This representation was used to reorient the academic, philosophical and intellectual issues that fundamentally matter in architectural education.

The first fractal triangle highlighted the fundamental principles articulated by Vitruvius, about two thousand years ago. Each issue was represented at the point of a triangle:

- Commodity, usually understood as fitness for use, is broadened to mean effectiveness, in environmental, economic, and programmatic terms.
- Firmness surpasses structural reliability and incorporates long term environmental sustainability, comfort, and longevity.
- Delight moves beyond pleasure in aesthetics and embraces deeper meaning.

The second triangle represented the architect as a professional serving a client with these three objectives:

- Economy of means (using architectural means to ensure lowest lifetime cost) and greatest effectiveness of outcomes (including environmental quality).
- Identity (strengthen understanding of place and sense of identity).
- Public recognition (fame, respect, status).

The third triangle covered the issues of the architect as guardian of the public good (fundamentally legal issues):

- Health, broadly understood as community health (clean air and water, sanitation, environmental quality, and reduction of stress).
- Safety, more than fire and structural standards, must now include neighborhood security and crime control.
- Welfare, expanded to embrace questions of social justice, freedom from harassment community and private property rights, entitlements, luxury and limits.

2) What can we do to inspire and effect architecture education

The discussion in this group centered on the importance of focussing on how to teach rather than what is being taught. The group felt that it was equally important for teachers to produce exemplary professional work as well as to take definitive stands on social and ethical issues. They should also be role models as individuals, engaged with the larger world, and visibly leading interdisciplinary design teams.

Teaching meant bringing new syntheses to students and illuminating how things happen in the larger and rapidly changing world, including how the marketplace works. It also meant developing and providing inspiration in the realm of the heart and connecting it to

the "human/self experience" with the greater goal of nurturing, in the words of Buckminster Fuller, a "Comprehensive Anticipatory Design Scientist." The role of designer must be re-framed politically, symbolically, and structurally, within the context of human resources.

Inspiring and affecting students could be assisted by sharing resources (e.g. slide shows via the internet) and trading lectures, developing internships, and creating and managing competitions for students. Students should be involved in real sites and real projects. One suggestion was that a faculty member at each school should pose the topic "Architecture in fifty years" and facilitate a genuine discussion about this among faculty and students.

They noted that it would be necessary to conduct a triage of priorities over the short and long-term to deal with bureaucracy problems and that it would also be necessary to examine and deal with the time and resource prohibitions on accreditation discussions and decisions. Accreditation with NAAB and NCARB needed to be understood in terms of the other types of relationships that exist, including with the profession, the larger community and with the school. It was also important to initiate and develop conversations with adjacent disciplines and schools, and to develop broader partnerships with industry, manufacturers, clients, and communities.

3) What is the ecology of Architecture?

This group sub-titled their discussion "How can architecture be thought of and interpreted as a living system?" The ideas generated followed three broad themes. They discussed "The ecology of the building" and its connection to "The ecosystem of the building". They bridged these two ideas with a discussion about context and consequence of systems and flows, with special emphasis on understanding the concept of the "The building as a snap-shot in a sequence of flows" and the consequences that follow from this.

The group noted that there were a number of immediate system interdependencies in the design of whole buildings. This interdependency meant the inclusion of a variety of designers from several specialties of engineers, electricians, architects, and transportation designers among others.

They also noted that it was important to consider the building from "cradle-to-cradle" given that our frame of reference for a building was often in the form of a static snap-shot from one moment in time. The term "cradle-to-cradle" was used to indicate that components of any building at the end of its useful life could and ought to be recycled into a next structure. Each of the individual components that converge in a building can be represented in a graphed trajectory with changes depicted over a specific passage of time. Each snap-shot then captures a fixed point on each of these graphic trajectories. Buildings should not be considered static, but should emphasize flexibility and adaptability. This adaptability has a foundation in ecology and nature, but extends to the political landscape, the economy, people in the community, neighborhoods and social landscape, legal limitations, and other buildings. Buildings should encourage, empower

and enable the ability of inhabitants to connect with nature and improve the health of the community.

4) How can the sustainability agenda transform the relationship between the academy and the industry?

This group began their discussion by framing four questions:

- How many industries are engaged in sustainability and sustainability education?
- How many faculty are involved in sustainability writing, research and practice?
- How many faculty are receptive to the ideas?
- How many industries link to the university or to the architectural profession?

In considering the question of links between industry and the university or between industry and the profession of architecture more specifically, the group was interested in who is driving the agenda? Is the industry solely manufacturing, or does it include related fields? Who are the clients and brokers, and who are the producers and what is the process that they are using? Do any of these industries produce buildings and communities?

They then shifted their discussion to consider how sustainability could change the complex structure of the academy compared with a more straight-forward research unit. They considered if this meant that having a hands-on, project-based learning process should become the driving catalyst for a meta-disciplinary education. Could this be accomplished by developing design oriented programs analogous to those used in jet propulsion and space technology research and development?

If a shift was undertaken at this level, it would ultimately make it necessary to have skills and organizational mechanisms to make it possible to develop shared goals among many and diverse stakeholders (bankers, manufacturers, tenants, designers and "constructors"). A change of this magnitude is possible as shown by a planning process pioneered and used in the Netherlands.

Changing the education system makes it essential to support the formation of consortia of colleges and universities dedicated to the same goal. This collaboration could be aided by federal funding support, notably the National Science Foundation. Other public and private foundations, councils and trade organizations, industry, and even college students are also potential sources for support. There is also a need to have a balance in funding among federal, foundation and industry to insulate the change from being entirely market driven. There is an additional need to ensure that funding is not all near term, applied or based on consulting.

They noted that there was a strong need for new graduate and doctoral programs that incorporated sustainability. Allied to this was a need for new basis for tenure and a need for new resources and recognition for programs.

It was also important to get the universities to shift their buying power towards industries that operate with sustainability as a component of core values. Colleges and universities

currently spend approximately \$17 billion a year is spent on operations and maintenance budgets and this provides a significant leverage opportunity for change.

In the past industry support has resulted in a shifts from fundamental to applied research, and from traditional individual lecture-based classrooms to project-based education and teams. Industry and corporate support has also created links from professional practice to graduate and undergraduate education, in diverse teaching forums (classes, projects, "test-beds" and learning-laboratories).

They also addressed the interests that industry might have in sustainability and what might interest them in a partnership with the academy. They noted that up to now Interface Corporation with CEO Ray Anderson have the highest sustainability profile in industry. They also noted that from industry's point of view, the access to students, projects, materials and faculty are all opportunities. By way of comparison they pondered whether any college of university had embraced sustainability, given that, generally speaking, the academy tends to be less cost-conscious and less cost-effective when compared to the profit industry. An important question that the group noted (but was unable to address) was how to drive the industry towards sustainability and positively impact the academy.

5) What does the Architect as leader look like?

This group suggested that the role of architect as leader has two complementary facets: vision and facilitation. Facilitation involves expanding on the traditional idea of the designer to include the ability to collaborate with the client to solve problems. Deft use of a facilitation process will enable the client to recast the design problem and from this may emerge new, unexpected opportunities.

A corollary of the ability to facilitate is a visioning skill to derive a "value set" or philosophy to support a higher understanding of the design problem and the possible solutions. A process and product – a design solution – will evolve from this supporting philosophy.

The architect as visionary has the capacity and ability to :

- Collaborate
- Design at all levels
- Embrace failure
- Embrace flexibility
- Maximize perception of opportunity

6) What is the essential role of Architects?

This discussion highlighted the pre-eminence of education of both students and clients. The group agreed that it was important to assist students to be interconnected and empowered, and also to build confidence to use their existing knowledge more effectively. It was important to inspire a mode of inquiry in students to find the

significant and the underlying patterns and to be intellectually and theoretically compelling in this pursuit.

A second component of the role is to design buildings that mimic natural systems and have the capacity to reconnect people to the spirit of nature – buildings they termed "ecomorphic". This entails working with others outside architecture and explicitly seeking and supporting the contribution of under-represented groups who might be affected by the building. They felt that it was important to find multiple ways to connect community to urban issues.

A third and crucial component is to develop a language that enables defining the role of the architect to include being a social change agent and an advocate for natural systems and ecological thinking. This would encompass concepts such as Community, Refinement, Integrity, Completeness, and 'Sense of Place'. A new language of architecture would have architects espouse a principle of the luxury of limits and move away from the luxury of excess. A new language in design would also shift thinking in society at large beyond Descartes and help broaden the definition of sustainability.

Fundamentally it is important to embrace a continually evolving role, and create and facilitate new linkages and different processes.

7) Moving architecture education beyond architecture

This group felt that a primary requirement was the development of a greatly expanded thought process, one that goes beyond buildings; architect/client relationships; aesthetics; politics; developers; and the work of non-profits.

The major supporting factor in developing this expanded vision is that architects are generalists, although this is masked by the necessity of specialization. Recognizing this brought the discussion to focus on the question of how architects are defined and how do they want to be defined. The group developed the following list.

Architects:

- are practical visionaries with an ability to project possibilities and to connect knowledge with action;
- have an ability to use very visual demonstrations of possibilities;
- have an ability to resolve the tension between 'problem-solving' on the one hand contrasted with 'creating' on the other;
- have a capacity to identify shared values to build a shared vision;
- understand the importance and need for team work inside and outside the profession;
- have an ability to make impacts visible within local communities and make connections to community health.

As practicing professionals, architects use certain types of 'diagnostics':

- problem definition by asking questions;

- definition of the boundaries of the system;
- the use of systemic thinking;
- an understanding of natural systems, site, and community.

Architects also have particular capabilities to expand the knowledge base inside and outside the profession. These include an ability to:

- cross-pollinate ideas;
- identify the client and 'go beyond the building' – analogous to the medical notion of 'going beyond the patient.'
- apply modes of thinking analogous to that used in legal education.
- connect all learning to the liberal arts and sciences where certain types of pedagogical elements are created and used, such as foundational concepts, 'learning by doing', and using the campus and the community as a laboratory. (This includes using research as a mechanism for working with facilities and operations.)

Being an architect also included:

- familiarity with rules, codes, specifications and practice;
- an understanding of general systems theory and function;

8) Architecture as a regenerative discipline

This group noted that design is fundamentally a generative art. Therefore, they felt that the discipline needs to include generative impulses (hubris) balanced with regenerative impulses (humility). This does not preclude the discipline from also being spiritually regenerative.

They felt that it was important to expand the idea of the discipline to incorporate skills and theory from other disciplines related to process, to support the ideas of "co-production". In the process of co-production it is crucial to shift from a focused problem-solving to a broader problem-posing external to the immediate architectural discipline. A focus on process would help to counteract the current trend towards narrowing and specialization.

The group felt that in teaching it was important to ask bigger questions and to start with larger systems. They also felt that it was important for architects to see themselves as radical leaders and not just as neutral facilitators functioning somewhere in the spectrum between hubris and humility.

SECTION II. Making sustainable design a reality in architecture and design schools

Workshop participants were given an opportunity to suggest discussion topics and then convene a smaller discussion that would serve to address strategies to make sustainable design a reality in Schools. Eight groups met and their respective discussions are summarized below:

1) Success stories

This discussion located and described examples of successful curriculum change projects from three programs: ECOSA, University of Virginia, and the Vital signs project at the University of California, Berkeley. Based on the success of these and many other programs, the group noted the value of creating and supporting similar 'Institutes for experimentation'.

2) How do we inspire, motivate and effect change?

This group felt that the motivating phrase for dealing with skeptics was "Just Do It!" They suggested that at least three different options were available:

- Convince colleagues about the need for institutional change
- Use financial incentives (grants, loans etc)
- Learn and teach about how the marketplace changes

They suggested that it was important to exemplify "Just do It!" They noted that the US is isolated from the vanguard of green design in Europe and elsewhere and that there is a strong need for integration. Examples of this were to be found in heating, cooling, ventilation and lighting design methods.

They also pointed out that there is a strong need to identify the level or point of evolution in the change process, depending on where one is located. They thought that it was preferable to focus on certain schools, and that different schools were in very different positions with regard to an agenda for sustainable design. It would be helpful to open connections between schools as much as possible. This would make it possible to share knowledge and resources, thereby modeling interconnectedness

They listed five options for demarginalizing sustainability:

- by evolution or revolution; However, evolution is peer-to-peer limited.
- through the accreditation process;
- through employment opportunities;
- by links to community organizations; and
- using new tools such as "ecological footprint" or life-cycle design.

Generally it was important to promote an understanding of relationships, including both people-to-people and people-to-buildings and to have a 'design thinking' beyond buildings. The group also suggested that it was important to reframe the role of the architect – and this begs a question as to where architecture education should be in

50 years? This could require new models for markets and market place behavior. As a change strategy, it was important to value the "pebble in the pool" model, where a change in individual behavior aggregates to changes in institutions and then to changes in society.

3) What Works?

This group focused its discussion in three categories: what worked in the past and present and might work in the future. They suggested that looking at strategy from the point of view of success provides crucial information for making decisions.

What worked in the Past?

- The work of Ian McHarg
- Vital signs
- The original work of Eugene and Thomas Odum on energy flows through ecosystems
- Old Urbanism

What is working now?

- Activating student groups on campus to push agendas;
- LEED;
- Research funding directed to graduate programs and tenure;
- The "Re-Think" open multi-disciplinary discussions;
- The university hierarchy dedicated to sustainability (possibly using criteria such as those provided by The Natural Step);
- The Minnesota Sustainable Design Guide currently being successfully used in county, state and university projects in Minnesota;
- Old Urbanism;
- Loose network of grassroots social and environmental organizations working locally (for example in the San Francisco Bay area); and
- Envirodesign Conferences.

What might work in the Future?

If engineering was the Trojan horse for architecture in the 1950's and 1960's, and Theory was in the '80's and '90's, then sustainability and urbanism could be a new Trojan horse to a better architecture.

- Coordinate the work of living laboratories;
- Develop a regional design philosophy that is based on the idea of the carrying capacity of the natural resource base;
- Tightly integrated network of individuals, communities and institutions dedicated to a sustainable future – formation of a political movement;
- Changing Faculty by:
 - Infiltrating adjunct ranks

- Developing secure streams of research funding for ecological issues in architecture
- Supporting ecological research for tenure decisions
- Conducting training for faculty
- Developing 10-year criteria for NAAB and NCARB
- Expand the NAAB criteria list to include a greater number of sustainability criteria;
- Encourage multi-disciplinary educational collaborative funding from federal, industry and foundation sources;
- Raising awareness that architecture and planning is central to the mission of USEPA, Dept of Interior, Dept of Transport;
- Creating heroes and theories for new architecture theorists;
- Developing links with other faculty around the world; and
- Create an eco-entrepreneur course.

4) Projects for the ACSA Task Force

The Association of Collegiate Schools of Architecture (ACSA) established a task force on sustainability prior to this conference. As chair of the task force, Kim Tanzer convened a discussion to develop a list of projects that the task force could undertake to support the mission of transforming the curriculum. The group developed the following list and subcommittees to take responsibility:

- Create a network of faculty;
- Disseminate Best Practices including books and webpages;
- Create a lecture bureau with videos;
- Ensure that the regular regional and annual ACSA conferences includes discussion and content about sustainability;
- Examine the NAAB criteria;
- Revise *Architecture Graphic standards* (Wiley & Sons);
- Ensure representation at the AIA National conference regarding the work of the ACSA Task Force;
- Complete a comprehensive survey of schools.

5) Energy and Form

Given that energy is a technological issue and form is related to a number of more abstract aesthetic considerations, this group felt that it was important to re-examine aesthetics. This would require that material and mass issues would also need to be discussed, and that nesting and scale were also important. Energy considerations hinge on regional climate patterns and this requires us to make connections to local and regional planning, with an understanding of biome issues. This group also noted that energy is a flux with daily and seasonal variations that require form to also follow flow patterns.

6) Architectural School Information

This group focussed on the need to produce an annual or biennial report that provided data and analysis of the status of architectural education with regard to sustainable design. The report might include some type of ranking system to assist prospective students with useful information for making choices about design schools as well as to create an incentive for schools to support internal institutional change through public accountability. The group recommended that a for-profit consultancy should be created to provide integrated design services to institutions of higher education.

7) Incentives List

Three types of incentives were likely to have a transformative effect for faculty and students in the school and the larger campus:

- financial incentives
- lectures and seminars, and
- changing the accreditation process

Accreditation ought to allow for failure and allow for flexibility because the schools are risk-averse.

The discussion in this group also examined the experience from the EASE project at Ball State. The consensus was that innovation would most likely come from the "middle-tier" design schools. The group also suggested that it was important to infuse sustainability into "Design/Build" programs at schools.

8) Links to the Larger Community

The central idea presented by this group was that all design decisions must originate with the larger scale. They felt that the importance of nesting footprint/scale needs to be emphasized, and that it was especially important to start with the larger scale in making any cascade of design decisions. At the largest scale it is necessary to make a distinction between the "bio" (purely living) and "eco" (everything living and dead).

In terms of curriculum this could be accomplished by teaching an advanced urban design studio in which infrastructural design was included ("no building is an island"). The massive impact of the automobile has to be acknowledged as a parameter of design decisions. Automobiles make it necessary for parking space allocation for buildings and the construction of roads be regarded as a component of infrastructure. The end result of the construction of both are primarily responsible for sprawl. One participant noted that the automobile results in subsidies of between \$300-\$750 billion per year.

SECTION III. Connecting the Curriculum, Campus, and Community

For this final session, workshop participants divided into four groups to consider the essential issues that connect curriculum to the campus and the campus to the larger community. One group focused on recommendations for curriculum as the formal offering of any design school, while a second group suggested tools and links that could make the curriculum more dynamically integrated. The third and fourth groups each generated options and recommendations for the campus and the larger community, respectively.

The Formal Curriculum

The ideas from this group have been divided into two subsections. The first addresses curriculum as an internal activity within any school of architecture or design (**Academic Initiatives**). The second (**Outreach Initiatives**) offers some additional ideas for how the school might connect to the larger context of the campus and community.

A) Academic Initiatives

1) Curriculum:

Strategies are needed for integrating sustainable design concepts in all four of the major areas in the architectural curriculum. Separate working groups could develop or collect and collate curricula and teaching materials in each of the four areas: History/ theory; Technology; Studio; and Professional Practice.

History/Theory: This may be the most difficult and most rewarding arena. The environmental movement must open up to broader theoretical investigations. In addition, architectural history courses could incorporate more perspectives on ecological design and more courses to address diverse cultures, climates and regions.

Technology: Courses should introduce the basic sciences of ecology, air and water movement, energy use and material composition in the fundamental way that physics and statics are taught. Tech faculty need opportunities and support to be constantly updated on new examples, tools, and case studies.

Studio: Introductory studios that begin by introducing community and regional scale issues would initiate an awareness of the larger environmental context of design. Shorter studio modules could provide flexibility for a wider variety of interdisciplinary approaches. Specific studio programs on sustainable design issues could be developed and widely shared. There is a need for a methodology and a visual icon to represent the ecological footprint as a standard indicator on projects, analogous to the use of the compass north arrow.

Professional Practice: Course materials are needed on issues of environmental ethics, responsible design, law and liability as pertains to environmental quality.

2) Faculty support

- Develop funding to provide grants for research and course development;
- Organize seminars for faculty on latest best designs;
- Organize workshops for faculty to share information and develop teaching materials together, on topics mentioned above under curriculum initiatives;
- Develop and fund a pool of visiting lecturers;
- Connect faculty to industry organizations looking to support research;
- Strengthen professional education opportunities for all faculty; and
- Encourage hiring new faculty with knowledge and experience in green design.

3) Student Leadership:

- Create and offer workshops on activist strategies for students to help lead in the process of changing schools. These could be regular features of annual meetings such as AIAS and they can be conducted at individual schools or groups of schools.
- Support student competitions and prizes for sustainable design.

B) Outreach Initiatives

1) Networks and Information Dissemination

- Facilitate the exchange and updating of information among faculty using the internet;
- Coordinate and publish the work of "Living Labs" such as Intelligent Workplace under the Center for Building Performance and Diagnostics at Carnegie Mellon University, The Center for Maximum Potential Building Systems, etc.
- Create and circulate slide and video course material. For example this could comprise ten lectures by contemporary design visionaries, case studies of great green buildings, Best Practices etc.
- Create a 'green' grants database for faculty

2) Assessment and Accreditation

- Encourage individual schools to conduct a self-assessment to create a baseline of sustainability components in all aspects of curriculum and operations;
- School self-assessments can be used in aggregate to develop and publish sustainability ratings for all architectural schools; and
- Work with NAAB, NCARB and ASCA to examine and revise the accreditation standards.

3) Campus Administration

- Integrate students and faculty into the planning, construction and rehab of campus facilities; and
- Create links with campus administration, facilities management, buildings and grounds and other campus departments to use design school skills to green campus operations.

- 4) **Organizational Links:** Actively develop relationships with:
- The accreditation organizations (NAAB, NCARB);
 - Professional organizations (AIA and AIAS, USGBC and LEED, SBSE, ACSA, and Congress for New Urbanism (CNU) (the latter is noted for its work to reduce sprawl);
 - Local community groups, community officials, and non governmental organizations;
 - Governmental organizations and regulatory agencies (EPA, HUD, and others); and
 - Professional and industry associations who could:
 - Provide financial support as sponsors for faculty seminars and research projects;
 - Bring interested professionals into the studio; and
 - Sponsor competitions with green programs and green existing competition programs.

Curriculum Tools and Links

This group discussed the mechanisms that might be used to enhance and augment a standard view of the curriculum. Examples of mechanisms include finding workable methods of breaking down the usual differentiation of the studio and the lecture; working on real life problems either on the campus itself or in the community at large; and working at different scales. From the discussion they assembled a list of options:

- 1) Create and/or assemble learning tools that are readily adaptable (“portable”), that are environmentally appropriate, preferably regenerative (“ecological”), and that have a broad uplifting sensory impact on humans, including users and others.
The Vital Signs project at Berkeley has examples of tools and projects that would fit this category.
- 2) Create and/or assemble fun and engaging environmental mock-up problems.
Examples of projects to emulate include the program at Reggio Emilia for early childhood education, expanding the “Egg-drop” exercise to different scales, or creating a solar still that is a beautiful object (“Teaching for survival while teaching aesthetics”).
- 3) Support and enrich programs on "design/build" to ensure that they have ecological considerations.
Adapt the ideas of *Solar Decathlon* to multiple scales, including consideration of aesthetics.
- 4) Support, encourage and participate with architectural students to change something with environmental impact on campus.
- 5) Develop ecological footprint text books, exercises and faculty training. Develop layered drawings to include Geographic Information System (GIS) information.

This type of approach will serve a dual pedagogical purpose in providing a meta-disciplinary understanding.

6) Bridge the major disciplinary divisions in design training, using a three-dimensional approach to solving problems.

Major divisions exist between architecture and industrial design, between architecture and planning (including both urban design and urban planning), and between architecture and civil infrastructures. Invite and enable students from all these disciplines to participate. Consider methods to change the studio. A component of bridging different disciplines will require the inter-operability of tools to ensure that these are applicable to all disciplines. Consider including business, construction and landscape and determine if there should be an order to the inclusion of these disciplines.

7) Illustrate and teach the holistic aesthetics of quality differences at all scales in the built environment.

This means addressing the issues of beauty, performance and ecological economics simultaneously.

8) Core courses should be offered for 1) Portable Tools; 2) Engaging real-life mock up problems; 3) Ecological considerations in Design/Build programs; and 5) Use of Geographic Information Systems and other tools as part of drawings. Include a core course in ecology.

The Campus

This group considered how to expand the relationship between the design school as a component of the larger campus community. They suggested six options that would support this expansion:

1) Rethink the relationship of space and new forms of learning. This would require acknowledgment of the importance of the “in-between” spaces – as much between different disciplines and domains, and between separate buildings where these endeavors are pursued.

- What are the instruction spaces? Can these be coffee shops or be under a tree?
- Question space allocation rules;
- Break down the alignment of the building equivalent to the discipline;
- Break down the learning spaces and increase the "in-between";
- Take advantage of cyber-spaces and mobile learning and thereby reduce the need to use inflexible building spaces;
- Use the campus for community education during evenings and on weekends;
- Use appropriate campus buildings as a hotel during breaks and vacations.

2) Develop a course for all students on the idea of the Campus as a sustainable community connected to a context and the larger community. The foundation of this would be an understanding of the buildings being connected to both the proximal (near and direct) and ultimate resources that flow into the buildings.

- The mission of any individual school should be explicitly related to place in the accreditation process;
- Highlight the connection between material resource base (wetland, carbon sink) to physical structure. This would mean the capability to attend to its own physical renewal;
- Ensure that the buildings on the campus and the use of open space are both linked by flows.

3) Overcome campus operational ‘traditions’ by training, using demonstrations that are broadly applicable. This would include coursework for facilities managers on the campus.

- A core course should be available that includes the maintenance and monitoring of the place as a whole and the stewards of the place are the faculty students and administration.

4) Reduce the number of buildings to increase the flow of learning. This would mean using the campus community as the classroom.

- How to reduce continual building on campus, where most campuses are out of space and will also increasingly experience competition from virtual universities. Rethink the use of space in relation to context and community needs.
- Create buildings that learn and that have multiple purposes for usage, that are more permeable and adaptable to change. Thereby minimizing buildings on the campus and in the community.
- Taliesin (Wright’s Design School) was a model where the school, office and living were integrated.

5) Develop institutional incentives and reduced costs as a model to attract students. Also develop internal incentives for reducing waste and water use, and for maintenance and durability improvements.

- Write RFPs with sustainability criteria.
- Training facilities managers in sustainability issues could be a very high leverage mechanism to achieve change.

6) Develop and use widely applicable short courses that can be transferred between institutions.

7) Portray the campus as a microcosm of a more sustainable world where the social system is as much valued as the physical system. The campus ought to be a place where risk-taking is rewarded.

- Consider the social justice issues of the service worker "underclass."

Sustainable Communities

This group established a description of a sustainable community in ten years and fifty years. A part of the community could include a networked area that was actual or virtual, and both enduring and new. The goals for this community would include:

- 1) Habitat and a shelter that is sustainable by being fecund, rich and desirable;
- 2) Hierarchy of amenities within easy reach;
- 3) As a village/urban village, a place characterized by well-being in four dimensions: a) a balance of high tech and high touch; b) multidimensional good health; c) energy self-sufficiency; and d) 'fast-path' and 'slow-path';
- 4) Place that enables walkability and mass transit with less auto-dependence and easy shifts from fast paths (e.g mass transit) to slow paths (walking, bicycles);
- 5) Pride of place that would become a sustaining force beyond nostalgia;
- 6) Where culture is perceived more as a resource than a commodity;
- 7) Cultural traditions inform building and development practices in such a way that includes rather than excludes lesser known or under-represented groups;
- 8) Guaranteed income: societal validation of a way of life;
- 9) Opportunities for rural business incubation that would include taking consideration of:
 - the nature of desirable work
 - the nature of resource distribution shifts.
 - community supported agriculture
- 10) Universities become a critical interface with their towns; and
- 11) Architects become effective politically and capable of convincing people of the value of sustainable design in ways that can be sustained.

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