

Learning through Architecture:
An Ecological Approach for Helping Children Understand the Natural Environment

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Dedication

To God Almighty, for His love and grace

His grace is sufficient for me, for His power is made perfect in weakness.

- 2 Corinthians 12:9

To my loving parents, Jeany and Philip, for their unconditional support

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Chapter 1: Introduction

Through many of today's built environments, children are learning that they are safe from the outside world; no matter day or night, the built environment makes them safe from pouring rain and gusty wind; it makes them safe from wild animals from sneaky squirrels to grizzly bears. With good intentions the architecture of the industrial era was more about having control over nature than it was about living in harmony with nature. Consequently instead of learning to enjoy the breezes that come from natural ventilation, children learned that air conditioning was what made their environment pleasant. Children who live in increasingly dense cities may be further distanced from nature, especially children who live in impoverished communities with inadequate parks and open spaces and concerns about safety; in addition, a plethora of electronic devices for education and entertainment are a major pulling factor for children to stay indoors. Many children may be stuck indoors using these effortless (physically) devices without opportunities for outdoor play. Or they may simply not care to play in wooded landscapes, on the beach, or on snow-covered mountains, which all served as precious learning environments for earlier generations. As nature is ever more threatened by people-designed built environments, children have no way of learning how to develop a less destructive relationship with their surroundings.

Learning how to live well with one's surroundings is called "ecological literacy" (Orr, 1992, p.86) and clearly today's children are more likely to be deficient in ecological literacy than were the boys and girls of a bygone era. Yet a number of architects and educators have been developing ways to foster more ecologically literate citizens. This thesis will carry forward those efforts and search for a solution to (a) help children gain, through architecture, a better sense of

how people and nature interact and, through that sense, to (b) possibly help them learn to take action as environmental advocates at a personal and community level. The ultimate intent of the thesis is developing a methodology for achieving these two goals.

Sim Van der Ryn and Stuart Cowan (2007) believed that “if the built environment is a powerful silent teacher, we can change the message people get from it. It can be redesigned so that people are richly informed about their place and the ecological processes endemic to it” (p. 186). Hoping to inform children about their place and its ecological processes, the thesis will seek to answer: How can architecture help children gain a better sense of their relationship with nature? How can children use their understanding of nature to develop an ability to take action as environmental advocates?

To explore these questions, the thesis will begin with researching existing literature about the ways that children relate to nature and the positive interactions they can have through the natural environment as mediated by architecture. Then it will continue the investigation through precedent studies to see what is working successfully to help children become more environmentally aware citizens.

Finally, the thesis will synthesize the lessons learned from the literature and the precedent studies to suggest strategies for creating educational activities and ecologically designed spaces that can help children develop as environmentally aware citizens. The goal is to create a new approach to using architecture to help children become “richly informed about their place and the ecological processes endemic to it” (Van der Ryn & Cowan, 2007, p. 187).

Chapter 2: Literature Review

This chapter summarizes literature on current human and nature relations affecting the next generation's view of built and natural environment. It also examines how children learn to take action, especially in relation to nature.

This thesis is not specifically aimed at a certain age and school grade, but most studies and facilities/institutes target K-5 (Kindergarten through Grade 5), or the age between toddlerhood and preadolescence, for environmental education. Although affective, cognitive, and evaluative development can happen in any stage of life and age, educators concur that developmental growth is more significant in early childhood.

Children connect to the environment, whether natural or built, in three ways: mentally, physically, and spiritually. This thesis will focus only on their mental and physical connection to the environment which, as the literature will show, are interrelated.

Children's Environmental Competence and Awareness

Children's environmental competence and awareness requires that they experience the environment, but what is the nature of that experience? Psychologists Peter Kahn and Stephen Kellert (2002) noted that young people experience nature in three ways: direct, indirect, and vicarious/symbolic. Briefly, direct experience is actual physical interaction with nature settings, elements and nonhuman species; indirect experience involves actual physical contact with nature but in restricted, programmed, and managed contexts; vicarious experience offers no actual physical contact with the natural world but instead offers an image of it, for example a

representation through a screen or printed material. Through these three types of experiences, children develop a relation with nature in cognitive, affective, and evaluative ways.

Kahn and Kellert (2002) emphasized the importance of direct experience for children, especially during middle childhood (ibid., p. 133). They explained that “the child’s experience of nature is . . . portrayed as an essential, critical, and irreplaceable dimension of healthy maturation and development” (ibid., p. 141). However, increases in children’s indirect and vicarious contact with nature do not appear to offer an adequate substitution for the significant declines that are occurring nowadays of direct experience (ibid.). That is, children need direct experience with nature to develop in cognitive, affective, and evaluative ways. But how should that direct experience occur if it is to be educational?

Referring to children learning about the natural environment, geographer Yi-Fu Tuan wrote that “nature is an inarticulate teacher—or one might say that its messages are too subtle to be understood by the immature mind. Children have to be taught by adult human beings” (Altman and Wohwill, 1978, p. 25 referring to Tuan). According to Tuan: “children learn in several levels, from observation and mimicry to structured acquisition of knowledge and traditions. However, the environments in which [children] live seem to have less impact than what they learn from adults at home and in the school” (ibid., p. 28). Tuan argued that: “except in the very rare case of the wild child surviving alone or under the care of other animals, a child’s world is never natural . . . A child’s imagination must be constantly stimulated by the world of adults; it does not develop of itself in free play” (ibid., p. 29). That is, children are most likely to develop environmental awareness and competence by experiencing nature directly and under the supervision of adults.

Ecological Literacy

An important aspect of children's mental connection to the environment is their ability to understand the relationships that occur among all aspects of their surroundings, or what is referred to as "ecological literacy." According to conservationist, David Orr (1992):

Literacy is the ability to read. Numeracy is the ability to count. Ecological literacy, according to Garrett Hardin, is the ability to ask "What then?" Considerable attention is properly being given to our shortcomings in teaching the young to read, count, and compute, but not nearly enough to ecological literacy . . . If literacy is driven by the search for knowledge, ecological literacy is driven by the sense of wonder, the sheer delight in being alive in a beautiful, mysterious, bountiful world (p. 85-6).

Orr recommended that development of ecological literacy begin in early childhood, noting on the other hand that "ecological literacy is becoming more difficult, not because there are fewer books about nature, but because there is less opportunity for the direct experience of it" (p. 89).

Ecological literacy results in an affection for the ecologies of a particular place, but even with increased literacy of its ecological systems, "a sense of place still requires more direct contact with the natural aspects of a place, with soils, landscape, and wildlife" (ibid., p. 89). "The positive result of ecological literacy is a group of ecologically literate: the stuff of epitaphs. Ecological literacy leads in other, and more durable, directions toward prudence, stewardship and the celebration of the Creation" (ibid., p. 95). Thus while children can develop environmental awareness and competence through adult-led experiences with nature, they need to understand their surroundings as a system of relationships if they are to become ecologically literate stewards.

Children's Involvement

Richard Louv (2008), an author best known for his study of children's current and historical relationship with nature, identified “time” and “fear” as the barriers between children and natural environment. The time factors that decrease children's direct exposure to nature are: parents’ schedule, children’s schedule, and electronic devices. The current schedules of parents and children are so tight that any trip to nature is a luxury; it is a vacation trip. But Louv argued that "time in nature is not leisure time; it’s an essential investment in our children’s health" (p. 120), and suggested that "by taking nature experience out of the leisure column and placing it in the health column, we are more likely to take our children on that hike—more likely to, well, have fun" (p. 121).

The fear factors that decrease children's direct exposure to nature are: first the idea of danger-out-there that prevents parents from allowing their children to wander outside due to fear of traffic, of crime, of stranger-danger—and of nature itself (*ibid.*); second is "ecophobia." Louv explained that ecophobia has to do with how current environmental abuses have been presented and “lacking direct experience with nature, children begin to associate it with fear and apocalypse, not joy and wonder” (*ibid.*, p. 134). On one side, it shows the current issues and problems, even abuses, but, on the other side, it has a negative inverted-psychological effect on children. Louv used Sobel’s analogy of dissociation: “in response to physical and sexual abuse, children learn to cut themselves off from pain. Emotionally, they turn off” (*ibid.*, p. 135).

Louv's observations concern only direct experience with nature settings. However as will be discussed in the next chapter, children can have an indirect experience of nature within the built environments of cities without being constrained by time and fear.

Children's Participation

Children come to understand their surrounding environment by participating in activities, whether initiated by themselves or by others. Roger Hart (1997) discussed the importance of children's participation by starting with the concept of primary environmental care and the development of children's identity. He quoted from UNICEF Response to Agenda 21: "environmental education should be promoted to encourage the active participation of women and children, to enhance their life skills and adaptability, and to enable them to attain a sustainable livelihood" (p. 9). Hart continued to explain the development of children's personal identity and self-concept: "an understanding of the social world and an understanding of oneself are constructed in a reciprocal manner, influencing and constraining each other" (p. 28). Hart echoed Tuan's thoughts on free play and adult supervision, stating that "children need to be able to discover that they can accomplish pragmatic and realistic tasks. Such accomplishment makes them aware of previously unexplored potentials in themselves" (p. 29).

Hart characterized the level of children's participation through an illustration of a ladder. He emphasized that the ladder of children's participation is not to encourage the development of "children's power" or to see them as operating in an entirely independent sector of their community. Instead Hart explained that while the upper levels of the ladder express increasing degrees of initiation by children, they are not meant to imply that a child should always be attempting to operate at the highest level of their competence. The figure is rather meant for adult facilitators to establish the conditions that enable groups of children to work at whatever levels they choose. Some children may not be initiators but are excellent collaborators. The important principle is to avoid working at the three lowest levels: the rungs of non-participation, manipulation, decoration, and tokenism (ibid.).

* * * * *

This brief literature review suggests that children's ecological literacy requires their active mental and physical connection to nature, with adults facilitating experiences that promote environmental awareness and competence at whatever level of independence children choose. Such activities can help children understand their surroundings as a system of relationships and should not be limited by lack of time to go to purely natural environments or by fear of such environments. Although some scholars feel that an indirect contact with nature does not substitute for direct contact, precedent studies in the next chapter illustrate that urban environments can expose children to an ecologically beneficial relationship between the natural and built world.

Chapter 3: Precedent Studies

This chapter examines and analyzes various precedents that take an ecological approach in helping children understand nature and the role architecture can play in that understanding. The purpose of the investigation is to see what is working, both as programs and as architectural designs, to help children become more environmentally aware citizens. Recognizing “time” and “fear” as the barriers between children and natural environment (Louv, 2008), this thesis investigates two programmatic approaches: 1) direct experiences that take children out of the city to expose them to nature, 2) indirect experiences that create an exposure to nature within the context of an urban site.

Going Out of the City for an Exposure to Nature

Two programs in the Puget Sound region of Washington State illustrate how children's direct experience of the natural environment can be magnified by an ecologically designed built environment. The first is IslandWood, which engages children and adults in hands-on learning and community stewardship in a sustainably designed setting. The second is Cedar River Watershed Environmental Learning Center, which is run by Seattle Public Utilities to make children and adults aware of the source of their water.

IslandWood

Location: Bainbridge Island, Washington

Design Firm: Mithun, Inc.

Located on Bainbridge Island near Seattle in Washington State, IslandWood is a unique 255-acre outdoor learning center designed to provide exceptional learning experiences and inspire lifelong environmental and community stewardship (www.islandwood.org/).



Figure 3.1. (source: <http://wsm.wsu.edu>)



Figure 3.2. (source: <http://www.thedailygreen.com>)

IslandWood has just six acres of sustainably designed conference facilities, which cover just a small portion of its 255-acre site.

IslandWood provides people with a deeper understanding of the natural environment through hands-on project and outdoor field experience in a curriculum combining science, technology and the arts. This complex undertaking preserves a variety of wetlands, streams and ponds, while restoring an earthen dam and salmon habitat. Careful master planning minimizes the project's disturbance of the site's heavily forested ecosystem, which includes rare wetlands, bogs, plants, and a restored salmon-bearing stream. The on-site wood from the solar meadows was milled to provide all interior trim and 50% of exterior siding. Strict clearing limits were enforced around all structures. Building sites only occupy six out of 255 acre (http://mithun.com/projects/project_detail/islandwood/).

Cedar River Watershed Environmental Learning Center

Location: North Bend, Washington

Design Firm: Jones and Jones Architects and Landscape Architects, Ltd.

The Cedar River Watershed Education Center provides students of all ages excellent educational opportunities and resources to explore and gain an understanding of their rich cultural and natural heritage in the 90,000 plus acre Cedar River Municipal

Watershed, the primary source of drinking water for 1.3 million people in the greater King County area (www.seattle.gov).



Figure 3.3. (source: <http://www.seattle.gov>)



Figure 3.4. (source: <http://blog.4culture.org>)

Cedar River Watershed Environmental Learning Center serves thousands of school children annually, and also welcomes casual visitors along with researchers and scientists.

Jones & Jones master-planned the lake environs, sited the center on previously disturbed land and designed the Center to interpret the natural and cultural history of the forested watershed preserve. The Center's educational programs focus on local wildlife and plant communities, forest and timber resources, fisheries and related scientific research. A network of pedestrian trails connects the Center to the lakeshore recreation area and the water department's administrative headquarters. The Center complex provides a living demonstration of the beauty and value of a healthy watershed (www.jonesandjones.com).

Creating an Exposure to Nature within an Urban Site

Three programs around the country offer an example of how children can be exposed to nature within the city. The first is the Growing Green Child Development Center, an environmentally friendly early childhood learning center for ages 2 to 12 in Kenosha Wisconsin, the fourth largest city on the western shore of Lake Michigan. The second is the Bertschi Center, a LEED gold-certified school campus in the Capitol Hill neighborhood of Seattle that helps children learn about environmental resources through a living building, teaching gardens, and the local community. The third is the Edible Schoolyard Berkeley, a one-acre organic garden and

kitchen classroom for public school students attending the Martin Luther King, Jr. Middle School, in Berkeley, California.

Growing Green Child Development Center

Location: Kenosha, Wisconsin

Design Firm: Unknown

Growing Green Child Development Center is based on educational principles that allow each child to develop to their fullest potential. Our approach focuses on the ‘whole child’ meaning we address and support the mind and body. We encourage children to explore their many intelligences through the use of a high quality natural environment that uses nature play, sensory play with sand/water, gardening, creative arts and music. We encourage every child to develop and grow in their understanding of our diverse world. We hope to support and help educate families on making healthy choices for their children (www.growinggreenchild.com).



Figure 3.5. (source: <http://growinggreenchild.com>)



Figure 3.6. (source: <http://growinggreenchild.com>)

The Growing Green Child Development Center combines learning with an environmental component that promotes children's health and safety, while also protecting the earth's resources.

While GREEN is often thought automatically as meaning obtaining LEED certification, it is possible to have a LEED certified center that is not healthy for children. Therefore, we are independently certified through the use of environmental rating scales designed specifically for early childhood environments. Our goal was to implement every step possible to support the environment and, most importantly, offer the healthiest learning environment for children (www.growinggreenchild.com).

The Bertschi Center

Location: Seattle, Washington

Design Firm: The Miller Hull Partnership, LLP

We have a commitment to making children "confident and creative builders of their future." In keeping with this vision, the school has made a commitment to further develop and integrate a sustainability curriculum. Sustainability is defined as living in a way that ensures the essential needs of all living things are met now and in the future. Children will discover principles, strategies, and technologies that prepare and empower them to create a positive future (www.bertschi.org).



Figure 3.7. (source: <http://www.millerhull.com>)



Figure 3.8. (source: <http://www.millerhull.com>)

The Bertschi Center is an expansion of an existing elementary school to an adjacent, previously developed site in the middle of a neighborhood of moderate density. It occupies an entire block along a busy street.

The Bertschi Center is a pre-kindergarten through 5th grade independent school located on Capitol Hill in Seattle . . . Miller Hull worked with the students to focus on other sustainable strategies. There is a high degree of environmental consciousness among the children, which has been fostered by the teachers. All of the sustainable features of the building and it's systems are recorded and made available to the children as part of the curriculum thru a touch screen monitor located in the art gallery. A conscious effort was made to choose building and site materials that are sustainable and have the lowest long term impact on the environment. Recycled and locally available materials were used and the life cycle of materials was also considered (www.millerhull.com).

The Edible Schoolyard at the Martin Luther King Jr. Middle School

Location: Berkeley, California

Design Firm: Unknown

The mission of the Edible Schoolyard Berkeley is to teach essential life skills and support academic learning through hands-on classes in a one acre organic garden and kitchen classroom. The Edible Schoolyard curriculum is fully integrated into the school day at Martin Luther King Jr. Middle School and teaches students how their choices about food affect their health, the environment and their communities”
(<http://edibleschoolyard.org/berkeley>).



Figure 3.9. (source: <http://edibleschoolyard.org>)



Figure 3.10. (source: <http://edibleschoolyard.org>)

Students at the *Edible Schoolyard Berkeley* participate in growing, harvesting, and preparing nutritious produce during the school day and also afterschool, which provides them with a hands-on understanding of how nature sustains the well-being of the school community.

King [Middle School] is home to the Edible Schoolyard, founded and supported by Chez Panisse founder Alice Waters. Students study plant cultivation, nutrition, and food preparation as a science and learn to regard the earth as a friend
(www.mlkmiddleschool.org).

Chapter 4: Findings

This thesis was conducted in order to investigate the possible re-connection between children and the natural environment, and the role architecture can play in helping children make a re-connection that is ecologically literate. An analysis of the literature and precedents reveals four interrelated intervention strategies:

First is children's active participation in hands-on experiences of the natural environment, whether in nature or in the city. Children's participation in activities in the natural environment helps them develop a sense of ownership and stewardship; these two characteristics lead to mature thinking and decision making, and a sense of responsibility.

Second is adult involvement in these experiences, which is a crucial part of children developing these characteristics but is too often considered just for safety. Of course, adult surveillance and protection are important, but these are not enough. To help children to develop a sense of ownership and stewardship in relation to the natural environment, adults need to take part in sharing and teaching knowledge and skills. By spending time with children in the natural environment, adults can assist children in understanding the environment as a system of relationships.

Third is adult involvement in providing and facilitating activities and programs. Adults share and teach knowledge and skill through educational activities and programs, no matter formal or informal. Activities, from farming to sensory play with water, can help children connect to the natural environment mentally and physically, which leads to the development of competence and awareness.

Fourth is adult involvement in designing learning environments that illustrate sustainable building strategies. Building and site materials should not only be recycled and locally available, but the learning environment should offer opportunities for children to experience the natural environment hands-on, whether in nature or in the city.

The role of architecture plays in connecting children to the natural environment can come in different forms, from protection to representing time or age through styles and technologies. However, it is the designed response to the natural environment and how occupants use the facilities that matters the most. “In other words,” Orr (2002) wrote, “we have always modified our environments to one degree or another, but the level of ecological damage has increased with the level of civilization and with the scale and kind of technology” (p. 15). To reverse this damage, architects can draw on many successful examples, like the precedent studies above, to take ecological design throughout the creative process, from asking both adults and children about their needs and use of places, to incorporating all possible harmonized strategies.

These findings suggest that the connection between children and the natural environment, ironically, cannot happen naturally through wandering around and free play in a natural setting. Although children's self exploration and discovery have beneficial features, children's participation, adult guidance and facilitation of programs, and architecture design strategies have to work together to maximize the possibility for children to re-connect with the nature as ecologically literate citizens.

Chapter 5: Conclusion and Recommendations

This thesis set out to (a) help children gain, through architecture, a better sense of how people and nature interact and, through that sense, to (b) possibly help them learn to take action as environmental advocates at a personal and community level. To achieve these goals, it presented evidence that children can re-connect to place through an array of informal and formal activities in both natural and urban settings. It also presented evidence that an appropriate level of facilitation by adults in combination with participation by children' can help promote prudence and stewardship. Finally it presented evidence that architecture itself can illustrate prudence and stewardship by being responsive to both people and place. As Orr (1992) suggested, we can begin learning “how to re-inhabit our places . . . restoring context to our lives in the process” (p. 131). This concluding chapter offers tentative recommendations about structuring environmental education activities and the architecture that houses those activities so children can re-inhabit their places and restore context to their lives.

Promoting Ecological Literacy through Activities and Programs

Expose children to nature early in life, beginning in toddlerhood.

Provide them with hands-on experiences of nature that are adult-supervised.

Design activities that help children understand nature as a system of connections so that [they] are richly informed about their place and the ecological processes endemic to it” (Van der Ryn & Cowan, 2007, p. 187).

Design activities that engage children as environmental stewards in the surrounding community.

Allow children to participate in directing their own experiences to their highest level of competence.

Promoting Ecological Literacy through Architecture

Take children out of the city to expose them to nature that has minimal human intervention, including forests, wetlands, bogs, streams, ponds, and wild animals.

Design learning environments in the city that offer opportunities for children to interact with nature, including soils, water, and wildlife.

Design learning environments, in the city and in nature, that illustrate efficient and frugal use of resources and the uniqueness of a particular place.

Design learning environments that "combine nature, interesting architecture, materials, natural lighting, and 'white sounds' (e.g., running water)" (Orr, 2004, p. 115).

Design learning environments that make "natural processes visible and active at levels of scale from the household to the neighborhood to the entire city" (Van der Ryn & Cowan, 2007, p. 187).

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