The Role of Connectedness Theory in Sustainable Architecture

Anthony W. Layne
University of Minnesota, Minneapolis, Minnesota

ABSTRACT: While generally discussed in terms of economics or technology, sustainability is a behavioral problem rooted in the unsustainable lifestyles of the Western world. A cultural paradigm shift is necessary to truly address this issue. Recent psychological research suggests that this paradigm shift can be brought about through connectedness. This paper examines both how architecture can foster connectedness and how connectedness can influence architecture.

Architectural connectedness is both about what one creates and how it is created. The connectedness design process fundamentally requires an awareness and understanding of the various systems affected or created by design and more importantly, the relationships between them. It is an iterative process involving the progressive layering or integration of systems and requires continual re-evaluation of design decisions in light of the newest layer of systems information. Once designed this multilayered integration of systems facilitates connectedness through human experience.

Architecture alone cannot create or cause connectedness, but by applying connectedness theory to the process of design, a method is generated that forces the architect to design in a holistic and systems-based manner and allows the architect to design the human experience. Ultimately, this process can create an architecture that facilitates connectedness. It is a both/and proposition. It is not a question of one or the other but both: 'how can architecture bring about connectedness?' and 'how can connectedness bring about architecture?'

Keywords: connectedness, psychology, design process

INTRODUCTION

For several years a near consensus of the world's scientists has warned that the environment that supports life on earth is in crisis. According to the Union of Concerned Scientists, every living system on the planet is in decline and the rate of that decline is increasing. In fact, planet earth is experiencing the fastest period of mass extinction in history, even faster than during the extinction of the dinosaurs (Eldredge 2001).

Motivated by the certainty of the deterioration of the environment and the realization that humans are dependent upon this environment for their own health and survival, several groups and individuals have taken action in an attempt to reverse these alarming trends. The last thirty years has been a time of unprecedented ecological and environmental awareness. Tactics as varied as Smart Growth, the Kyoto Protocol and carbon trading as well as numerous energy conserving initiatives have been implemented by groups as disparate as the European Union and the American homeowner in efforts to live a more sustainable existence. Yet, during this same time period, energy use, greenhouse gas emissions, deforestation, and destruction of habitat has continued to rise to unprecedented levels (Annual Energy Outlook 2002, Addington 2003).

Why has this mobilization of policy and design not made a significant impact in the crisis of environmental degradation? The answer lies in examining the broader picture. The current strategies for addressing sustainability are compromises focused on symptoms, not true solutions. Technology and various forms of economic policy have been put in place in an effort to resolve the current environmental crisis. The problem is that this crisis has not been caused by technological or economic factors alone and therefore will not be solved just through technological or economic solutions. The dilemma that faces the human race, and especially the Western world, is embedded in unsustainable lifestyles (Wang 2003). Sustainability is a behavioral problem.

Environmental degradation, or the deterioration of the planet's ability to sustain life due to industrialized human activities, is among the most difficult and complex issues ever faced by modern society. One would not think this is the case however, from the existing architectural discourse regarding the subject. The prevailing logic is that solutions are known and straightforward and that these solutions merely need implementing (Addington 2003). Indeed the human built environment, the buildings, roads and infrastructure of man's cities and towns and the industrial processes that come along with them, are responsible for a significant portion of the present negative impact on our natural environment. Currently, the built environment, and the method in which it
is designed and constructed, consumes energy and natural resources, pollutes air and water, and destroys diversity and natural habitat. This has led architects to work towards implementing technologies and strategies in their designs that mitigate the deleterious effects of buildings. This strategy however, merely addresses the symptoms of the problem and not the root cause. If environmental reparation is to be made, the behavioral source of humanity’s unsustainable tendencies must be transformed.

Several methods are often employed in an attempt to bring about change in a population’s behavior. Proscriptive measures such as laws forbidding certain actions are one popular technique. Dissemination of information with the hope that awareness of an issue will bring about behavioral change is another. The most powerful however, is to change the paradigm out of which the behavior arises. The paradigm, specifically a society’s collective belief about how the world works, contains a leverage point that once changed transforms the entire system (Meadows 1997). Recent research in psychology suggests that the shift to a sustainable paradigm could be brought about through connectedness. Connectedness refers to the extent to which individuals believe that they are a part of the natural world or the capacity of a person to see their own life and its conditions as part of a larger matrix (Schultz 2002, Cock 2002). The role of the architect is as important in this critical mission of change as it has been in working to implement sustainable technologies and strategies into design. Architecture can promote a necessary paradigm shift towards a sustainable lifestyle through facilitating connectedness and encourage the growth of responsible, engaged, self-actualized citizens.

1. RESEARCH PROCESS

1.1. Research objectives
The general intent of this research was to gather evidence of strategies that successfully bring about behavioral change and distill several principles from these strategies that can guide future efforts to direct sustainable behavior. The ultimate goal of this research was to determine the role of architecture in supporting and promoting these sustainable behavior change principles. This research contributes to a dialog about the responsibility of architecture in affecting behavior regarding sustainability and begins to develop tools or strategies that can be applied during design to affect positive change.

1.2. Research method
This research consisted of five parts:

Part I. A general background into the current crisis of sustainability was established. This identified major issues contributing to the problem, investigated predominant strategies for addressing it and provided support for the supposition that the crisis of sustainability is a behavioral problem, rooted in the unsustainable lifestyles of the Western world.

Part II. Issues involving behavioral change regarding sustainability were established. This identified popular methods currently employed to attempt to bring about behavioral change, the limitations to these methods and provided support for a paradigm shift as a more effective method of bringing about change.

Part III. Through a review of recent research in the psychology and sociology of sustainable development and research in sustainable development learning and education the concept of behavioral change and paradigm shift were investigated further. Through this research review, guiding principles affecting change regarding sustainable behavior were established. The role of architecture in supporting and promoting these change principles was then identified.

Part IV. Through precedent study and identification of current architectural work involving these principles, their direct application in design and architecture were explored further in an effort to be better understood. This precedent study targeted facilities focused on environmental and sustainable education in order to support part V, the design component of the project.

Part V. Finally, these change principles and their corollary architectural principles were investigated and illustrated through the design of the Kettle River Environmental Education Center located on a 160 acre site just west of the Kettle River in Sandstone, Minnesota. This project served as a vehicle to test the validity and refine the developed processes and principles.

2. CONNECTEDNESS THEORY

2.1. Man’s relationship with nature
At the center of the discussion on sustainable behavior is the recurring theme of a relationship with nature. Philosophers talk about this in terms of ethics, or morality. Sociologists talk about culture, values and the ways in which societies interact with nature. Conservationists talk about land ethics, and the experiences that result from encounters in nature. But at the core is the individual, and his or her understanding of his place in nature (Schultz 2002:66).

Psychologists and researchers point to the concept of connectedness as central in this discussion. Broadly the term connectedness describes the extent to which individuals believe that they are a part of the natural physical universe (Schultz 2002). Recent research suggests that an individual or group’s level of connectedness directly
affects their level of sustainable behavior (Clayton 1998, Kidner 2001). Some even argue that this psychological connection with nature will be required to achieve sustainability. Consider this quote from Tarnas:

Only the experience of connectedness will save the earth – and us with it. Any attempt, however grandiose and with however much commitment to its cause, will fall short if it does not have at its root the transformation of human experience in which human thinking knows connectedness as such and itself with that (Tarnas 1991:73).

2.2. Inclusion with nature
In later work, Schultz argues that connectedness is one part of a larger notion he terms “inclusion with nature.” Higher levels of connectedness ultimately leads to caring for nature which leads to a commitment to protect nature and higher levels of inclusion with nature which, in turn, leads to more sustainable behavior. He goes on to say that the core of a connection with nature is cognitive and defines connectedness as “the extent to which an individual includes nature within his/her cognitive representation of self (Schultz 2002).”

The term self is used to refer to a range of constructs, but in this work it refers to a person’s thoughts and feelings about who they are. Self knowledge is organized into hierarchical cognitive structures known as self schemas. A person may have a schema of self that includes physical characteristics like brown hair, social identities like father or husband, or leisure activities like camping and skiing (Brown 1998). These self schemas serve to organize experiences and provide a coherent understanding of identity (Schultz 2002). Furthermore this allows definition of self in relation to others. Some researchers argue that in close relationships, the cognitive representations of self and other can become integrated (Aron 1999). Taken to the extreme, self and other become one (fig. 1). Schultz concludes:

This is the central aspect of inclusion [or connectedness] with nature. Individuals who define themselves as part of nature have cognitive representations of self that overlap extensively with their cognitive representations of nature. In contrast, individuals who do not define themselves as part of nature will not have overlapping schemas of self and nature (Schultz 2002:68).

![Figure 1: Integrated cognitive representation of self and other. Source: (Schultz 2002:72)](image)

This research also shows that the relationship between a commitment to protect nature and caring for nature and connectedness is, in fact, causal. “Commitment to protecting the environment cannot occur in the absence of caring. Likewise, it would seem that caring is unlikely to occur in the absence of connectedness (Schultz 2002:70).” Therefore, it would seem that strategies to increase connectedness would ultimately result in positive sustainable behavioral change. It is on the aspect of connectedness and strategies to encourage it that this paper will focus.

2.3. Connectedness sub-categories
This paper proposes that connectedness can be further defined as containing at least three sub-categories, physical connectedness, social connectedness and emotional connectedness. Physical connectedness refers to a tangible connection to and understanding of nature and its cycles and flows (e.g. the cycles of the sun, the seasons or cycles in microclimate). Social connectedness refers to the extent an individual believes that he or she is a part of larger social groups and through this maintains an ability to empathize with others. Emotional connectedness refers to the emotional component affecting an individual’s behavior. The level of intensity in each of these sub-categories ultimately comprises one’s overall connectedness. While each of these sub-categories is defined separately and contains distinct and individual concepts, they are also interrelated and overlap.

2.4. The role of architecture
Understanding connectedness and its components along with methods in which it is being addressed is fundamental in advancing a solution in the crisis of sustainability. Developing change strategies that engender connectedness is essential. Once identified, successful change strategies must be implemented. Because of the multifaceted nature of the crisis of sustainability, implementation of change strategies will also be intricate and multidisciplinary. Research that translates general tactics into discipline specific approaches to change is vital to their useful application. Specifically, the research undertaken for this paper explores the part that architecture plays in facilitating or impeding connectedness.

Up to this point, the architectural profession’s approach to addressing the crisis of sustainability has predominantly been applying sustainable design technology to building design. While an important component in
the journey to a sustainable society, the simple application of technology does little to address the larger issue of unsustainable behavior. This is identified as one of several contradictions in sustainability.

The development and application of technology for practically all purposes has enabled an increase in our consumption of resources and production of wastes, to the point where this duality of allied problems threatens The Biosphere, as well as our own and Nature’s survival. We have become evermore dependent on technological support systems even when we could meet our needs in other ways (Dovers 1993:217).

Architecture can do more. In its design and construction, architecture can contribute significantly to its inhabitant’s connectedness and as a result, to their overall sustainable awareness and behavior.

### 3. DESIGN RESEARCH

#### 3.1. Design methodology

Utilizing the principles of physical, social and emotional connectedness as parameters to guide sustainable design requires a modified design process. While the connectedness process may run parallel to a traditional architectural process with typical project phases and sequence (e.g., pre-design/concept design, schematic design, design development, construction documentation, qualifications and bidding, and construction administration), the process requires more time spent in early phases of the project, identifying specific goals and strategies, and any synergies that may be obtained through the combination of these strategies. In some ways this is true of all sustainable design processes when compared to a traditional architectural design process. However, while any sustainable design process would look for design and construction strategies to make a building more sustainable, the connectedness process goes beyond looking for strategies or techniques that simply make a building more sustainable and seeks strategies that will actually facilitate sustainable behavior on the part of the building’s occupants.

To accomplish this, relevant principles affecting the level of connectedness in each of the three categories (physical, social and emotional) were identified from the research (column 1, fig. 2). Then, each of these principles were evaluated with regard to their relationship to architecture along a continuum ranging from a physical manifestation characterizing a low level of connectedness to a physical manifestation characterizing a high level of connectedness. Next, specific project goals were established from architectural qualities that fostered a high level of connectedness (column 2, fig. 2). Once project goals and criteria were generated, specific sustainable strategies could be identified to address each goal (column 3, fig. 2). For instance, operable windows, daylighting, separation of building elements, integrated site design, choice of materials, outdoor gathering spaces, and access to views were all identified as sustainable strategies to achieve the project goal of a ‘strong indoor/outdoor connection’ as a part of the ‘awareness of natural cycles principle’ under the ‘physical connectedness’ category. After this process was repeated for each project goal, all the goals and strategies were mapped against one another to identify overlap and opportunities for integration and synergy. For instance, outdoor gathering spaces, identified as a strategy to achieve a ‘strong indoor/outdoor connection,’ was also identified to achieve project goals such as ‘project is accessible with areas designed to promote interaction,’ ‘project is integrated into context and community, promoting a culture of trust,’ ‘project encourages time spent in nature,’ ‘project encourages time spent with significant others,’ and ‘project encourages interest in nature.’ Each of these goals was also linked to other strategies (fig. 2).

By tracing the linkages back and forth between the project goals and the sustainable strategies, a web of interconnectedness was revealed. This provided an understanding of the motivation behind each of the proposed strategies and how certain strategies could be partnered to achieve the most significant impact toward the project goals. The integration map could then be used to guide the subsequent design process, helping to identify, prioritize and evaluate design strategies and their usefulness toward facilitating sustainable behavior. In order to follow the application of the three categories of connectedness their nine criteria were color coded. This allowed program areas and design elements to be readily understood as supporting one or more of the connectedness criteria.

Once this integration map was generated it was utilized to generate an architectural schematic design concept for the Kettle River Environmental Education Center from a previously established space program. The resulting design concept functionally accommodated all the necessary spaces and adjacencies as well as employed many of the sustainable design strategies identified in the integration map. The design certainly would have produced a ‘sustainable’ building, but in many ways it was no different than a design produced through any other sustainable design process and it was unclear how it ultimately related to connectedness.
Figure 2: Connectedness strategy matrix and integration diagram illustrating connectedness principles, connectedness project goals and correlating sustainable strategies. Source: (Image by author)

3.2. Connectedness logic

It was at this point in the process that a fundamental shift occurred in the way connectedness, as it applies to architecture, was conceptualized. Here, the question broadened from 'how can architecture bring about connectedness?' to include 'how can connectedness bring about architecture?' This widening of focus provided a more holistic way of exploring the issue of modifying behavior through connectedness. This also brought about the realization that if architecture is to bring about connectedness it would be through human experience. Therefore, this process is ultimately about the design of human experience.

3.3. Design process

With this shift in thinking, the design and exploration process also shifted. The schematic design generated earlier was maintained in order to serve as a vehicle in the subsequent shifted process. It would serve as a baseline in a concept test method. Additionally it was recognized that in order to design a human experience that facilitated connectedness, the design process itself and the designer must have a high level of connectedness. In order to achieve this, building program components, processes, materials and activities and their interrelationship must be understood and the process must include a rigorous analysis of these components and their relationships.

This analysis began with the site and examined both the existing and proposed natural and manmade site elements. The analysis also investigated the relationship between these elements. This analysis was not exhaustive but, chose to focus on ten specific site components. These included site topography, water/hydrology, under-story vegetation, over-story vegetation, wildlife path, natural landmarks, agricultural plots, pedestrian path, vehicular path and man-made landmarks.

The analysis then shifted from site elements to the existing and proposed systems of the site and focused on seven systems - wildlife habitat, stormwater system, energy production, food production, research process, learning process, and rainwater cycle. By graphically mapping the components and flows of these systems common elements between them and their relationship to each other became readily apparent.

The examination of the site systems and their interrelationships helped shift the thinking of the project from element or object based to relationship based. It was not necessarily the objects themselves that were most important, but the relationships between the objects and the realization that the objects were simply a collection of other relationships. In fact, once the analysis shifted to a relationship based paradigm, new objects were revealed. For instance, objects initially viewed separately like a pond or a tree were seen in a larger context as part of a habitat system. Without a shift in the way these systems were thought about these new objects would never have been recognized.

This shift to a relationship-based analysis paradigm motivated by the need to design the human experience necessitated a change in the way the architectural building program was conceptualized. To this point, the program was thought about in a typical space-based model. However, this change in thinking provoked the awareness that an activity-based program model would allow a better analysis of human experience and provide a more useful method of exploring connectedness (fig. 3).

![Figure 3: A portion of the activity program showing identified activities, corresponding program spaces and related connectedness principles. Source: (Image by author)](image)
In order to generate this new program a list of activities that participants would engage in on site was developed. This list included activities such as walk, gather, observe, eat and harvest. These activities were then sorted by their relationship to each other. For instance, the activities read, listen, communicate, research, gather, think, test/experiment, observe, and explore were all grouped under the broader activity category teach/learn. This process identified three program categories: arrive/depart, teach/learn, and produce/consume. Once these categories were generated program space components could be identified to support the given activities. For instance, classrooms, an observation tower, site trails and teaching stations were listed in support of the teach/learn activity category. Further, each of the space program components were scrutinized for their potential to promote the earlier developed connectedness criteria.

With an activity program developed, the next step was to begin to integrate the program with the site. A site/activity map was created to begin to integrate the two and identify zones of activity on the site. This helped to visually organize proposed and existing elements and activities. After mapping the activities on the site another map was generated to relate the activity program to the space program. This map involved tracking the proposed human experience chronologically across the site. Here too each of the proposed experiences was referenced with the earlier established connectedness criteria. Because so much of the exploration of this project dealt with human experience, it was determined that traditional architectural drawings alone could not be effectively utilized in the design process. Therefore, an iterative process of design was developed using collage as the tool for exploration. Each of the three program activity categories were investigated through this process. This iterative process involved the progressive layering and integration of systems and required continual re-evaluation of design decisions in light of the newest layer of systems information (fig. 4).

Figure 4: Iterative process diagram showing how new understanding from inside and outside the design process influences further discovery. Source: (Image by author)

Once these experiential collages were created, they were used as the basis for exploring the design further through more traditional architectural representations such as plan, elevation and section drawings. Additionally, the previously mapped systems information was then re-mapped onto the design plans or sections (fig. 5). This furthered the understanding of the design and the site systems and the integration between the two.

Figure 5: Arrival/departure site section with overlaid stormwater system map. Source: (Image by author)

CONCLUSION

This paper began with the assertion that the crisis of sustainability is, at its root, a behavioral problem. A critical survey of recent psychological research suggested that behavior could be modified through connectedness and
that a higher level of connectedness was correlated to more sustainable behavior. It was thought that architecture could play a strong part in achieving connectedness through the design of human experience.

Through the course of the work, a new method for approaching the design process was uncovered. This iterative process focuses heavily on understanding the relationships and systems created or affected by building and then relies on this knowledge to guide subsequent design. As more is understood, the design is continually revised and adapted to incorporate this new knowledge. This process of knowing is extremely valuable not only in working to create sustainable buildings but more importantly in functioning to facilitate sustainable behavior through connectedness.

So, can architecture facilitate connectedness and therefore encourage sustainable behavior? The answer is yes, however, connectedness is not created through the simple application of sustainable design strategies or technologies, but through the design of human experience and architecture that encourages connectedness cannot be created in the absence of a connectedness design process. Encouraging connectedness through architecture requires: 1. a high level of connectedness on the part of the architect, 2. a holistic understanding of the systems created or affected by the project, and 3. a holistic understanding of the potential human experience.

Architectural connectedness is both about what one creates and how it is created. The connectedness design process fundamentally requires an awareness and understanding of the various systems affected or created by design and more importantly, the relationships between them. Architecture alone does not cause connectedness, but by applying connectedness theory to the process of design, a method is generated that allows the architect to design the human experience of a building’s occupants in a holistic and systems based way. Ultimately, this creates an architecture that facilitates connectedness through human experience.

REFERENCES


