Child's Play: An empirical study of the relationship between the physical form of schoolyards and children's behavior

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Introduction

There is a growing body of literature that suggests children's experiences in natural environments support healthy growth and development. This issue is particularly relevant for children who are growing up in an urban context where access to green-space is increasingly limited. The obvious solution to this problem is to protect existing parks and other natural areas such as vacant lots. While this is certainly an important element in increasing natural experiences for children, a number of issues including safety and accessibility necessitate additional actions. There is an urgent need to examine the institutions where children are spending their time, such as schools, and assess whether these physical environments can be adapted to promote positive child development. One such strategy is the "naturalization" of schoolyards.

This paper is divided into two parts. The first section reviews existing literature on the importance of nature experiences in the development of the "whole child", which includes psychological and social development, as well as the acquisition of knowledge. The concept of a "Natural Schoolyard" and its role in child development through the provision of opportunities for contact with the natural world is discussed. This is especially important for urban children who may lack access to these experiences due to characteristics typical of their living environments. The second part of this paper is a description of an exploratory study that I performed with two third grade classes at Worthington Hooker Elementary School in New Haven. The goal of this study was to lay the foundation for future studies that aim to understand the way that the students use the schoolyard. My hope is that the information generated from this study can be

combined with the information on Natural schoolyards to create play spaces that better meet the needs of the children.

The paper provides what I believe are some important lessons for designers, environmental scientists, educators, and child advocates about the relevance of schoolyard design to child development and concludes with suggestions for future research.

The Need for Natural Environments

Contact with "healthy" outdoor environments is an important part of a child's development. While some empirical data does exist in support of this contention, it should be noted that this is an area that requires further research. According to Moore and Wong (1996), active learning in outdoor settings stimulates all aspects of child development more readily than indoor environments. Natural environments seem to be associated with the cognitive development of children through opportunities for exploration, experimentation and play (Hart, 1994). Play is extremely important in the development of social skills, the development of gross and fine motor skills, and the utilization of excess energy (International Association for the Child's Right to Play, 1982). Outdoor environments are also important for effective environmental education. Increasingly, evidence suggests that the development of environmentally responsible behaviors is associated with a combination of both formal learning and informal, positive experiences in the natural world.

Cognitive Development

Cognitive development is a complicated process influenced by a range of social and environmental factors. Exposure to natural environments seems to play a role in this process by improving a child's awareness, reasoning and observational skills, and the kinds of associative skills that enhance neurological functions (Pyle, 2001). The importance of the physical environment in cognitive development is captured by Moore's (1986) comment that "the task of education is to recognize the power of primary experience and help children use secondary media and materials to extend their culture and development". Stimulating and memorable environments advance children's development significantly. Conversely, dull and easily forgotten environments can delay or block development (Moore, 1986). This implies that the diversity that is inherent in the natural environment promotes the development of children.

Natural environments tend to allow children to manipulate and change "pieces" of their surroundings i.e. in forested areas where forts can be built or in sandy areas where children can dig and create structures. Bjorklid (1982) notes Jean Piaget's comment that: "children should be able to do their own experimenting, their own research…In order for a child to understand something he must construct it for himself, he must reinvent it…if in the future individuals are to be formed who are capable of creativity and not simply repetition." This statement reinforces the importance of explorative behaviors in development of a child's intellect, particularly their problem solving abilities and creativity. Natural settings seem to support this learning process.

The development of a child's creativity is often associated with the outdoors. While this makes "intuitive sense" the empirical evidence supporting this supposition is

limited. The fact that this relationship is often taken for granted is reflected in educator David Sobel's (1993) statement that there seems to be "a broad tendency, if not a universal experience, for children to find or make special places during middle childhood that hold special meaning throughout their lives; they become places of repose, of sureness, to return to".

The most commonly cited work in support of the association of nature with creativity is Edith Cobb's survey of over three hundred volumes of autobiographical recollections of "geniuses". Cobb found that these individuals returned to specific natural places "in memory in order to renew the power and impulse to create" (Cobb, 1977). Louise Chawla (1986) replicated Cobb's study using a smaller number of autobiographies including people from a more diverse social and professional spectrum. While her findings do not support the universality noted by Cobb, she did find that almost half of the writings contained events significantly tied to the environment. Many of these experiences served as "a reservoir of calm and strength within the self" for the autobiographers. While these results are compelling, caution should be used in their interpretation, considering the non-random selection of study subjects in Chawla's work, as well as the retrospective nature of both pieces of research (the inspirational aspects of these places may have been created in the adult mind).

It is difficult to draw specific conclusions regarding the relationship between cognitive development and the outdoors. This is largely due to the paucity of systematic research that looks specifically at the types of places that are actually utilized by children who are engaged in activities (such as exploration) that may affect their cognitive development and creativity. As Moore (1986) notes, most of the developmental research

has been conducted within the boundaries of adult-managed domestic and institutional settings with a focus on the use of toys and educational materials. Clearly, this is an area that needs increased study.

Play

Researchers have identified a series of social and cognitive categories of play based on a child's stage of development. Cooperative and symbolic play is typical of primary aged students (Parten, 1932). Construction and functional (or exercise) play becomes increasingly integrated with other forms of recreation as children develop (Smilansky, 1968). Many late primary-age children are ready for games with rules (Piaget, 1962). An in-depth review of the development of children's play is far beyond the scope of this paper, but it is certainly evident that the various stages in play development necessitate provisions for all categories of play in both the outdoor and indoor environment.

Play theory suggests that it is an important tool for developing social skills, culture and community (Hart, 1994). Play is part of the learning experience (Moore, 1986); it allows children to learn negotiation skills and to be creative (Parker, 1998). Unaccompanied activities are particularly important as over time these independent experiences result in a feeling of competence (Huttermoser, 1995; Moore, 1986). Active games enhance a child's coordination and their level of physical fitness.

Titman's (1994) finding that children value and prefer natural environments to urban and built environments and that they associate adventure, challenge and risk with being outdoors is certainly striking. These associations suggest that contact with nature

promotes the types of play that allows children to challenge themselves and develop self-esteem.

Unfortunately, safety issues and declining budgets for public parks and outdoor playgrounds have diminished children's opportunity for outdoor recreation. The resulting lack of appropriate play spaces is likely a factor affecting the amount of television that children watch and, ultimately, their level of physical activity. According to Pyle (2001), "scrounging" in the outdoors provides children with exercise. He argues that the current rates of obesity amongst youth are a result of sedentary indoor play and that there is a vicious cycle at play—the less physically fit a child becomes, the less apt they are to partake in physical play resulting in increased time at computers or in front of the T.V. The added health care costs over the lifetimes of these children would be avoided by giving students the opportunity to be physically active during the school day (Moore and Wong, 1997). Unfortunately, the opposite trend seems to be occurring; physical education as well as recess has disappeared from the curriculum of many school districts in the United States (Goodale, 1998; Pellegrini, 1995).

Environmental Education

The literature on environmental education theory and practice is far too vast to address within this paper. In an attempt to simplify the discussion, I will address three main points: 1) the goal of environmental education is to produce environmentally responsible citizens; 2) contact with nature is a fundamental component of the Environmental Education process; and 3) a holistic approach to environmental education is essential.

Environmental education is aimed at "producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work towards their solution" (Stapp et al., 1969). The traditional approach to environmental education that emphasizes knowledge (or cognitive learning) about large-scale problems does not necessarily produce environmentally responsible citizens. While knowledge is an important part of environmentally responsible behavior, research seems to indicate that it does not, in itself, produce this outcome (Kellert, 1996). It has even been suggested that the focus on knowledge may actually be hindering the aim of environmental education (Pooley and O'Connor, 2000). The connection between human welfare and environmental health should extend beyond cognitive awareness to emotional (or affective) learning (Pooley and O'Connor, 2000). Ultimately, respect for the ecosystem needs to be integrated into people's values (Kellert, 1996).

Children as old as twelve years are unlikely to be able to apply information about far-off, abstract problems, such as rainforest depletion and hazardous waste sites, to their daily lives (Hart, 1979). In addition, these issues are often overwhelming and can even have a "nightmarish, insidious effect on young children whose sense of time, place and self are still forming" (Sobel, 1996). This means if children are to develop a positive emotional connection to nature, they need to have opportunities for sustained, long-term contacts with specific places.

Until fairly recently, there was little recognition of the importance of the local environment in successful environmental education. As Jennifer Sahn (1996) writes in the introduction to Ecophobia: "In rushing to teach them about global issues, we neglect

the fact that young children have a fascination with the immediate and an undying curiosity that requires sensory rather than conceptual generalization". In other words, some of the most effective teaching occurs when the emphasis is on discovery and exploration rather than imparting knowledge (Sobel, 1996). Ultimately, this process may instill the children with a sense of stewardship over their local environment.

This is not to suggest that cognitive learning is unimportant in environmental education. Chawla (1988) found that most environmentalists attribute their commitment to a combination of two sources: 1) extended periods of time spent outdoors in natural areas in childhood or adolescence and 2) an adult who taught them respect for nature. A teacher or parent who supplements a child's informal experiences in the environment with formal knowledge about the system and how to conserve its integrity is an essential component of the educational process.

The importance of both affective and cognitive learning as well as formal and informal experiences in a given environment underscores the importance of a holistic approach to Environmental Education. It appears that the real challenge for proponents of Environmental Education is to give children meaningful contacts with their local environments and to give teachers and parents the tools that they need to facilitate the transfer of formal knowledge and to be environmental role models.

Decreasing Opportunities

In theory, there are many opportunities for children to connect with natural environments; however, the reality is that children's territorial ranges[1] are declining due to urbanization and the associated problems of drugs, safety, and crime (Sivakumaran,

[1] Territorial range is the spatial area that encompasses a child's play and leisure places and the pathways connecting them (Moore, 1986).

2001). Hart (1994) describes neighborhoods in the Bronx where these issues are so prevalent that there are literally no spaces left for play at all.

The frenetic pace of modern life and the rapid rate of human expansion across the landscape has increased the need for contact with nature as a place of "respite"; yet at the same time, this growth is eliminating opportunities for these experiences. Francis (1995) notes that as the restrictions that are being placed on children increase, "interaction with nature and natural experience are even more critical". Unfortunately, with the disappearance of accessible nature in the urban context, children are less likely to have access to these natural environments.

Parents' fears of traffic, strangers and physical hazards are the most common barriers to free exploration cited by children (Moore, 1986). The declining freedom of children to explore is illustrated in a study by Hillman et al. (1990), which found that between 1970 and 1990, the number of seven and eight year olds permitted to go to school on their own dropped from 80% to 9 %. This trend translates into a reduction in opportunities for spontaneous contact with the outdoor environment. This is not to suggest that parental fears are unfounded. It is shocking that firearm deaths and injuries to children are now about ten times larger than those from the polio epidemic of the first part of this century (Christoffel, 1995). It seems that if children are to be reconnected with nature, spaces need to be preserved and restored in places where parents feel comfortable leaving their children.

A final factor contributing to the decline in opportunities for children to explore the outdoors is the increasing "schedulization" of children's lives in school, lessons, and after-school programs (Rivkin, 1997). Children now spend as many as 40-50 hours per

week in institutional, commercial, and other out-of-home care situations (Herrington and Studtmann, 1998). This greatly reduces children's opportunities for spontaneous encounters with nature.

The restrictions on children's opportunities for contact with the natural environment brings to light questions about how to reconnect children with nature in a manner that does not threaten their safety and security. School grounds represent one type of outdoor environment to which all children have access--they *must* go to school! Despite the *potential* accessibility and safety of schoolyards, most of these spaces are not designed in a manner that allows for meaningful encounters with the natural world.

Building Natural Schoolyards

It is difficult to define what constitutes a "natural" schoolyard. Whether the schoolyard is dominated by greenspace or blacktop, humans have altered the space in some way. Can areas that have been changed by anthropogenic forces be considered "natural"? The argument that nature is separate from people is a prevalent school of thought amongst conservationists. This belief has generated support for "protected areas" and parks with limited human access. Clearly, this view of nature is incompatible with the notion that nature can be a part of a child's play area, particularly within an urban environment.

The beneficial effects of nature on the psychosocial development of children, makes it difficult to subscribe to a view that sets natural places apart from humanity. Anne Spirn (1984) suggests that nature should be seen as a continuum—ranging from wilderness to cities. This concept is useful as it acknowledges the differences between these environments while recognizing the rich opportunities that exist for experiences

with nature within the urban context. The experiences a child has in a protected area may differ from that in a vacant lot, however, both places provide opportunities for exploration, manipulation and experimentation with the natural elements. This exploration may contribute to a child's emotional attachment to a place, thereby laying the foundation for the development of effective environmental education programs. While the tree in the lot may be an "invasive", it requires the same air and water to thrive as a tree in a national park, and subsequently, the child can learn about ecosystem function in either environment.

Acceptance of the potential for nature in urban schoolyards is essential to the advancement of the Natural Schoolyards movement. I suggest that the element that defines a schoolyard as "natural" is the presence of opportunities for children to have contact with non-human constructs such as soil, flora, and fauna. The depth of this experience is affected by the diversity of species and spaces that are offered within a given area.

The relationship between stability and diversity has been studied extensively in Ecology. There are a range of prominent hypotheses, ranging from the Rivet Hypothesis to the Redundancy Hypothesis, which suggest that there is a positive relationship between the diversity of a system and its stability (Johnson et al, 1996). I submit that the same concept holds true for Natural Schoolyards. A diverse schoolyard contains a wide range of amenities that accommodate a variety of activities. Combinations of permanent elements, such as main access routes and standard play opportunities that remain constant, give children a clear overall image of a place. At the same time, other areas need to be available for change and manipulation by the students. According to Moore et

al. (1992) one of the principle aims of site design should be to "locate and juxtapose settings in such a way that the greatest variety of play activity patterns will be generated, producing the greatest possible range of interactions and relationships while meeting the requirements of different ages, abilities, and developmental stages". By providing opportunities for all children to play, the schoolyard will receive support from both parents and children—ultimately resulting in a more stable system.

Diversity in a schoolyard is an important element in promoting inclusion of children with special needs. Universal design suggests that designing special facilities for people (in this case children) with special needs is not necessary. This concept was developed in response to the segregation of children with disabilities from their peers and friends as they navigate the physical environment. According to Moore et al (1992) universal design can be achieved through "thoughtful planning and design focused on user needs at all stages of the project".

An example of the importance of universal design is illustrated in the work of Barbour (1999). She examined the effects of playground design on peer relationships of children with low physical competence (LPC) and those with high physical competence (HPC). Her results indicate that playgrounds that emphasize exercise play tend to segregate children according to level of physical skill, whereas playgrounds that support various forms of play mitigate separation by level of physical skill. Obviously, this mixing has tremendous benefits for the children with LPC who are often socially isolated from their peer groups. There are also benefits for the HPC children in that they may learn new types of social skills. This is not to suggest that field areas be eliminated from schools but that the diversity inherent in a natural play area may present opportunities for

the types of activities that promote integration. Further research is necessary to determine the specific characteristics of the spaces that promote social mixing amongst children of different abilities.

Designing to Decrease Liability

Obviously, safety, security and liability are major factors in determining the design of playgrounds. These concerns are used to justify the mass paving of many of these spaces. Moore et al. (1992) acknowledge the importance of these issues in playground design but suggest that they must be balanced with the goal of providing stimulating and challenging environments for children's play and development. In order to learn to their full potential, children must have the opportunity to be challenged. It should be noted that there is an important distinction between a "challenge" and a "hazard". A hazard is something a child does not see; a challenge is a risk the child can see and chooses either to partake in or to avoid.

A playscape that is designed to be challenging recognizes that children will utilize the playground in a variety of ways—some of them unintended by the designer i.e. running up slides, jumping out of swings and climbing trees. A challenging playscape is created with an awareness of this characteristic of children's play and provides risk taking and challenging play opportunities without introducing "hazards" or unforeseen consequences i.e. swings and slides are built upon soft terrain and the landscape design encourages the "traffic flow" of children at a safe distance from the swings. Settings can be constructed so that children "read" them as challenges, but so that failure will not result in injury. For example, high places are perceived as challenging regardless of the

safety of their enclosure: the smaller the high place, the more dangerous it is perceived to be, even if well protected by walls and railings (Moore et al., 1992).

Taking into account the natural tendency of children to explore and maximize the potential uses of a given setting may result in lower rates of accidents. This point is illustrated in the case study of the Washington School (Appendix 1) where accident rates declined once the tarmac was replaced with grass, sand and trees. In addition to the reduction in play injuries, there also appears to be a relationship between diminished aggressive behaviors and schoolyard naturalization (Moore and Wong, 1997).

The presence of adult playground supervisors also mitigates some of the hazards that may occur on a playground. The design of the playground can provide opportunities for passive supervision—particularly in areas that have a greater potential for hazard such as ponds or trees that are likely to be climbed. Moore et al. (1992) recommend structures or vegetative barriers that are open for two thirds of their enclosure to allow children to feel that they have private space while at the same time allowing for supervision.

The lack of systematic, empirical research on Natural Schoolyards may necessitate the use of "adaptive management". This strategy is used in natural resource management, and it requires continual monitoring and adaptation of management protocols to meet the changing status of the resource. In the case of schoolyards, teachers and designers should continually monitor the types of activities and safety concerns that arise in different areas of the yard and allow the design to shift to mitigate these hazards.

The Important Role of Natural Schoolyards

Natural Schoolyards can provide children with many of the benefits that are associated with contact with natural environments. While the evidence relating cognitive development to exposure to nature is limited, exploration and manipulation do seem to

support a child's intellectual growth. If designed appropriately, schoolyards can supply opportunities for these types of activities. In addition, the forms of play that are supported by Natural Schoolyards are associated with benefits ranging from more integrated, cooperative patterns of socialization to enhanced levels of physical fitness. Natural Schoolyards also encourage the type of hands-on experiences that are necessary for effective environmental education. For example, direct experiences with the land allow children participating in the Edible Schoolyard program (Appendix 2) to truly understand and appreciate the value of natural cycles, which are necessary for food production. While more research needs to be done to identify the specific elements of Natural Yards that are most effective in promoting healthy child development, the evidence that exists is a compelling reason to move forward with efforts to naturalize children's play areas.

Modifying schoolyards to make them more "natural" may seem fairly straightforward, yet despite this apparent simplicity, many yards in the U.S. have been completely paved and suffer from severe neglect. The situation is quite dire in some places and restoration is a major undertaking. For example, in describing the blacktop playground in a Berkley public School Moore and Wong (1997) state:

> *"If the schoolchildren had been unionized, they would have surely gone on strike to protest such unsatisfactory working conditions. The fact that these conditions are prevalent in most urban schools in the United States and many other countries is a measure of adults' basic disregard of children's basic right to grow up in a safe, life-enhancing, and developmentally appropriate environment."*

Despite worries about liability, there does appear to be a growing interest in the reclamation of schoolyards. In 1996, the US Fish and Wildlife conducted a survey in which they identified more than 40 organizations that were involved, in some way, with

schoolyard enhancement programs (Rivkin, 1997). These naturalization efforts include the creation of gardens, forests, and aquatic environments. Appendix 1 and 2 provide in-depth examples of two different schoolyard naturalization programs.

Overseas, there are more cohesive national naturalization initiatives such as the United Kingdom's Learning Through Landscapes Trust (Lucas, 1994), the Canadian Evergreen Foundation (Evergreen Foundation, 1999), and the Swedish Skolans Uterum (Warren, 1995). It is important to utilize the information that has been generated through these extensive programs to optimize the effectiveness of new projects.

There is a great deal to learn from established schoolyard organizations; however, they all seem to suffer from a lack of institutional backing. Few of these schoolyard initiatives are being led or supported by educational establishments; they are being spearheaded by local community members, dedicated teachers and school principles (Moore and Wong, 1997). While grassroots activism is an important driving force behind the innovation and vitality of these programs, the lack of a formal support system means that the programs will be highly vulnerable once the organizers move on. For example, despite strong support from teachers and parents at Washington School, the highly successful "Environmental Yard" was not maintained when the school was renovated to meet California's earthquake standards (Appendix 1). In order for these spaces to become permanent fixtures, there needs to be a greater level of institutional support.

Appendix 1

Washington School, Berkley, CA (Moore and Wong, 1997)

Background

The Washington School was built in the 1950s at which time there were vacant lots scattered across Berkley. These lots were used by people for grazing their cows and collecting mushrooms. Over the years, the neighborhood became increasingly urbanized and opportunities for access to open space declined. By the 1970s, the area had become the city district most lacking in open space. The idea of restoring the playground to an "Environmental Yard" was conceived of in 1971 by Roger Moore, and the then administrator of the school and education professor, Herbert Wong.

Before the Restoration

When the project began in the early 1970s, the school was surrounded by paved surfaces and chain linked fences. Each day, over twenty thousand cars passed the school along the Martin Luther King Way, which runs parallel to the school's longest boundary. The traffic brought constant visual and acoustic intrusion. In hot weather the children had to stand in the narrow strips of shade provided by adjacent apartment buildings.

Prior to the revitalization efforts, there was a notable separation between genders. The boy's ballgames dominated the asphalt and the girls occupied the bars in one far corner or played hopscotch. There was little diversity in types of play as the sparse environment offered little inspiration for the types of creative playing and learning that once occurred on nearby vacant lots. In addition, the children often exhibited aggressive behaviors. Moore and Wong attribute these behaviors to the "boring and unresponsive" physical environment. They suggest that these negative behaviors were the only available diversions.

The school accident records support the apparent relationship between environmental quality and physical, social and psychological health. According to the school secretary, the day redevelopment of the yard started, she saw significantly fewer injuries. It seems that many of the accidents that occurred before this development were a result of children running around and falling on the blacktop.

Despite the poor quality of the physical environment at Washington, the teachers were always interested in experiential learning. There were animals such as doves, roosters, mice and gerbils in the classrooms. Plants lined windowsills and cooking stations introduced students to the concept of nutrition. In some senses, the creation of the Environmental Yard simply allowed the outdoor learning facilities to come into line with the existing indoor curriculum.

Another positive element of the Washington School was the cohesive nature of the neighborhood. It was a "rare case of a socially integrated school community". Most of the children walked to school, which facilitated the maintenance of friendships outside of school. The solidarity of the neighborhood certainly contributed to the participatory process involved in developing the yard.

The Restoration

The idea of the Environmental Yard initially came from Roger Moore (a landscape architect) and Herbert Wong (an educator), but the actual design process involved a wide range of stakeholders. Parents, teachers, and students were all brought into the design process from the project's conception. This participatory design process, while time consuming, was key to the project's success.

One of the goals of the yard was to demonstrate that a higher quality outdoor environment would help improve the quality of children's social relationships and broaden the range of educational opportunities. The basic concept was to create an integrated, child-centered curriculum, based on the value of informal play as the first motivational step in both non-formal education and formal classroom instruction. The stakeholders worked together for seven months to produce the initial plans for the project.

Following the planning process, a bulldozer arrived and scraped off the asphalt covering one-third of the site. This action immediately created new play opportunities for the children as they built forts in the dirt. The children then watched "the forces of nature" at play as pioneer plant species began to sprout. As the Yard took shape, there was constant input from the stakeholders regarding the plans.

A core group of teachers enthusiastically utilized the outdoor resources within the classroom curriculum—children were encouraged to bring in the products of their outdoor investigations. However, other teachers were less excited about the prospect of mud in the classroom. In response to the reluctance of some teachers to embrace the yard as a teaching tool, a childhood memories workshop was conducted. This gave teachers an opportunity to remember the types of activities they enjoyed as children. According to the authors, this workshop was key in generating support for the project.

Within a few years, the yard had a huge array of resources. To name but a few of the "natural elements", there were dozens of species of trees and plants, animals, several ponds and a stream, a garden and a greenhouse. A concerted effort was made to create private spaces that provided an opportunity for reflection and connection with the natural surroundings. The yard also included many traditional elements of a schoolyard

including a basketball court, swings, a kickball area, and traditional playground equipment.

According to the authors, the yard reached its peak in 1976 and 1977 when funds became available for teachers to develop curricular materials. Funding also supported a full-time yard teacher, which allowed for a broad range of programs. In the late 1970s, schools across the US, including Washington, faced financial crises. In response, the parents and neighbors formed a non-profit called Friends of the Yard that began taking on responsibility for managing the site. These necessary volunteer efforts maintained the yard over the next 15 years.

The current State of the Yard

The end of the Yard came when the school was renovated in 1995-1996 to meet new earthquake standards. Despite energetic protests from neighborhood residents, the school district removed a large part of the yard and replaced it with a rectangle of grass and basketball courts. The school authorities justified their actions by citing the need for open space for ballplay of older students (primarily male). This was at the expense of the other children at the school who lost a diversity of play spaces and a comforting microclimate.

While some parts of the Natural Resource Area still offer support for more holistic child development, the scope is greatly limited compared to the earlier era of the Yard. Commercial play equipment has been installed in place of the lower pond. The upper pond has been enclosed by a chain-linked fence as a "protected area" to be used exclusively for formal learning processes. The gardens are the only setting that has been

used continuously throughout the lifetime of the yard. Apparently, it is managed by children, in conjunction with students and faculty from UC Berkley.

Appendix 2

The Edible School Yard, Martin Luther Jr. Middle School, Berkley California (The Edible Schoolyard, 2001; The Center for Ecoliteracy, 1999)

Background

In 1993, Alice Waters, the chef and proprietor of the world-famous Chez Panisse restaurant in Berkley, California began the process of creating an Edible Schoolyard in a paved vacant lot adjacent to the schoolyard of the Martin Luther King Junior Middle School in Berkley. She was inspired by a vision of covering a very neglected schoolyard "with edible landscaping—orchards, grape arbors to sit under, groves of oranges and lemons and herb and vegetable gardens, all producing food that could be used at the school". The principal of King, Neil Smith, was very enthusiastic about the project and pledged to give moral support to the effort.

The Restoration

Unlike the Washington schoolyard, the plans for the Edible Schoolyard did not seem to involve the students or the parents. The initial plans were created in collaboration with landscape architects, teachers, gardeners, and other design professionals. The project also differs from the other case studies in that the efforts to date are not actually on the school's property. Land tenure was not addressed in any of the literature on this project but clearly this is an issue that may affect the longevity of the garden.

The asphalt was removed from the vacant lot at the end of 1995 and by the spring of 1997, a two-acre garden had begun. Over the next two years, over 900 eleven and twelve year olds transformed a vacant lot into a fertile garden. The goal of the project is to eventually "edibly landscape" the entire school campus.

The mission of the Edible Schoolyard is:

> *"to create and sustain an organic garden and landscape which is wholly integrated into the school's curriculum and lunch program. It involves the students in all aspects of farming the garden—along with preparing, serving and eating the food—as a means of awakening their senses and encouraging awareness and appreciation of the transformative values of nourishment, community and* ***stewardship*** *of the land" (emphasis added)*

The functioning of the schoolyard is guided by three central principles: participation, ecology, and aesthetics. The participatory element of the yard is achieved through the involvement of multiple stakeholders (including student, staff, teachers and an executive committee) who help to plan and manage the garden. The ecological component of the garden is attained through farming practices, food preparation, and recycling of waste that aims to minimize the impact to the natural environment. The goal of aesthetic beauty shows that the beauty of the environment that is created is central, the belief being that this will inspire personal and social responsibility. There is a full time garden manager who guides the students in their work in the garden and strives to meet the mission of the garden.

The Current State of the Schoolyard

The design of the garden is dynamic and largely reflects the desires of the students. The former garden manager, David Hawkins, initially had doubts about whether or not groups of 11 and 12 year olds could really enjoy working in a garden. He found that not only did the students enjoy working in the garden, they enjoyed shaping the design of the space. Rather than the ordered yard he originally envisioned, "many of the beds have become a patchwork of diverse plants, a rich mixture of interplanted vegetables, flowers, herbs and weeds". As well as gardening, the children take great pleasure in digging forts and creating networks of caverns in the soil. Hawkins sums up

the importance of the garden in creating an environmental ethic: "if they are going to care for the earth, working and playing with the very stuff of existence is a priority".

Students have learned about natural cycles through an understanding of the growing seasons and the composting of weeds and waste. Working in "teams" in the garden has taught the students how to cooperate and teachers have noticed positive changes in behavior in the classroom.

Some of the children initially disliked getting dirty. Overcoming their initial resistance, some of these students really began to enjoy working in the dirt. Hawkins notes:

> *"Gradually a culture of gardening is growing and the initial revulsion to dirt, compost, manure and spiders changes, as weary youth see adults and other students dealing quite happily with them."*

While the garden has definitely contributed to the children's education and development, it is important to note that the garden does not counterbalance the poor quality of home life that many of these children are exposed to. For example, more than half of the students do not eat breakfast in the morning, and as a result have less energy while working in the dirt. At the same time, the knowledge and confidence that students gain from the program may result in skills to better cope with adversity.

Kelsey Siegel, the current gardening manager, sums up the benefits of the garden in her statement:

> *"I see the garden as a place where relationships grow—not only the obvious relationships between students, ecosystems and the food they grow and eat, but also the human relationships that develop. The garden provides a place for children to interact with adult staff, teachers, and volunteers in a manner that is different from the adult interaction in many other parts of their lives. It is a place where children can be heard; where they can talk with adults, rather than being talked at by adults. They encounter dirt, bugs, and jobs that may have negative connotations to*

them. However, by spending time with them, listening to them, and being very patient with them, I have watched the students begin to see the beauty of the space they have created"

Part II--Research

Background

Children's development is, to a large extent, dependent on environment (Lindholm, 1995). While there has been substantial research on the social environment, studies that examine the relationship between the physical environment and children's physical and social growth are limited. The dearth of research in this area is surprising given the general recognition of the importance of a child's *entire* environment in their development (Lindholm, 1995).

Given that most children have contact with a schoolyard on a regular basis throughout their childhood, it is an environment that deserves substantial attention. Recess is a particularly important time in that children spontaneously determine their own activities (Pellegrini, 1995); they choose whether or not to partake in behaviors that require socialization and/or are physically challenging. Thus, the schoolyard represents an important opportunity for children to develop both motor and social skills.

The manner in which a child utilizes his/her environment is affected by a variety of factors, including their level of motor skills. This is particularly evident in a schoolyard where a range of activities occurs simultaneously within a finite area. Children with higher levels of physical coordination often use a given space differently than those functioning at a lower level (Barbour,1999; Smyth and Anderson, 2000). This is potentially problematic as children with impaired coordination can become isolated and solitary in the school playground (Smyth and Anderson, 2000). This social isolation may inhibit the development of a child's social and motor skills as well as diminish their self-esteem. In contrast, kids who are "popular" are often athletic and cooperative (Farmer et

al, 1996)—characteristics that lend themselves to group play on the schoolyard. This may result in a type of feedback loop whereby kids who are socially and physically adept socialize in a manner that furthers their skills and self-confidence. The students who lack these skills are less apt to be engaged in activities that promote their development—causing them to fall even further behind their more accomplished peers.

It is important that playgrounds are designed in a way that maximizes opportunities for social interaction and physical development for *all* pupils. In order to create these playscapes, the manner in which children interact with these spaces must be better understood and the needs and desires of the students incorporated into the design process.

This research has three main objectives. The first is to assess the way in which children utilize their playground and whether or not there is a difference in the behaviors of pupils with differing "popularity". The second goal is to gain a sense of the types of spaces and amenities students would like to have on their playgrounds and how these desires differ between groups of children. This will provide basic guidelines on how the playground can be altered to better stimulate the children. The third objective is to lay the foundation for future studies on the efficacy of specific playground design in promoting social integration across children of different needs.

Data for this investigation was collected from two third grade classes at Worthington Hooker Elementary School in New Haven, Connecticut. The schoolyard consists of a paved area (blacktop) and a small fenced in playground. The playground has a new metal jungle gym and a wood chip substrate. The selection of this school was based primarily on the fact that the school is slated for a new building in the next four years and

the principle at the school expressed an interest in improving the design of the schoolyard. Data collection was also facilitated by the fact that I am very familiar with the students having taught them a four-week environmental education program.

Methods

Data was collected through a series of interviews and observations of students. The data was triangulated through informal interviews with teachers. The first two phases of research were conducted with all of the children (n=38) and the latter stages of research were conducted with a select group of children (n=8).

During the first phase of the research children were asked to draw a picture of their schoolyard. The students were questioned orally about the drawings i.e. What do you do in this area? Where do most kids play? Students also answered three written questions about their drawings. These questions were:

1. What is your favorite part of the schoolyard?
2. What games do you play in your favorite places?
3. Do you usually play in a group or by yourself?

During the second phase of the research, students were asked to draw a picture of their "dream schoolyard". The students were questioned orally about the drawings i.e. What is that? Why do you want to have that on the schoolyard? The students answered two written questions about their second drawing. These questions were:

1. What kind of games would you play on your dream playground?
2. What is the best part of your new playground?

Based on the results of the first part of the study, eight children (four females and four males) were selected to participate in the third phase of the research. The aim of the selection process was to have a sample of four "popular" children and four "unpopular" children. The choice of subjects was based largely on the student's answers to whether or

not they played alone, observations of the students in class and on the playground, as well as consultation with the teachers. The "popular"' children were those who indicated that they always play in groups and the "unpopular" children indicated that the always or often play alone. After the initial selection was made, the teachers were consulted for their input. The teachers agreed (and were surprised by the accuracy) of the selection.

During the third stage of the research, the subjects went on a tour of the schoolyard and talked once more about the various activities that they partake in on the schoolyard. The children were given a camera and were encouraged to photograph the places that they like to play.

Thus, there are three sets of pictures with accompanying oral accounts for all eight students. The investigation was successful although the data collected during the first two stages of research are not as detailed as I would have liked. This is a result of performing the study in a classroom setting (with approximately twenty students participating at one time) without any help collecting the data. In addition, it would have been very helpful to have had an opportunity to observe the students playing on the schoolyard during recess following the interviews in order to triangulate the self-reported information. It would have been interesting to see how many of the children who noted that they play in groups *actually* play alone—from my experience teaching these classes, I suspect that there are more children who fall into this category than those who self-reported this behavior.

Processing the Material

The material consists of all the places in the schoolyards mentioned by the pupils. The places that were drawn in the first two parts of the research have been processed

statistically. Due to the small number of study subjects in the third part of the research, the information collected during the interviews about the places and activities have been transcribed and are described qualitatively.

Eight children identified themselves as playing alone most of the time. Twenty-eight children claimed to always play in a group. Obviously, the small sample size of children who play alone makes it difficult to draw any statistically significant conclusions about differences in the ways these children perceive their schoolyards but some interesting patterns did emerge which may be investigated in future studies.

Five places were identified on the children's drawings of their actual schoolyard. These places were: 1) the playground; 2) the blacktop; 3) the foursquare; 4) the wall; and 5) the dumpster. Twenty places were identified on the children's drawings of their "dream schoolyards"—sixteen of which were "new", meaning they did not appear on the drawings of the current yard. To obtain an overview of the types of places that the students added to the playground, a categorization was performed. The activities were sorted based on student's written and verbal comments about the manner in which they would use these spaces. The "new" elements were put into five categories: 1) changes to the playground that require high levels of motor skill i.e. climbing wall, monkey bars; 2) changes to the playground that require low levels of motor skill i.e. slide, swing set; 3) changes to the blacktop that require high levels of motor skill i.e. tennis court, basketball; 4) changes to the blacktop that require low levels of motor skill i.e. garden, benches and 5) private spaces i.e. forts and dens. (See Appendix 1 for a full list of the activities).

Results and Discussion

Schoolyard Drawings

As mentioned above, the schoolyard drawings contained five different places: 1) the playground; 2) the blacktop; 3) the foursquare court; 4) the wall; and 5) the dumpster. The elements appeared with different frequencies and combinations in each of the children's drawings. The children noted which of these places was their "favorite". These statistics are summarized in Table 1.

Place	Appeared in Drawing (%)	Favorite Place (%)
Playground	92	48
Blacktop	61	60
Foursquare	28	20
Wall	38	29
Dumpster	14	0

Table 1 Elements of the playground that appeared in students drawings of their schoolyards and the percentage of these places that were marked as their favorite places.

The drawings of the schoolyard indicate that the children are most aware of the playground. Ninety-two percent of all of the children featured this in their drawings. It is compelling that only forty-eight percent of those children identified it as one of their favorite places. This suggests that while the students are cognizant of the presence of the playground, for some reason (possibly that it is not challenging enough or it is too challenging), the students do not necessarily utilize this space.

The second most common feature in the pupil's drawings was the blacktop. The majority of the children who included the blacktop stated that it was one of their favorite places, and they used it for a variety of group games—the most popular being soccer, tag, and king crab. In order to partake in these activities, children need to possess a certain level of physical competence. That many of the students who drew this area cite it as their

favorite place is not surprising, given that children who do not enjoy these active games are unlikely to play in this area.

The foursquare was included in approximately one quarter of the drawings. Although there is no statistically significant relationship between the presence of the blacktop and the foursquare in the student's pictures, it is not that surprising that all of the children who mentioned the foursquare also featured the blacktop in their drawings as the foursquare court is essentially a part of the blacktop.

The wall was included in less than half of the student's drawings. This is surprising, as it suggests that the students see the schoolyard as separate from the school. The pupils who noted that the wall was one of their favorite places all indicated that they enjoyed playing suicide (a game in which a ball is thrown against the wall). This game requires a great deal of hand-eye coordination and is likely played exclusively by children possessing high levels of these skills. This assumption is borne out to some extent by the fact that none of the children who indicated that they play alone indicated that the wall was a favorite place.

Only five children incorporated the dumpster into their picture. None of the children indicated that it was their favorite place. One student, who often plays alone, commented that the dumpster is "important for being alone" and that he gets "privacy behind the dumpster". All of the students who drew the dumpster noted its dreadful smell.

A series of paired t tests were performed to see if there was a relationship between the playground features that appeared in the student's drawings and whether or not they tended to play alone. None of these tests yielded statistically significant results. This is

likely due to the small number of children who stated that they play alone (n=8). As noted above, a more in-depth study with student observations may result in a larger portion of the students in the "play alone" grouping.

Despite the lack of statistical significance, there are two observations that deserve comment and further investigation. The first is that three out of eight children who said that they play alone included the dumpster in their drawing whereas only two out of twenty-eight students who claim to play in groups had the dumpster in their picture. For some reason, children who play alone seem to be more aware of the presence of the dumpster. This may be because it is one of the few places that children can be alone, or because they are being "forced out" of the more popular play areas.

The second notable observation is that all of the children who play alone included the playground in their pictures. This could be due to the fact that the playground provides a place where students can play by themselves; alternatively it may provide a venue for less popular children to socialize. Further examination of the children in the schoolyard environment is necessary to understand the relationship between place and play habits.

Dream Schoolyard Drawings

Many of the children's dream schoolyards featured different places than were shown in their first drawings. The playground was featured in sixty-nine percent of the students "dream" drawings (versus ninety-two percent of the original drawings). The blacktop, four square and wall were featured in less than one-third of the student's second drawings (table 2). The dumpster did not appear in any of the children's dream schoolyards. All of the playgrounds have features that do not exist on the current

playground, suggesting that other spaces may fill the play requirements of the children more effectively than the equipment that is currently on the schoolyard.

Place	**Appeared in Drawing (%)**
Playground	69
Blacktop	25
Foursquare	17
Wall	14
Dumpster	0

Table 2 Elements of the existing playground that appeared in students "dream schoolyards**".**

Because there was such a large range of places and types of equipment on the children's dream schoolyards, it was difficult to see any patterns. A categorization was performed to look for trends in the data. The "new" schoolyard elements were put into five categories: 1) changes to the playground that require high levels of motor skill i.e. climbing wall, monkey bars; 2) changes to the playground that require low levels of motor skill i.e. slide, swing set; 3) changes to the blacktop that require high levels of motor skill i.e. tennis court, basketball; and 4) changes to the blacktop that require low levels of motor skill i.e. garden, benches and 5) private spaces i.e. forts and dens. It was hypothesized that there would be a relationship between children's tendency to play in groups and the elements that they added to the schoolyard. A series of paired t tests designed to test this relationship did not yield any statistically significant results. The fact that the individual interviews (discussed below) point to an association between these variables implies that there may be details about the children's preferences that were not captured as a result of the data collection method.

Individual Interviews

Individual interviews and tours of the schoolyard were conducted with eight children. Four of the students (two girls and two boys) are considered "popular" and the

other four of the students (two girls and two boys) are considered "unpopular". The data collected from these eight students will be described qualitatively, with an attempt to identify meaningful trends for future investigations.

Popular Children

Three out of four of the popular children specified that they did not use the playground during recess time. However, all of the children spontaneously suggested that design changes be made to the area. Three out of four of the children did not like the woodchips that are on the ground around the equipment. The kids found that they often "cut" or "give splinters". Two of the children also noted that the grooves on the monkey bars cause blisters on their hands. These simple observations underscore the importance of soliciting the children's input when designing a play-space; as the primary users of the space, the students are aware of hazards that are overlooked by adults.

There was a general pattern of looking for greater challenges and more space in this area. Comments included:

"The bridge should be higher"
"Get rid of the rope on the climbing wall—it is too easy"
"Need things that are faster and higher"

The "popular" student who uses the playground on a regular basis demonstrated some of the adaptations he has made to the equipment in order to feel challenged i.e. he does flips off the slide and runs up the slide.

The blacktop is used on a regular basis by three out of four of these children. All of the children noted that while the blacktop is good for some activities such as foursquare and suicide, they agreed that they would prefer to have grass as the dominant substrate. In a discussion on why she would change the blacktop to grass one student noted, "blacktop hurts".

In the first two stages of this study, none of these "popular" children drew or mentioned a school garden. However, when the students gave their tours of the yard, two of the children spontaneously commented that they would enjoy playing and working in a school garden. Both of these children also mentioned that they may enjoy playing alone sometimes if there were "better places" to do so. This suggests that even "popular" students may want to partake in quiet or independent activities.

The students interest in gardens brings to mind the question of whether or not children are more attracted to "natural" play areas and whether the activities that occur in these places differ from those that occur in a "built" environment. Testing this hypothesis on the Hooker schoolyard would require either finding a "control" schoolyard where natural spaces are available or implementing changes to the schoolyard and monitoring the children's reaction to the introduced "natural" areas.

Unpopular Children

The "unpopular" students uniformly noted that they utilize the playground some of the time but that they were unable to meet the challenges in this area. Some of them illustrated the modifications they have made to the equipment in order to use it successfully. For example, two of the children used the steps on the ladder to make getting across the monkey bars less difficult. One of the girls noted that while she couldn't make it across the length of the monkey bars, she often "practiced". Another student noted that while he likes being on the playground he finds it "hard to get down from the wall" but that he *eventually* manages to make it down. For these children, the playground seems to be a place where they can push their physical abilities.

All of the children who were in the "unpopular" group, tended to steer clear of large group games that occur on the blacktop, such as soccer, suicide and foursquare.

The students all spent time alone in some part of the schoolyard. Two of these students said that they often hang out along the fence in order to "relax". Another student said she likes to sit on the back steps of the school where she "looks at the sky and rests". The fourth student said that he looks at the cracks on the blacktop. As mentioned above, one of the boys values the space behind the dumpster as a quiet place (although he noted if he were to redesign the yard, he would get rid of it!). These comments illustrate the importance of giving consideration of how best to construct stimulating spaces that accommodate children who wish to rest and reflect.

Three of the children remarked that they thought they would play with other children if certain features were added to the playground. These included a garden, a sandbox, and a special quiet area for hand games. It is interesting to note that all of these spaces emphasize fine motor skills and small group socialization. While it is unclear from this study whether these students have a preference for a certain amount of solitary play, it appears that these children desire the construction of features that are conducive to greater levels of socialization.

Areas for Future Research

While the limited sample size, lack of student observation, and time constraints make it difficult to draw any statistically significant results from this study; it is instructive in terms of providing direction for future research. There are three major areas that deserve further investigation: 1) identifying the mechanism behind solitary play; 2) ascertaining how to increase levels of integration on the playground; and 3) comparing the use of "natural" versus "built" elements on the schoolyard.

A deeper analysis into the behaviors of children who play alone is essential. Do these kids prefer to play alone? Is it the result of "overcrowding? Is there a relationship

between factors such as academic achievement, coordination or self-perception and play habits? Understanding why these children play alone is important, as this type of play may be lead to future social isolation.

In addition to understanding why children play alone, it is also important to look at ways to encourage social integration between children with differing physical and social aptitudes. Would the addition of specific amenities increase levels of socialization? Which activities are likely to promote interactions between children? Does teacher supervision increase or impede social mixing? Creating spaces that encourage contact between all children may allow for schoolyard design and management that minimizes the seclusion of individual students.

The fact that a schoolyard garden was mentioned by two of the "popular" children while touring the schoolyard, elicits the questions of how children relate to the built versus the natural environment in the context of a schoolyard. What types of activities occur in these spaces? Which children tend to use natural areas? Are levels of social integration higher in natural versus built environments? Does playing in "natural" environments increase ecological knowledge or awareness? This is an area that is difficult to quantify-- it requires either a comparison of two schoolyards or a study that compares the behavior of children before and after the redesign of their schoolyard. Although it would be challenging to carry out such a study, the results could be very instructive in terms of designing play areas that cater to the emotional and physical needs of the students as well as being educationally valuable resources.

Conclusions

This study aimed to examine the way in which children utilize their schoolyards, what children would like to access to in these spaces, and to gain direction for future

research. The results of this research suggest that there is a diversity of activities occurring on the schoolyard. While there were no statistically significant results, it appears that children who are less "popular" are more likely to spend time on the playground or simply hanging out by themselves. "Popular" children are more apt to utilize the blacktop and be involved in games and sports. These children may not use the playground due to constraints on space and the lack of challenging activities.

While this study does not contain specific conclusions about the manner in which students utilize their schoolyards, it does provide useful information that can be used in the formulation of future studies. Some of the areas which I feel are important to assess are the mechanisms behind solitary play, identifying the types of spaces and activities that encourage social integration and looking at the role of the ""natural" versus "built" environment in the functioning of children on the schoolyard.

Finally, the results of the interviews highlight the value of children as designers of the schoolyard. The students pointed out a variety of hazards that have been overlooked by adult designers including splinters and cuts from the woodchips, blisters from the monkey bars and the risks of falling on a hard paved surface while playing soccer. It is essential that as research on the schoolyard moves forward, the insights provided by the students are put into practice—after all, the schoolyard is *their* environment!

Appendix 1—Categorization of Features found on Children's "Dream Schoolyards"

Additions to the Playground (requiring low gross motor skills)
See saw
Slide
Swings
Maze
Sandbox

Additions to the Playground (requiring high gross motor skills)
Climbing Wall
Trampoline
Balance Beam
Climbing Rope
Monkey Bars

Additions to the Blacktop (requiring high gross motor skills)
Track
Basketball
Tennis Courts
Hopscotch
Pool
Waterslide

Additions to the Blacktop (requiring low gross motor skills)
Grass
Garden
Animals
Pond
Sprinkler

Private Spaces
Tree Fort
Cave Underground Tunnels
Maze
Bench

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