The influence of the natural environment on the total development of young children, and the implications for designing school playgrounds: a literature review.

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Abstract

Children's multidimensional developmental needs can be met in natural environments, and in the end of the twentieth century, quality playgrounds have become more important as children have less leisure time to spend outdoors. Published literature states that traditional, structure-based playgrounds support only the physical needs of the child. Cognitive, social, emotional, spiritual, and moral developments flourish in playgrounds that offer a natural, varied landscape, and opportunities to manipulate and build. Different playground designs include traditional, adventure, creative, designer, music, and garden. Steps for planning and implementing a playground change are detailed for planners and policy makers. Several European outdoor playground programs are discussed, and designs for playgrounds are included. More research on childhood exposure to nature is needed.

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Introduction

Originally, I was going to review ways to incorporate nature study into the classroom, but after beginning my research, I realized that the field was already saturated with information. I found one article on the design of the outdoor landscape at a school playground, and immediately focused on that narrower topic. After reading dozens of articles and books that emphasized the importance of natural environments on child development, most of which also remarked on the need for more research in the field, I was hooked. It was interesting to find evidence of many European programs that have implemented the non-traditional playgrounds into schools as well as public playgrounds. They have unanimously reported that besides physical benefits from playing in a natural environment, children's social, emotional, cognitive, and moral developments are also supported. "The playground of today sets the pattern for the world of tomorrow" (Talbot, 1985: 249).

I love nature, and I think that children today do not enjoy or respect nature as much as they could. Perhaps this is because children in our culture do not have much exposure to nature during these days of material wealth and physical laziness. What I have read supports my beliefs. I can still foresee some resistance, however, as many of the non-traditional playgrounds need a refocusing of resources, away from static structures, and towards a complex, manipulative, natural landscape. I hope that the research I have done for this thesis helps others to improve their school's outdoor environments.

Play is important in the development of children, and the natural environment supports total development. In this thesis I will argue that traditional, structure-based playgrounds are not meeting the needs of children, and I will present findings of published literature that researched the impact of the natural environment on children. A varied, natural landscape lends the best creative opportunities in which children can experiment. I list reasons why a change in playground design is necessary. I offer advice for landscape planners and urban policy makers, and conclude with examples of playground blueprints.

Importance of play for development

Many leading educational psychologists maintain that children's development is multidimensional. Interactions with the physical, social and cultural environments influence child development. (Moore, 1985). Vitally important to the development of the total child is *play*. Instinctive to children, typical play is pleasurable, self-motivated, imaginative, non-goal directed, spontaneous, active, and free of adult-imposed rules (Hughes, 1991; Garvey, 1977; Piaget, 1951; Singer, 1953; Herron & Sutton-Smith, 1971).

Frost (1992) categorized play activities into three categories. *Functional play* comprises gross-motor activities and basic skills such as games like tag, chase, hide and seek, making angels in the snow. *Construction play* activities include building shelters, dens and other constructions like pirate ships, building with cones and sticks and other moveable things, and are afforded by landscape structures and loose parts. *Symbolic play* includes socio-dramatic play such as playing house, pirates, and playing farm with cones and sticks and leaves. All of these types of play are well suited to a more natural, unstructured playground environment.

A healthy child is one who has been exposed to a variety of situations that are appropriate to his or her developmental stage. The discovery of self is achieved through creativity and play (Galligan, 2000). Quality play involves the whole child: gross motor, fine motor, senses, emotion, intellect, individual growth and social interaction (Haas, 1996). Play enables children to test their skills, try new ideas, seek challenges, and problem-solve (Hendy, 2000). It is necessary for mastering emotional traumas, ego mastery, learning to live with everyday experiences, socialization, emotional and physical health, motivation, and love of learning (Isenberg & Quisenberry, 2002).

In the last century, there has been a social trend towards recognizing the importance to the child of exposure to nature, including the opportunities for play. The physical environment offers a unique influence upon children's development (Wachs, 1985). Uddenberg (1993) found that problem-solving ability, preferences and ethics in adulthood were greatly influenced by the quality of childhood playing rooms (in Rydberg and Falck, 2000). Playgrounds offer children opportunities to develop physically, mentally, and socially, improving academic readiness as well as the overall health of the child (Hendy, 2000). Further, the development of motor skills improves academic readiness, learning, motivation, and creativity (McCabe, 1999).

The natural environment and healthy development

Childhood is a unique time in one's life, and numerous theories place incredible significance on early experiences as forming the adult beliefs and patterns of thought. The architecture of the mind, i.e. networks and "places" in which experiences are stored, is constructed by early life experiences (Lazar, 1999). Future coping skills depend on the diversity of the individual's experiences. With a diverse network of internal models, Lazar wrote, the individual can compensate when the usual solutions to a problem do not work. Past experience can be used to solve new problems.

If childhood is the process of evolving out of our pure biological nature into culturally created worlds, and personal history shapes the adult personality, then it may follow that exposure to nature will help nourish the child's evolution as a person. The values and skills learned in childhood contribute to adult knowledge. Cobb (1977) writes about the importance of

the latency period (age six to twelve). The adult mind is subliminally influenced by the knowledge gained and personality that is half-formed in the latent stage.

There are several researchers who study nature's positive effect on people, especially children. Robin C. Moore (1993) found that plants stimulate discovery, dramatic pretend play, and imagination. Plants, as part of a pleasant setting (a mix of sun, shade, color, texture, and fragrance, and softness of enclosure), will encourage a sense of peacefulness. Children, Moore (1996) found, when playing in nature, are highly likely to have positive feelings about each other and their surroundings. Grahn (as cited in Rydberg & Falck, 2000) stressed that children exposed to nature had more imaginative and varied play, giving the children opportunities for relating to the environment in different ways. Grahn also found that exposure to an enriched natural environment improved children's concentration abilities, as well as reduced absences due to illness compared to an urban kindergarten. Taylor, Kuo, and Sullivan (2002) found that three forms of inner city children's self discipline, namely concentration, inhibiting initial impulse, and delaying gratification, are enhanced by contact with nature. Ulrich (1993) found that pleasing natural environments improve recall of information, creative problem solving, and creativity. Current issues of journals such as *Landscape Architecture*, *Landscape and Urban Planning, Journal of Environmental Psychology, Children's Environment Quarterly, Childhood Education, Journal of Therapeutic Horticulture, Environment and Behavior,* have many studies showing how exposure to nature is helpful for the child's total development.

Most people, when they think of children, think of their curiosity and excitement about their environment. However, some children today appear to be lazy, and obesity is common. Active engagement with the environment is not taught by passively watching television. (Garbarino, as cited in Moore, 1997). Edith Cobb, in *The Ecology of Imagination in Childhood* (Cobb, 1977), wrote that early experiences with the natural world have been positively correlated with the development of imagination and the sense of wonder. Wilson (1997) found that wonder is a motivator for life long learning. Louv (1991), after interviewing families all over the United States, concluded that the natural world is essential to the emotional health of children. White and Stoecklin (1998) wrote that exposure to outdoor environments helps children gain independence and autonomy by allowing the child to experiment with separation from his or her caretaker.

Another benefit of playing in an unstructured, more natural environment is that it allows children to more easily find favorite places. Spencer and Woolley (2000) claim that children gain personal identity through place attachment. Favorite places may have an important role in the individual's self-regulation (Korpela, as cited in Spencer & Woolley, 2000) and developing a full personal identity, which leads to the ability to participate in social networks as adults (Corbishley, as cited in Rydberg & Falck, 2000).

Benefits of Nature for Development of Social Consciousness

Besides benefits to individual development, a closer and more intimate relationship with natural environments starting early in life has benefits for cultural attitudes towards, and treatment of, the physical world we live in. Wilson (1996) wrote that experiences of very young children in natural environments help shape lifelong attitudes, values, and patterns of behavior toward natural environments. Environmental education is an antidote to the result of a dwindling natural lifestyle. As leisure time has filled up with technology-based activities such as watching TV and riding in a car, young children are at risk of never developing positive attitudes toward the natural environment or never achieving a healthy degree of familiarity with their environment.

Connection to nature forms a foundation for social consciousness, which can stimulate environmental activism later in life (Kemple & Johnson, 2002). Young children can be exposed to nature's concepts of interdependence and environmental responsibility with simple lessons like leaving an oak tree unscathed so the squirrels have acorns next year, or picking up after oneself.

When children are exposed to natural environments, they acquire compassion for the natural world. Maria Montessori (1962/1967) in her book *The Discovery of the Child,* wrote:

> Let the children be free; encourage them; let them run outside when it is raining; let them remove their shoes when they find a puddle of water; and, when the grass of the meadows is damp with dew, let them run on it and trample it with their bare feet; let them rest peacefully when a tree beckons them to sleep beneath its shade; let them shout and laugh when the sun wakes them in the morning as it wakes every living creature that divides its day between waking and sleeping (p. 68).

But instead we restrict our children from this free experience with the natural world. When children who live under such restraints kill insects or small harmless animals, adults today tend to look upon such behavior as natural, not noticing that the child's "soul has already become estranged from nature" (Montessori, 1962/1967, p. 69).

Eco-psychology and evolutionary psychology, two new disciplines relating the natural environment to human development, suggest that humans have an inherited affinity for the natural outdoors (Roszak, Gomes, & Kanner, 1995). The term *biophilia* refers to a human's innate, hereditary emotional attraction to nature and other living organisms. Evolutionary psychologists regard Biophilia as a biologically based human need to affiliate with nature and the genetic basis for human's positive responses to nature (Wilson, 1993).

For biophilia to flourish, there need to be more natural places of mystery and adventure where children can roam, explore, and imagine. This means redesigning schools to provide greater contact with nature during the school day, as well as giving children freedom to play in

protected natural places for hours at a time. Education needs to nourish a reverence for life by occurring outdoors more often and in relation to the local community (Wilson, 1993)

Biophobia, an aversion to nature, may develop without ample childhood exposure to, and experimentation with, nature. Signs of biophobia include discomfort in natural places, scorn for anything not man-made, and a tendency to regard nature as a disposable resource (Wilson, 1997). "Earth makes you dirty, water is wet, a draught causes a cold, and fire burns.
Plants are 'poisonous' and 'not allowed,' animals 'bite' or are 'nasty.' (Britz-Creclius, 1972, p. 117) These are examples of a biophobic attitude. This relationship with nature and its corresponding destructive attitude may have implications in the causes of contemporary ecological issues such as pollution and global warming.

Lewis (1996) found that natural outdoor environments produce positive physiological and psychological responses in humans, including reduced stress and a general feeling of well-being. Results from van den Berg, Koole, and van der Wulp's (2003) study indicated that viewing natural environments improved adults' mood and concentration more so than viewing built environments. Nature provides restoration from stress or attention fatigue (Kaplan & Kaplan, 1989; Hartig & Evans, 1993; Staats, Kieviet, & Hartig, 2003; as cited in van den Berg, Koole, and van der Wulp (2003). With children's busy schedules of classes and after-school activities, they may find exposure to nature helpful to reduce stress.

Montessori (1912/1964) wrote that the importance of exposure to nature for children is twofold: for physical fitness, and for "psychical," or mental/spiritual benefits. "A child needs to live naturally and not simply have a knowledge of nature… Little by little we have come to look upon nature as being restricted to the growing of flowers or to the care of domestic animals… This has caused our souls to shrink and has filled them with contradictions" (Montessori, 1962/1967, p. 67). Montessori speaks of a natural progression of principles that a child learns from natural education, specifically through the cultivation of plants and animals. After a child learns to observe the phenomena of life, she gains a sense of foresight by way of taking responsibility for nurturing a plant or animal on her own. Then she gains patience, and learns to have faith in her own expectations. Next she is inspired with a feeling of love for nature and a corresponding feeling of union with the universe. "What most develops a feeling of nature is the cultivation of living things, because they by their natural development give back far more than they receive, and show something like infinity in their beauty and variety" (Montessori, 1964, 161). Finally the child's evolution harmonizes with humanity and the child is now civilized.

Like Montessori, Henry Parsons (1910) wrote that gardening is a good way to educate the moral senses of children. Parsons wrote that children who garden at school communities learn where food comes from, gain respect for property rights and develop cooperation and community interests. Children can use sieves to separate trash from soil. The soil can be reused and the

trash can be incorporated into recycling programs. Sieve use trains in habits of saving and thrift, and develops a belief that good soil is valuable, which is a good introduction to recycling. Now, almost a century since Parsons wrote the above, awareness of recycling and implementing recycling programs into schools, has become an important component in environmental education.

School playgrounds are more important today

The time children spend in schools has become more important as our day-to-day life has become divorced from nature. Louv (1991) describes a web, both emotional and physical, that represents the environment pattern that surrounds children. The four strands of this web are parents, the school system, the neighborhood, and how the city is shaped. In today's American culture, communities are becoming disconnected, and the web has begun to unravel. As parents spend more time at work, and are strangers to their neighbors, they are more likely to assume that their children can take care of themselves.

> The more of the manmade world that children experience, the more they assume they know… as a result, children and adults pass each other in the night at ever-accelerating speeds, and the American social environment becomes increasingly lonely for both. The way to reverse this process is to find ways to increase positive contact between adults and children… The new web needs to be woven through transforming public schools, family friendly work places, new community designs, new ways of structuring family time, a new synthesis of traditional and modern family values." (Louv, 1991, p. 5)

White and Stoecklin (1998) wrote of similar findings. In older generations, most children had more free access to the outdoors. Children today have more structured and supervised lives, with fewer opportunities for free play. This is due to a few factors. Parents have become afraid for their child's safety when they leave the house alone, and place tight boundaries and restrictions on their child's geographical freedom (White and Stoecklin (1998); Louv, 1991). Families are becoming more dependent on indoor after-school care. Parents enroll their children in classes and structured activities in the belief that the child will be a more successful adult. Many children do not have access to the outdoors besides recess at the school playground, and many schools in the United States have eliminated outdoor time in the form of recess (Clements, as cited in Kemple & Johnson, 2002). As parents' dependence on schools increase, it is more important than ever for teachers and administration to heed the current environmental psychology research and make good choices for the playground environment. In short, it has become crucial to design a playground that caters to a child's developmental needs.

Traditional playgrounds fail to address needs of the child

I have discussed the importance of children's exposure to the natural environment. In our schools, playgrounds can offer a link to nature. But without proper thought and design, a playground might not be offering any developmental beneficial value.

When most adults were young, they played on playgrounds that were asphalt areas with gross motor play equipment such as swings, jungle gyms and slides. Now, playgrounds tend to have safer equipment, as asphalt has been replaced with wood-chips, and metal with softer plastic and wood. These traditional playgrounds haven't changed much over time, as most adults use their own experience as a reference model when choosing equipment for new playgrounds. White and Stoecklin (1998) refer to the habit of choosing such structures as the *playground design paradigm paralysis*. The paradigm for designing a playground is to find a structure in a catalog that resembles a childhood memory of a playground, and place it in an outdoor space. The only natural elements that manufactured playgrounds offer are sun and air. White and Stoecklin claim that this paralysis denies children their birthright to experience the totally natural outdoors, including vegetation, animals, water and sand.

Traditional playgrounds in America, with steel structures such as a merry-go-round, slide, seesaw and swings, are designed and used primarily to support physical development (Frost, 1989, p. 17). Ellis (1970) stated, "Playgrounds in general are duplicated from site to site in a monotony of stereotyped apparatus designed to catch the adult's eye," (p. 3) and that traditional playgrounds are "no more than a large combination of large playthings placed together… [to] provide opportunities for gross motor activity by stimulating, in galvanized steel, some primitive jungle setting" (p. 137).

Talbot (1985) recognized the educational possibilities in a creative outdoor playspace. Being aware that the environment changes with time is crucial to a working concept of our world. Plants change dynamically and cyclically, as opposed to play equipment, which only deteriorates.

> Man made objects serve their purposes but they need something else which only Nature offers, filtered light, mustiness of dense foliage flowers and fruit, birds and insects. The *spirit* of a place is essential: it is the state of mind and heart the child experiences, something that is sensed. Any environment we create that doesn't take this into account will fail in the larger sense (Talbot, 1985, p. 245).

Both Fjortoft (2001) and Grahn (as cited in Rydberg & Falck, 2000) compared the physical fitness level of children in a kindergarten that had regular access to a natural environment at school to that of children in a kindergarten with access to a traditional urban playground. While both groups improved in fitness level, the children who had access to the natural environment showed a significantly better performance overall, especially in balance and coordination. In Fjortoft's study, children with access to the forest chose favorite places, such as

a flexible juniper tree, which motivated functional play (how to get in and out) and social play (play house). Shrubs afforded hiding, social play, and construction play. Loose natural objects were used creatively. Winter activities included sliding down slopes, building, climbing, and skiing. Results clearly indicated that natural environments were beneficial for developing physical skills and coordination.

An opportunity for a variety of developmentally appropriate experiences must be provided within the playground environment for children to meet their full physical and mental capabilities (Hendy, 2000; Nicholson, 1971; Moore, 1986). Furthermore, several studies indicate that a diverse and adventurous playground stimulates creative play (Frost & Campbell, 1985; Frost & Strickland, 1985; Moore, G. T., 1985; Moore, R. C., 1986; Steel & Neuman, 1985; Winter, 1985; Frost & Wortham, 1988; Hart, 1993), which is believed to be crucial for the learning process of a child.

Playgrounds should include tools and materials with which to build. Simon Nicholson's (1971) theory of loose parts, states that, "In any environment, both the degree of inventiveness and creativity and the possibilities of discovery are directly proportional to the number and kind of variables in it." Loose parts can be sand, water, manipulative props and naturally found objects. Isenberg and Quisenberry's (2002) research supports Nicholson's theory. They advise creating outside environments that provide opportunities to build temporary structures. Materials such as tires, lumber, telephone poles, barrels, and scrap pipe allow for complex and varied play. "Children should have ample opportunity to climb on ropes, ladders, nets, and trees." Playgrounds should include a sloping area, large sand areas, and space for digging. In warmer months, water play should be encouraged, and snow activities in the winter. There should be spaces or structures that encourage role-games, such as a house or a plane. Varied physical activity helps children engage in the environment.

There is evidence that physical skills and cognitive skills are linked. According to brain development experts, climbing helps a child read, write, and solve math problems, (Hendy, 2000). A poor sense of balance has been linked with trouble learning in school. Playgrounds can provide opportunities for developing balance with stepping-stones, boulders, inclined planes, and logs. The movement of swinging stimulates inner ear development, thus helping to develop balance and coordination.

Besides catering to the physical and cognitive needs of the child, playgrounds can also nurture social development. Changing the playground can alter the social dynamics of a group of children. Herrington and Studtmann (1998) showed that the social structure of a group of preschoolers was altered by an addition of enclosures of small trees, called "vegetative rooms." The social structure before the interventions was a hierarchy, with the strongest and fastest children as the most dominant leaders. After the addition of vegetative rooms, a second social

hierarchy developed. Since the vegetative rooms were used primarily for socialization and fantasy play, children's command of language, creativity, and inventiveness became a factor in leadership. Hence, the social hierarchy became directly linked to cognitive, social, and emotional skills.

Schools need to implement the more recent research to satisfy the developmental needs of the children. If designed with current developmental research in mind, playgrounds can be an ideal ground for nurturing several aspects of development.

Children's preferences are different from adult preferences

Children judge a natural setting not by its aesthetics, but rather by how they can interact with the environment. Children experience the environment differently than adults. Just as children generally are interested in the process rather than the product of an activity, they experience nature as a stimulator and experiential component of their activities. Nature, to children, is not a scene or a landscape, but sheer sensory experience (Sebba, 1991). As adults, we perceive the landscape as forms, whereas children will interpret the landscape and terrain as functions (Gibson, 1979; Heft, 1988). A commonly used term in the playground literature is *affordance.* A place that has a rich variety of materials and structures affords many different kinds of play. A rock might afford throwing, a slide affords sliding, and a hedge may afford hiding. According to Gibson (1979) the affordances of play are based on the features that the environment can provide (Gibson, 1979).

Adult playground designers have to try to get inside the mind of the child. It's sometimes hard to remember the sensations of pure play. One description comes from Lewis (1998), who gave an example of getting in touch with one's inner self through experiencing nature:

> Imagine a day when, as a young child, you were wading barefoot in a stream or in the ocean. You had no intention of swimming; you were content to walk in the water. You were with a friend or you were just alone. In any case, you were enjoying the feeling of the water touching your feet. And as you walked, you felt a sense of yourself that had nothing to do with the strict boundaries of learning as experienced in school. You felt, if I might presume, a connection to your own sensations, and these sensations in turn moved inside your thoughts. Somehow, thought and sensation were entwined and you were aware of hearing yourself speaking, murmuring, humming- even listening. You were alone yet, in the daylight of your thoughts you were conversing with a larger personhood than only yourself. What is this personhood? For each of us it is different. It is a feeling of being within the texture of life itself. Such feelings are what playing must have been when we were very young, when we and the object of play were content to be within the closures of playing (p. 77).

White and Stoecklin (1998) wrote that if children designed their own outdoor spaces, they would be different than the areas that most adults currently design for them. They would be fully naturalized with plants, trees, flowers, water, dirt, sand, mud, animals and insects, as well as richly endowed with a wide variety of developmentally appropriate play opportunities (White et al., 1998). According to Titman (1994) and Moore and Wong (1997), children find the natural playscape more attractive and exciting than a traditional playground. Children need green playgrounds including fields to play on, trees for climbing and bushes for shelter and hiding. (Titman, 1994). Talbot (1985) wrote that shrubs are a favorite play area for children and vines can give a sense of enhanced quality of life.

Moore (1996) and Grahn (cited in Rydberg & Falck, 2000) noted that children prefer wild areas for play, whereas adults generally prefer manicured lawns and orderly, uncluttered landscapes. According to Moore, children value wild, spacious, uneven areas broken by clusters of plants, in part because of the mystery these landscapes lend for hiding places and adventures. It seems that children enjoy a savannah-like landscape while adults prefer a structured, cultivated landscape with easily identifiable trees (Balling & Falk, as cited in Rydberg & Falck, 2000; Wilson, 1984).

When researchers studied attitudes towards water, they found that both children and adults place value on a water component in an environment. Water brings life to an environment and also increases the environment's recreational value (Grahn, as cited in Rydberg & Falck, 2000). However, Yamashita (2002) found that adults and children prefer different aspects of water. Adults are drawn to the dynamic aspect of water such as the flow of a stream, whereas children are interested in static pools of water. It would follow that a playground should have at least one water element.

Different playground designs

In the last quarter of the twentieth century, the United States has undergone a playground movement. America's traditional playgrounds consist of concrete and steel or wooden fixed structures, which are unsafe and developmentally inappropriate. Other countries have graduated to natural, adventure playscapes. As indicated in Frost's (1985) writing/research, there are changing or newly emerging influences for playground designers. He notes four main ones, which are (1) a backlash of the cognitive emphasis in early childhood education, (2) European play environments, (3) increasing awareness of deficiencies in American playgrounds, (4) experiences with new types of playgrounds.

Various researchers have defined playgrounds as playscapes, play gardens, or discovery gardens. While no official name has been given to the emerging non-traditional playgrounds, and the above terms have been used interchangeably, there are distinct playground categories emerging from current research. In this section, I will attempt to define them.

Frost (1985) categorized playgrounds into four groups: traditional, designer, adventure, and creative.

The traditional playground.

Traditional playgrounds are formal areas, with commercial equipment made from metal, plastic, or wood, and fixed in a sturdy base (in the mid-1980s the base shifted from concrete to wood chips, and currently it can also be springy plastic). Typical equipment includes a jungle gym, seesaw, merry-go-round, seesaw, swing, and slide. The equipment is designed for gross motor play and limited adult involvement. There may be an adjacent grassy level field, with trees on the perimeter (Frost, 1985). Structures should have multi-levels, as shown in Figure 1.

Figure 1. Providing for the interaction of children with older children and adults (Moore, 1985).

The adventure playground.

Architect and professor D. Th. Sorenson of Holland proposed his idea of adventure playgrounds in the 1930s and the first was built in 1943 near Copenhagen. Today, adventure playgrounds in England, Sweden and Denmark attract children of all ages. An informal fenced area, adventure playgrounds have many zones, each with a variety of opportunities for play and leisure. A main building has lavatories, first aid, tool storage, and an office for the supervising

adult (employed by the state). There are areas for cave-digging and construction, communal meeting, a pet stable, asphalt for skating and cycling, a stage for plays, a bonfire site for cooking and warmth, fixed climbing equipment and sand and water, a garden, and a nature area left wild. Adults play a role, bringing in scrap material and tools, and hire a playground employee. Children are free to build, dig, and care for gardens and animals at their leisure. Common needs across countries are threefold: 1) having an adequate supply of building materials, 2) providing warm, friendly, skilled supervisors, and 3) securing support and cooperation of adults who initially view playgrounds as eyesores and who believe play activities breed destructive or aggressive behaviors in children (Frost, 1985).

Figure 2. Diagram for an adventure play yard (McGinty et al, in Moore, 1985).

The designer playground.

The designer's playground is created by a professional architect, is usually formal and of high aesthetic quality, and has variable function equipment and connected play zones. Natural stone and concrete create terraces, sculptures are made with expensive commercial wood, and metal apparatus dominate the area. (Frost, 1985)

The creative playground

Creative playgrounds are semiformal, are constructed from existing commercial equipment and scrounged materials such as tires, lumber, railroad ties, and scrap pipe. There is permanent equipment as well as sand and water, and loose parts. Frequently included are areas for art, gardening and caring for animals.

Frost (1985) provides a checklist to compare merits of the four types of playgrounds. Important themes are safety and durability of equipment; proper installment and maintenance of the area; age appropriateness; provisions for art, gardening and science projects; variety of loose parts; large group capability; aesthetic quality; economic feasibility. According to this checklist, traditional playgrounds are unacceptable from both developmental and safety purposes. Designer playgrounds are generally quite expensive and are often limited to fixed structures due to lack of a hired employee to protect against theft of loose parts. Adventure and creative playgrounds succeed in all categories except perhaps aesthetic value. They can be constructed by people of all ages working together, which is a great strength for a peaceful community.

Figure 3. Diagram for a creative play yard (McGinty et al, in Moore, 1985).

In addition to Frost's four categories, there are other types of playgrounds.

The music playground.

One way that children can have an influence on their environment is in a music playground. Ellen Booth Church's (1985) article on music playgrounds discusses the range of open-ended opportunities afforded by implementing scavenged materials and low-cost pieces that make sounds into a playground. Such a playground could be developmentally beneficial to children in nursery schools, childcare centers, and elementary schools. Besides group singing and dancing, children need time for individual self-expression with rhythm and pitch. "Educators need to give children time to use their thinking skills in a musical environment" (Church, 1985:240). Time is often limited for the teacher in the classroom, so Church recommends adding the music materials to the outdoor environment. Encouraging children to make a wet or dry sound, or to count the different sounds that can be made with a piece of paper, encourages problem-solving that links the mind to the body. In a music park, almost everything makes a sound.

Music parks contain places in which to climb and strum strings, and places to produce sounds with feet, hands, or the whole body. There is continuity from one section of musical apparatus to the next, via specially designed music trails. The music trail consists of sections (4 x 3 feet) of material with unique sound characteristics, such as stones, rubber mats, or tile. Inverted pails or plastic margarine tubs attached to the feet make hollow clip-clop noises, which vary according to the surface materials. Attaching film canisters, wooden blocks, pie plates, coconut halves, or sleigh bells to any fence transforms it into a background for children to produce sounds and rhythms. Loose musical instruments and art materials to construct instruments can be displayed in a "music discovery house" or table. Church describes permanent structures to add: a harp box, slit drum, drum box balance beam, steel drum sculpture and net climber, tire swing, old washboard wall.

Gardens

Working in a garden is a fun way to get physical exercise. Children benefit from working with small and large tools, as they develop fine and gross motor skills. Besides the benefits of physical labor, there are many intellectual benefits of agricultural sections of playgrounds. Montessori (1912/1964) listed ways that can incorporate nature into all curriculum areas. Gardening and horticulture can be the point of departure for intellectual education, and is integral to the practical life, sensorial, language, science, art and even cultural curriculums. Practical life could incorporate the cultivation and culinary preparation of class-grown vegetables and herbs that the children later will serve on the snack table (and washing the utensils afterward). The children would learn to identify the smells, textures, and tastes of the different plants by various sensorial exercises including blindfolds. The language curriculum would benefit from names of the plants and tools and methods. Many conversations could occur about ways of life before technology, how technology has changed our everyday lifestyle, leading naturally to topics on

ecology, conservation, and healthy living. Silence games in the garden would be enriching. Scientific explorations and discussions about plants, insects, and seasons relate to agriculture. Gardening can be a major component of a young child's outdoor environment and daily activity.

Natural Playground (general)

McGinty, Cohen, and Moore (1981) provided a drawing of a possible natural play yard. Different from a wild forest, a natural play yard is designed to be an enclosed area with sub-areas for various natural states such as an orchard, a forest, a garden, animal area, and picnic area.

Figure 4. Diagram for a natural play yard (McGinty et al, in Moore, 1985).

Comparison of playgrounds

No one type of play setting seems to provide for all of children's play activities and developmental needs. Adventure playgrounds provide for more cognitive play, traditional playgrounds and playing fields provide for more motor play, and neighborhood settings provide the most social play (Moore, 1985).

A number of comparisons have been made of the different types of playgrounds.

1. Cooper (1970) reported a greater variety of activities, ages, cross-age interaction and group sizes on London adventure playgrounds than on comparable tradition\al playgrounds. She also reported two community benefits: reduction in neighborhood vandalism and greater community involvement.

2. Hayward, Rothenberg, and Beasley (1974) compared traditional playgrounds to contemporary and adventure playgrounds designed by architects or landscape architects. Using behavior-mapping methods and interviews with children, they found that children spent more time and engaged in more cognitive play activities on adventure playgrounds than on traditional playgrounds. Children's preferences stood out: children preferred moveable equipment over static equipment in traditional playgrounds; children preferred multiple equipment over isolated items in contemporary playgrounds, and children preferred building and clubhouse activities at adventure playgrounds. They also found that adults participated with children more on adventure playgrounds.

3. Adventure playgrounds give children opportunities to interact with more varied landscape and loose parts. Studies have shown that children will engage in more developmentally supportive behaviors on adventure playgrounds than on traditional or contemporary playgrounds (Cooper, 1970; Nicholson, 1971; Spencer, Tuxford & Dennis, 1964).

Advice for planners and policy makers

According to Moore (1985:179-180), environmental policies should look at the total environment of play, and provide for integrating cognitive, social, and gross-motor play. Urban planners should provide traditional, contemporary, and adventure play environments in proximity to each other, as complementary types of play occur on each type of environment. There should be opportunities for adults to be involved in children's play. Moore recommends that child-care centers are ideal locations for creative play yards, natural play yards, and play/learning environments for handicapped children.

Plants

There is detailed information on incorporating plants in playgrounds. Plants should be selected based on two criteria: (a) toxicity level, and the plant's tendency to attract bees; (b) uniqueness or amount of the plant's texture, color, and form (Herrington and Studtmann, 1998). Talbot (1985) gave detailed information on steps to plan the flora landscape in a children's playground:

1. Clarify goals by thinking about the ages, activities, weather, transition between indoor and outdoor spaces, amount of comfort and use the area will have.
2. Get advice from a local expert in plants for the area.
3. Send a questionnaire to local professionals (nurseries, landscapes etc.) explaining your intention and asking for recommendations for a variety of plants, keeping in mind a need for low and high plants and vines that children can grow themselves.
4. Learn about native plants as they are hardier and easier to maintain, avoiding poisonous plants.
5. Read children's literature for inspiration on creative playscapes.

6. Care for the landscape with a strict feeding and pruning schedule. Plant double the needed amount.

7. Choose a tree arrangement: single tree (umbrella), pair, avenue, courtyard (open space in the middle), grove (random cluster), or orchard (rows of fruit trees).

8. To make level changes, use boulders or tires. Fill cracks with trailing plants or fragrant herbs.

Landscape-based design

Herrington and Studtmann (1998) used a landscape-based design approach to place natural materials (i.e. plants, stones, and earth) in an existing outdoor play area. Their landscape-based design employs fundamental landscape architectural design principles like ordering systems, spatial sequence, and sense of place to guide the composition and shaping of outdoor play spaces. Their aim was to find interventions that would reflect seasonal changes and would encourage children to engage with natural elements (wind, water, plants) that changed with these variations. They found that children's interactions with the environment were influenced, thus encouraging social, emotional, cognitive and physical development. They created various states of enclosure and promoted certain paths of movement in the playgrounds. Forming a path of equidistantly placed stepping stones altered the children's physical use and cognitive understanding of the place. The children were physically challenged because the distance of two feet is larger than the children's normal stepping pace. The uniform spacing may also provide a scaling tool for understanding space (Lynch, 1960, p. 55). A landscape based design model would be a good choice for designing a child's playground as it can increase the variety and types of ways that children interact with the environment.

Budget considerations in playground design

The landscape interventions done by Herrington & Studtmann (1998) were largely inexpensive. Since they were adding materials such as stepping stones and plants to an existing playground, they did not have go through a process of an external building review. In their study, they tried to mimic what a day-care facility or school might actually be able to afford and execute. One of the cheapest features was simply not mowing a patch of grass. This patch proved to be the only intervention that enticed a majority of the children in the class, as they used it for hide-and-seek and to conduct secret meetings. Learning through landscapes (2004) pleased children by attaching rock-climbing pegs to a fence.

A higher percentage of the budget must be allowed for professional landscape designers rather than a piece of manufactured equipment. The overall cost of a discovery play garden, according to White and Stoecklin (1998), is no more than that of a traditional playground. Money can be shifted to landscaping and creating play areas with natural materials. However, it may be more time consuming to create such a holistic and integrated child's world.

Examples of well-run and established adventure playgrounds/ programs

An example from the past of a natural playground comes from Montessori (1912/1964), who described the outdoor environment at her first school in Rome:

> We have a vast courtyard, cultivated as a garden, where the children are free to run in the open air – and, besides, a long stretch of ground, which is planted on one side with trees, has a branching path in the middle, and on the opposite side, has broken ground for the cultivation of plants. This last, we have divided into so many portions, reserving one for each child. While the smaller children run freely up and down the paths, or rest in the shade of the trees, the possessors of the earth (children from four years of age up), are sowing, or hoeing, watering or examining, the surface of the soil watching for the sprouting of plants. (p.161)

Learning Through Landscapes (LTL, 2003) is a United Kingdom national school grounds charity organization dedicated to helping make school grounds better places, as they consider access to decent school grounds crucial for a good start in life. LTL works with schools and their local communities to "achieve maximum benefit from school grounds for teaching and learning across the whole curriculum and for the full development of the child" (LTL, 2003).

Since the founding in 1990, LTL has helped over 10,000 schools. LTL has seen results such as children learning to create and look after something valuable; their self-esteem grows and their behavior improves, along with their potential to learn and achieve. Between January and June 2003, LTL surveyed 700 schools in the UK, each having taken steps to improve their grounds during the past four years. Results showed that 65% of schools saw increased overall attitudes to learning and 52% saw improved academic achievement. Socially, there were improvements as well: in behavior (73%), social interaction (84%), self esteem (64), and a reduction in bullying (64%). (http://www.ltl.org.uk/uploaded_documents/LTL_Survey.pdf).

Fjortoft (2001) comments that Scandinavian kindergartens have recently let kindergarteners outdoors more in the natural environment. "Outdoor-in-all-Weather," a Swedish educational philosophy that teaches children how to perform in nature and to be careful with living beings, and intends to improve the children's individual development, has been implemented all over Sweden since 1985 (Grahn, as cited in Rydberg & Falck, 2000). Grahn found that children from an "Outdoor-in-all-Weather" day nursery were less sick, had better powers of concentration, and had better motor activity than did children from a usual city day nursery.

Also in Sweden, the "Forest-in-School" program, which helps teachers educate their pupils about the great economical and environmental value of the Swedish forest, receives a share of Swedish forest company profits (Lofquist, as cited in Rydberg & Falck, 2000). This project received the IPRA Golden World Award of the United Nations in 1998.

Moore and Wong (1997) describe a project called the "environment yard," which attempts to transform an ordinary asphalt schoolyard into a lush, naturalized environment. They found that students reported less boredom, and were more socially active as they became engaged in the landscape. Their book is a useful tool for anyone who is interested in transforming a traditional playground into a more natural one. It provides innovative ways of teaching in outdoor settings, and offers ideas on creating engaging play areas that foster positive behavior. Appendices provide lists of natural yard species, and helpful organizations and suppliers.

Prospects for future - more research needed

The impact of a natural environment on children's learning and development has been a topic of low priority within child research and the importance of natural playscapes for children has also been neglected in physical planning. (Fjortoft & Sageie, 2000). One reason for the lack of systematic studies of the impact a natural environment has on children's development is that there is a lack of suitable methods for describing and analyzing natural environments as playscapes (Fjortoft & Sageie, 2000).

The research on play environments is of theoretical interest and of practical importance to educators, policy makers, planners and designers. The research to date suggests some very important conclusions, namely that the standard, traditional, structure-based playground supports only physical development, and that the natural environment seems to be the most attractive and developmentally appropriate learning and play environment for young children.

Research concerning the developmental impact of outdoor physical environments on young children is sparse (Moore, 1985; Moore, 1997; Moore & Strinste, 1989; Wachs, 1989). As yet, we do not know much about the creative effects of our sensory perception of nature (Cobb, 1977). Moore (1997) prioritized research that could inform policy development. Most importantly, what happens when children lack experiences of the natural world? Other important research topics include child-friendly urban design; special childhood places, including those that get overlooked and destroyed by developments; children's participation in planning and design of their environments to improve self esteem and democratic skills; and cross-cultural studies of childhood environments. Hopefully these topics will be addressed over the next few years.

Additional topics needing attention are children's unconscious attitude towards water (Yamashita, 2002), and people's perceptions, preferences, expectations, and emotional feelings about urban forests (Rydberg and Falck, 2000). Future studies are needed to explore how materials and design strategies can support specific developmental milestones. This research would enable landscape architects and environmental designers to fine-tune the design of outdoor play space to match the specific developmental goals of a child care program.

Diversity in landscape elements, affordances for play, challenges and safety, accessibility, wear resistance and the impact of children's play on the ecology of the playground may be important criteria in the planning and management of future playscapes for children (Fjortoft & Sageie, 2000).

One issue in particular poses a real threat to the natural landscape playground movement. The issue of safety, or security has reached a high level as injury law suits mount and parents leave their children under others' supervision for extended periods of time. A rough, multi-leveled and complex natural landscape has the potential for people to consider them unsafe. With safety in mind, traditional playgrounds include benches with views of the entire playground, thus eliminating hiding places. Every precaution is taken to avoid children falling from high places or scratching themselves on pointy bits. However, these types of playgrounds are not the best for children's total development, as research has shown. It seems that the tighter the security, the less likely the playground suits child development. Consequently, without educating planners and parents of children's needs, and encouraging discussion on an acceptable level of risks, playgrounds may continue down the homogenized, unsatisfactory path.

Conclusion

In this thesis I have shown that creative play is important to the development of the child. Incorporating nature into outdoor environments for children encourages the development of a lasting connection/relationship to nature, as well as nurturing cognitive, emotional, and social development. Playgrounds can be recognized as a major vehicle for learning and a wise investment in the welfare and development of children and their communities. I have listed different types of playgrounds, and given advice on planning natural environments. It seems like natural playgrounds are gaining support in America, but further research is needed to discover the specific ways that natural environments nurture the total development of the child.

Summary of learning experiences

My goals for the next five years are to remain in an enjoyable, slightly challenging work environment. I plan to be an assistant in a Montessori children's house for the next year or two, and hopefully by then I will feel comfortable enough to be a head teacher. In the classroom, I hope to master the materials so that I have a deep understanding of what material calls to a certain child. I'd like to become familiar with different learning styles so that I can accommodate all types of children in my classroom. I'd like to get better at classroom management.

I want to try to get involved in committees within my school so that I learn more about the running of a school. I also plan on becoming more familiar with school and city policies on outdoor environments. The process of writing this masters thesis has opened my eyes to a new field that I find myself passionately drawn towards. I know in my heart that children need to be

exposed to nature, and I see many children who only have television and a poor diet. I know that people need to be educated about what is right for their children, and I am aware that this is a topic with a lot of heated issues, but I also am becoming aware of the consequences that a lack of parental and societal education may bring. Working in a stimulating environment such as Kingsley Montessori School is a wonderful experience, however, their outdoor play space is lacking. It is very much a traditional playground, and barely has space for the children to run around in. I hope to try to get more natural items and perhaps gardening for the Kingsley children. I'd like to practice being a leader in the community, and perhaps even publish something for a Montessori magazine on my natural environment topic.

References

Adams, E. (1990). *Learning Through Landscapes. The Final Report.*

Britz-Creclius, H. (1972). *Children at play: Preparation for life* (C. von Arnim & I. von Arnim, Trans.). Vermont: Inner Traditions International. (Original work published 1970).

Church, E. B. (1985). The music playground: A place for creative thinking and play. In: Frost, J. L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International, pp.239-242.

Cobb, E. (1977). *The Ecology of Imagination in Childhood*. New York: Columbia University Press

Cooper, C. C. (1970). Adventure playgrounds. *Landscape Architecture*, 61, 18-29.

Ellis, M. J. (1973). *Why people play.* Englewood Cliffs, NJ: Prentice Hall.

Fjortoft, I. (2001). The natural environment as a playground for children: The impact of outdoor play activities in pre-primary school children. *Early Childhood Education Journal*, 29(2), 111-117.

Fjortoft, I., & Sageie, J. (2000). The natural environment as a playground for children: Landscape description and analyses of a natural playscape. *Landscape and Urban Planning*. 48(1-2), 83-97.

Frost, J. L. (1985). The American playground movement. In: Frost, J. L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International.

Frost, J. L. (1989). Play environments for young children in the USA, 1800-1990. *Children's Environment Quarterly,* 6(4), 17-24.

Frost, J. L. (1992). *Play and Playscapes.* New York: Delmar Publishers.

Frost, J. L., Campbell, S. D. (1985). Equipment choices of primary-age children on conventional and creative playgrounds. In: Frost, J. L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International.

Frost, J. L., Strickland, E. (1985). Equipment choices of young children during free play. In: Frost, J. L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International.

Frost, J. L., Wortham, S. (1988). The evolution of American playgrounds. *Young Children.* pp. 19-28.

Galligan, A. C. (2000). That place where we live: The discovery of self through the creative play experience. *Journal of Child and Adolescent Psychiatric Nursing*, 13(4), 169.

Garvey, C. (1977). *Play.* Cambridge, MA: Harvard University Press.

Gibson, J. (1979). *The ecological approach to visual perception*. Boston: Houghton Mifflin Company.

Haas, M. (1996). Children in the Junkyard. *Childhood Education* 72(6), Association for Childhood Education International, Wheaton, MD.

Hart, C. H. (Ed.), (1993). *Children on playgrounds. Research perspectives and applications.* Albany: State University of New York Press.

Heft, H. (1988). Affordances of children's environments: a functional approach to environmental description. *Children's Environment Quarterly,* 5(3).

Hendy, T. B. (2000). Jungle gym or brain gym (child development and physical activity). *Parks and Recreation,* 35(6), 84.

Herrington, S., & Studtmann, K. (1998). Landscape interventions: new directions for the design of children's outdoor play environments. *Landscape and Urban Planning,* 42(2-4), 191-205

Herron, R. E., & Sutton-Smith, B. (1971). *Child's Play*. New York: Wiley.

Hughes, F. P. (1991). *Children play and development*. MA: Allyn & Bacon.

Isenberg, J. P., & Quisenberry, N. (2002). Play: essential for all children (A position paper of the Association for Childhood Education International). *Childhood Education*, 79(1), 33-37.

Kemple, K. M., Johnson, C. A. (2002). From the inside out: Nurturing aesthetic response to nature in the primary grades. *Childhood Education*, 78(4), 210-218.

Korpela, K., Kytta, M., Hartig, T. (2002). Restorative experience, self-regulation, and children's place preferences. *Journal of Environmental Psychology*, 22, 387-398.

Lazar, I. (1999). Early experience become building materials for the brain/mind. *The Brown University child and adolescent behavior letter.* 15(12), 1.

Learning Through Landscapes. (n.d.). Retrieved 2 January, 2004, from www.ltl.org.uk.

Lewis, C. A. (1996). *Green Nature, Human Nature: The Meaning of Plants in our Lives*, Chicago: University of Illinois Press.

Louv, R. (1991). *Childhood's Future*. New York: Doubleday.
Lynch, K. (1960). *The Image of the City*. Cambridge, MA: MIT Press.
McCabe, M . L. (1999). *'FitKid' Curriculum guide for elementary school exercise equipment*.
Montessori, M. (1964). *The Montessori Method*. (A. E. George, Trans.). New York: Schocken Books. (Original work published 1912).
Montessori, M. (1967). *The Discovery of the Child.* (M. J. Costelloe, Trans.). New York: Random House. (Original work published 1962).
Moore, G. T. (1985). State of the art in play environment. In: Frost, J. L., Sunderlin, S. (Eds.), *When children play. Proceedings of the International Conference of Play and Play Environments*. Association for Childhood Education International, pp. 171-192.
Moore, R. C. (1986). *Childhood's domain: Play and space in child development.* London: Croom Helm.
Moore, R. C. (1993). *Plants for play: a plant guide for children's outdoor* environments. Berkeley, CA: MIG Communications.
Moore, R. C. (1996). Compact nature: The role of playing and learning gardens on children's lives. *Journal of Therapeutic Horticulture*.
Moore, R. C. (1997). The need for nature: a childhood right. *Social Justice*, 24(3), 203-218.
Moore, R, C. & Strinste, (1989). Early Childhood outdoors: A literature review related to the design of child care environments, *Children's Environments Quarterly, 6(4),* 25-31.
Moore, R. C. & Wong, H. H. (1997). *Natural learning. Creating environments for rediscovering nature's way of teaching. The Life History of an environmemtal schoolyard.* Berkeley, CA; MIG Communications.
Moore, R. C. & Young, D. (1978). Childhood outdoors: toward a social ecology of the landscape. In Altman, I., & Wohlwill, J. F., (Eds.). *Children and the environment.* New York: Plenum.
Nicholson, S. (1971). How not to cheat children. The theory of loose parts. *Landscape Architecture,* 62, 30-34.
Parsons, H. G. (1910). *Children's gardens for pleasure, health and education.* New York: Sturgis & Watson Company.
Piaget, J. (1951). *Play, dreams, and imagination in childhood (La formation de symbolole*, orig. French ed. 1946). New York: Norton.
Roszak, T., Gomes, M.D, & Kanner, A.D. (1995). *Ecopsychology*. San Francisco: Sierra Club Book.
Rydberg, D., & Falck, J. (2000). Urban forestry in Sweden from a silvicultural perspective: a review. *Landscape and Urban Planning,* 47(1-2), 1-18.
Sebba, R. (1991). The landscape of childhood, the reflection of childhood's environment in adult memories and in children's attitudes. *Environment and Behavior*, 23(4), 395-422.
Singer, J. L. (1973). *The child's world of make-believe: Experimental studies of imaginative play.* New York: Academic.
Spencer, C., & Woolley, H. (2000). Children and the city: A summary of recent environmental psychology research. *Child: Care, Health and Development*. 26(3), 181
Spencer, J., Tuxford, J., Dennis, N. (1964). *Stress and release in an urban estate: Study in action research.* London: Tavistock.
Steel, C., Neuman, M. (1985). Infant's play on outdoor equipment. In: Frost, J L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International.
Talbot. (1985). Plants in children's outdoor environments. In: Frost, J L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International.
Taylor, A. F., Kuo, F. E., Sullivan, W. C. (2002). Views of nature and self-discipline: Evidence from inner city children. *Journal of Environmental Psychology*, 22, 49-63.
Titman, W. (1994). *Special places, special people. The hidden curriculum of school grounds.* WWF UK (World Wide Fund for Nature)/Learning Through Landscapes.

Ulrich, R. S. (1993). Biophilia, biophobia, and natural landscapes. *The Biophilia Hypothesis*. Kellert & Wilson (eds). Washington, D.C.: Island Press.

van den Berg, A. E., Koole, S. L., & van der Wulp, N. Y. (2003). Environmental preference and restoration: (How) are they related? *Journal of Environmental Psychology*, 23(2), 135-146.

Wachs, T. D. (1989). The development of effective child care environments: Contributions from the study of early experience. *Children's Environments Quarterly,* 6(4), 4-7.

Wachs, T. D. (1985). Toys as an aspect of the physical environment: Constraints and nature of relationship to development. *Topics in Early Childhood Special Education,* 5(3), 31-46.

White, R., Stoecklin, V. (1998). Children's outdoor play and learning environments: returning to nature. Retrieved August 25, 2002, from http://www.whitehutchinson.com/children/articles/outdoor.shtml

Wilson, E.O. (1984). *Biophilia.* Cambridge, MA: Harvard University Press.

Wilson, E. O. (1993). Biophilia and the Conservative Ethic, *The Biophilia Hypothesis*, Kellert & Wilson (eds), Washington D.C.: Island Press.

Wilson, R. A. (1996). *What can I teach my young child about the environment*? ERIC Clearinghouse for Science, Mathematics, and Environmental Education. Retrieved September 5, 2003, from http://www.kidsource.com/education/teach.environment.p.k12.3.html

Wilson, R. A., Ph.D. (1997). The wonders of nature – Honoring children's ways of knowing. *Early Childhood News*, 9(2), 6-19.

Winter, S. M. (1985). Toddler play behaviors and equipment choices in an outdoor playground. In: Frost, J L., Sunderlin, S. (Eds.), *When Children Play. Proceedings of the International Conference on Play and Play Environments.* Association for Childhood Education International.