

Raindrops on Noses and Toes in the Dirt:
Infants and Toddlers in the Outdoor Classroom



By:

Ellen Veselack
Preschool Director and Co-researcher
Child Educational Center, JPL/Caltech Community

Dana Miller, PhD
Doane College—School of Graduate and Professional Studies

Lisa Cain-Chang
Program Director and Co-researcher
Child Educational Center, JPL/Caltech Community

Table of Contents

Introduction.....	4
Research Approach.....	7
Introduction to Site.....	9
Findings.....	12
Theme #1 Skill Development.....	13
Kinesthetic Skills.....	13
Visual-Spatial Skills.....	16
Intrapersonal Skills.....	19
Math Skills.....	22
Science Skills.....	24
Language Skills.....	26
Social skills.....	28
Construction and Engineering Skills.....	31
Theme #2 Children’s Focus.....	35
Theme #3 It Would Not Have Happened Indoors.....	36
Implications.....	38
Skill Development.....	39
Children’s Focus.....	44
It Would Not Have Happened Indoors.....	45
Recommendations.....	46
Parents and Teachers/Caregivers.....	47
Administrators.....	48

Higher Education.....	48
Legislators and Policy Makers.....	49
Conclusion.....	49
References.....	51

Introduction

Infants and toddlers have a fresh view of the world. They have spent little time on this planet yet they are innately curious about the natural world around them. They wonder at the rustle of the leaves in the breeze, delight in the splash of puddles and study the way the sand falls through their fingers. Yet how often are infants and toddlers allowed to wander and explore in nature, partaking of the gifts around them? The conventional wisdom has been to wrap them up and keep them safe, to protect them (Johnson, 2010). Nature presents too many dangers to allow these fragile young humans to go foraging in the wild. Nonsense! Infants and toddlers in well designed outdoor spaces can have safe access to a wide variety of sights, sounds, textures and even tastes that will expand their working knowledge of the world around them and give them the foundations for learning (Chawla, 2006; Johnson, 2010).

Humans have, over the millennia, had a strong pull to be connected with nature. It is this inborn love of nature that Edward O. Wilson identified as “biophilia” that drives us as adults to quietly watch the deer in the meadow, to dance in the waves of the ocean or to appreciate the fragrance of the pine scented air of the mountains (1984). It also draws the very youngest children to connect with nature. Take a fussy infant outdoors and they almost instantly calm. Lay them on a blanket under a tree and they will spend long periods of time observing the leaves on the branches or, if they are mobile, will begin inching off of the blanket to explore the grass just beyond their reach. Open any door near a toddler and they find their way over the threshold to the wide world that awaits them, in any weather, rain, snow or sunshine. They can find the tiniest ant as it makes its way across a log, pick up just the right leaf in a pile of hundreds and they seem to be pulled into any puddle that is near. They know what’s good for them and they go after it with gusto!

Older children and adults are increasingly experiencing a fear of nature due to a lack of experience with or knowledge of the natural world (Louv, 2005, Sobel, 1996). In his latest book, *The Nature Principle*, Richard Louv discusses the importance for humans to connect with nature. He stresses the importance of daily experiences outside in nature for children and adults and suggests that we need to get our daily dose of Vitamin N (Nature) (2011). Research indicates children and their parents are spending less and less time outdoors and losing their connection to nature (Clements, 2004; Dannemaier, 1998; Louv, 2005; McGinnis, 2003; Rivkin, 1995; Sobel, 1996; White & Stoecklin, 2008). These are heavy influences on the lives of infants and toddlers, who are dependent on others to get them outdoors, setting the stage for a lack of knowledge and connection to the natural world as well as a fear of nature. (Chawla, 1988 & 2006; Young, Haas & McGown, 2010). Children need direct experiences with nature; to learn firsthand how ants carry a tiny crumb to their nest, rain falls from the sky, how leaves blow in the wind (Chawla, 1988; Kellert; Rosenow, 2005). This knowledge leads to greater respect and love of nature (Chawla, 1988; Rosenow, 2005; Young, Haas & McGown, 2010). Children learn how to experience the world from examples set by those closest to them and if those around them are showing them their respect and love for nature, children will follow their lead (Carson, 1956; Arbor Day Foundation, 2007; Rosenow, 2005; Young, Haas & McGown, 2010). Naturalist and author Rachel Carson said, “If a child is to keep alive his inborn sense of wonder...he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in” (1956).

Our research conducted at the Child Educational Center in La Cañada, California took place in four separate outdoor classrooms with children ages 4 months to 35 months. Our focus was on three main themes: 1) skills children were developing as they explored and played

outdoors, 2) the amount of time children spent engaged in an activity, and 3) the uniqueness of these experiences happening outdoors. Our grand tour question was “How does infant and toddlers’ experiences in the outdoor classroom affect their skill development?” As educators of young children, we knew through our own observations that children were learning outdoors, but this qualitative research study allowed us the opportunity to take much closer and systematic look at just what it was that very young children are gaining as they explored their outdoor classroom.

This research is critically important as we look at trends in education. There are few scholarly bodies of work that focus on infants and toddlers in the outdoor environment (Kellert, 2002) or that supports the idea of the very youngest of children spending long periods of their days outdoors and in contact with nature. There are studies of preschool children benefitting in a variety of ways outdoors (Bohling, Saarela & Miller, 2011; Chang, Miller & Veselack, 2011; Miller, 2007; Miller, Tichota & White, 2009) but the focus on infants and toddlers has been lacking. This work adds to the small but growing body of literature which studies the link between skill development and the outdoors. Parents, teachers, program administrators, and policy makers will all gain important knowledge from the findings presented in this paper.

Teachers, as well as parents, can use these findings to change their attitudes about the importance of getting children outdoors and connecting them with nature. Parents can devote time daily to getting their young children outdoors utilizing their back yards, their neighborhood park or nearby gardens. They will have a better understanding of the skills their children are gaining in the simplest of experiences with nature. Teachers can take a closer look at how and when they are taking infants and toddlers into the outdoor classroom and find ways to increase the time spent outdoors as well as providing more natural elements found therein.

Administrators will be able to consider how the philosophy of their program is supporting infants and toddlers to be outdoors and connecting with nature. They may make changes in routines, staffing or environments to enable children to be outdoors more and have more opportunities to engage with natural materials. They can work more effectively with staff that may be resistant to the idea of infants and toddlers being outdoors by providing them with the data presented in this narrative and make informed decisions about how to best meet the needs of the children in their care. Legislators and policy makers will have a greater understanding of the skills children develop in the outdoor classroom and be able to make more informed decisions regarding the policies that affect young children.

The evidence presented in this paper could be influential in the greater field of early childhood education providing much needed evidence of the important role the outdoor environment plays on the development of young children. Institutions of higher learning will be able to use the information presented here to take a closer look at the course of study for early childhood educators. They may increase the amount of class time spent on learning about the influences of the outdoors and nature on young children. This could result in new teachers coming into the workforce with a much greater understanding and appreciation of the link between young children's skill development and the natural world. It could also spur others to focus their research on skill development in the outdoor classroom, adding other data and literature to this area of study.

Research Approach

This study used a qualitative, single site case study tradition (Creswell, 2007). The "case" or site selected for this research was the Child Educational Center (CEC) in La Cañada, California (specifically the focus of this research was on infants and toddlers ages 4-35 months

interacting in the outdoor classroom). The study was funded by Dimensions Educational Research Foundation, and was part of a larger study that included two research sites, the CEC and Dimensions Early Education Programs in Lincoln, Nebraska. The product of the larger study was a cross-case analysis that identified common themes across both sites. Each research site had designated co-site directors who were formally trained in qualitative research methods by Dimensions' Research Director, a college professor. The co-site directors were responsible for coordinating the research at their respective sites.

The initial phase of this study was conducted during the 2010-2011 academic year. Twenty-six teachers at the CEC served as co-researchers and the primary instruments for data collection. Some of the teachers had been introduced to the qualitative research methods in the fall of 2009 and began recording their observations at that time. Selected others received their training in August 2010. They were introduced to qualitative research methods and trained in recording Nature Notes by Dimensions' Research Director and a teacher/co-researcher from Dimensions.

The focus of data collection in 2009-2011 was on children who ranged in age from 4 - 35 months of age. Teachers closely observed children and recorded their observations on Nature Notes forms, a protocol for recording, specifically designed for this research. These Nature Notes included written narratives about teachers' observations, photographs and sketches of children and materials, to help us fully understand the context of the observations as we analyzed the data. Data collection began on September 16, 2009 and the final Nature Note included in this study was recorded on June 3, 2011. For the purpose of this study, we analyzed 126 Nature Notes. On average, the initial analysis of each Nature Note took 30 minutes, and we returned to each Nature Note several times as we continued to make sense of our data and constructed our narrative.

We analyzed the data collaboratively, using a systematic, methodological approach to examine each data entry. Through this analysis, common patterns emerged and we identified key themes across teachers' observations, the results of which are described in this paper. We analyzed the skills children were developing in the outdoor classroom using a specific analysis protocol that examined key categories of skills. This structured approach helped us organize the data into categories that could then be analyzed for common themes. We examined each data entry as a single unit, and created spreadsheets for each category on the analysis sheet in order to look at the data as a whole and identify themes.

Excerpts of several teachers' observations are included in this paper. In order to protect the anonymity of the children who participated in this research, we used pseudonyms instead of their real names.

Introduction to the Site

The Child Educational Center (CEC) is a private, nonprofit program located in northern Los Angeles County in California. The program serves families with children from 6 weeks through 5 years 9 months, as well as children in kindergarten through 6th grade before and after their regular school day. Since its inception in 1979, the program has been housed in a 1950's era elementary school with surrounding grounds leased from a school district.

Figure 1: Entrance



Two of the more distinctive characteristics of this site are the amount of outdoor space children have to play in and the emphasis on natural beauty outdoors. Each age group of children, from infants through preschool, has their own outdoor space allowing the spaces to be specifically designed for the ages of children using them. From its inception the program has recognized the importance of children learning through outdoor play and connecting to nature, both of which are reflected in its daily practice with children and through its consulting and educational outreach with the Outdoor Classroom Project, an initiative of the CEC.

The program's outdoor environment serves as a model site for the Outdoor Classroom Project. There are four yards with infants and toddlers; one younger infant yard with one classroom adjacent, one older infant yard with one classroom adjacent, one younger toddler yard with two adjacent classrooms and one older toddler/younger preschool yard with two adjacent classrooms. The outdoor classroom design concepts emphasize supporting children as active, independent learners. Much of the design work was developed as a collaborative effort between the Child Educational Center staff and consulting landscape architect, Ronnie Siegel. Permanent equipment occupies little space relative to the whole space so that teachers and children can exercise flexibility and creativity in how they use their environment.

Each of the yards has their own unique qualities and features. All of them have some areas established to support specific child-initiated experiences such as the garden areas and sand

boxes. Additionally, there is an abundance of open space for children to manipulate as they desire. The two infant yards have deck areas where the youngest, non-mobile infants spend much of their time while outdoors. As the infants become mobile, they begin exploring other parts of the yard. There are plantings nearby to entice them into exploration (no chemicals are used on the grass or plants). There are trees in or nearby each yard, providing shade and also giving children the opportunity to have physical contact with trees, leaves and stick on a daily basis. Several storage areas in different locations assist teachers in setting up and cleaning up materials.

Teachers bring a selection of equipment and play materials outside from storage sheds and from classrooms daily based on several factors: teachers' observations of and response to children's needs; children's articulation of their needs or initiative in bringing items outdoors themselves; staff members consideration of the weather or other factors.

There are a total of 6 classrooms and a maximum of 100 children each day. Teachers make sure there are abundant loose parts available to children. There is also a wide variety of natural materials which can be found around the outdoor classroom for children to discover as they move about the space or to use in their play. Natural items such as rocks, shells, pinecones, seed pods, twigs, leaves, tree cookies and acorns can be found throughout the yards. Large branches are also available for children to carry or construct with. Some of these materials occur naturally in the space and others are brought into the space by teachers. Each classroom has direct access to the outdoors and classroom doors are open throughout the day to allow children free and easy access between classrooms and the outdoors.

Findings

Three key themes were revealed as we analyzed the data. The first theme was the skills children were developing as they used the outdoor classroom. We found skill development in each of the 126 Nature Notes and as we analyzed we created subthemes of skills that included every domain of learning. The second key theme was the amount of time children focused on an activity or experience as well as the number of times a child repeated an experience. This was not data that was specifically asked for on the protocol but some teachers found this significant and made comments on their Nature Notes indicating the length of time a child stayed with the activity. As we reviewed the data, it was notable how long infants and toddlers stayed focused on specific experiences. The third key theme to emerge was the number of Nature Notes recorded that simply would not have happened indoors. These were uniquely outdoor experiences for children because of the natural materials available to them, the weather they experienced or the space they were in.

Table 1: Key themes and subthemes

Key Themes	Sub-themes
Skill Development	<ul style="list-style-type: none"> • Kinesthetic • Visual-Spatial • Intrapersonal • Math • Science • Language • Social • Construction and Engineering
Children’s Focus	<ul style="list-style-type: none"> • Length of time • Number of repetitions
It Wouldn’t Have Happened Indoors	<ul style="list-style-type: none"> • Natural materials • Weather • Space

Theme #1 – Skill Development

The first theme to emerge as we analyzed the data was the skills children developed in the outdoor classroom. Infants and toddlers gained many skills while engaged in experiences in the outdoor classroom. They had a wide variety of materials to choose from and the space and autonomy to engage in self-initiated activities. As noted above, we divided the skills into eight different skill areas as we analyzed the data; Kinesthetic, Visual-Spatial, Math, Science, Language/Literacy, Social, Intrapersonal and Construction/Engineering. Children did not work on these skills in isolation, however, and all of the Nature Notes revealed at least 3 different skill categories (100%). In 95 out of 126 Nature Notes (75%) children developed skills in 6 to 8 of the skill categories listed. We extracted and separated the skills for our analysis and have selected Nature Notes that demonstrate the individual skills children were developing and we have included them in this narrative.

Kinesthetic Skills

There were more kinesthetic skills noted in the data than any other skill. We logged 1,444 kinesthetic skills overall with 177 unduplicated skills. It was clear from looking at the data that infants and toddlers are working on gaining important kinesthetic skills.

A striking example of a child using a variety of kinesthetic skills was when Cory, a 35 month old boy, noticed the tree branches set up in the dirt digging area. There was a large branch that a teacher had secured vertically in the sand with other branches nearby to build with (figure 2). He took a branch about 3 feet long and placed it in the crook of one of the vertical branches that was shaped like a “Y”.

Figure 2: Balancing branch



He proceeded to climb up the branch, carefully balancing and gripping the branch with his feet and toes. Holding onto the “Y” branch he used his weight to push the branch he was standing on into a horizontal position and balanced it there. He repeated this experience successfully several times even though the branch would slip a few times as he jumped down. Eventually, the branch was in the fork by only a few inches creating a 90° angle to balance on (figure 3).

Figure 3: Balancing



Two other children watched Cory balance and made their own attempts, one successfully and one not (Palkovic, Nature Note, 5/13/10).

Cory was developing balance, stability, gross motor (climbing, walking, jumping), and fine motor as he grasped and let go and strength in using his arms to lift the branches. He explored body orientation, eye-hand coordination, and felt the textures of the materials he was

working with. He engaged in full body exploration, motor planning and purposeful movement and his repeated experience developed his muscle memory.

Another example occurred on a sunny cool day. Adrian, a 24-month-old boy, explored some elements of the younger toddler yard. He began by sliding down a large rock. He got up, stepped over the sandbox wall, walked through the sand, stepped up and out of the sandbox, went up the hill, around the tree and slid back down the rock. He did this self-made obstacle course several times before walking away to another activity (Kärkkäinen, Nature Note, 2/11/10). Adrian was working on a number of important kinesthetic skills such as balance, walking, and climbing. He utilized motor planning as he mapped out his route and physically anticipated how he was going to move his body. He engaged in purposeful movement making decisions about how to move his body to accomplish his task. He developed muscle memory as he did the same physical tasks over and over, gaining mastery of the obstacle course. He also used his whole body in his exploration, not only engaging in gross motor skills but also experiencing the textures of the natural elements as he maneuvered through the yard.

Children gained many kinesthetic skills as they engaged in a variety of experiences in the outdoor classroom. Seemingly simple experiences such as digging in the sandbox brought a wealth of kinesthetic skill development for children. When Anci a 21 month old girl, was digging in the sandbox, 21 different kinesthetic skills were noted such as digging, developing core balance as she sat, grasping the shovel, bending over, lifting the shovel, moving her arms as she pushed and pulled, engaging in purposeful movement and utilizing motor planning. She also experienced the texture of the sand on various parts of her body (Orozco, Nature Note, 12/7/09). Adara, an 8-month-old girl, held a small tree cookie and experimented with its properties. She shook it, hit it and scraped it along the wooden decking, stopping now and then to taste it. Her

nonlocomotor movements included grasping, moving her arms and sitting, using her core balance. She also experienced the tree cookie with her senses, tasting, feeling and listening to the sound it made as it made contact with the deck. (Yamada, Nature Note, 11/7/09).

Children crawled, walked, ran, lifted, pushed, pulled, grasped and let go. They rolled over, sat up, pulled up to standing and worked on balance. They pinched and picked up items, and moved their bodies in purposeful ways. They experienced the variety of natural textures in the outdoor classroom from the sand, to pinecones to tree bark to grass. They not only touched them but also tasted them and experienced the sounds they made. They experienced the outdoor classroom with their whole body, actively and intently.

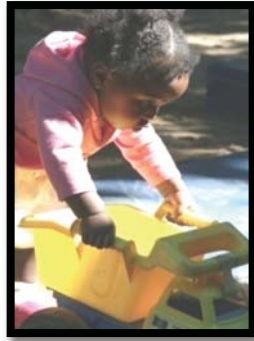
Visual-spatial Skills

Knowing that visual spatial thinking is the first language of infants, it was not surprising that we identified visual spatial skills in 121 of the 126 Nature Notes (96%). Within those 121 Nature Notes, visual-spatial skills were noted 375 times with 27 unduplicated skills identified. Some of those skills included close observation, navigating their body through space, eye-hand coordination, figure-ground discrimination, viewing from multiple perspectives, body placement, visual mapping, visual tracking and visual estimation.

For example, a group of 6 toddlers, ages 15-25 months and a balance of girls and boys were pushing dump trucks in the corridor where the incline of the sidewalk acts as a ramp for many toddler activities. The sidewalk is in the shape of an 'L' and the children ran behind their dump truck down the sidewalk and around the corner. They were going as fast as they could, at toddler breakneck speed. Once they got to the bottom, they collected their trucks and went back up the hill to start all over again. They narrowly missed hitting one another most of the time, but the occasional intentional collision was part of the play and brought great peals of laughter from

the children. Some of the children let go of their trucks at the top of the hill, sending them down unattended, and watched them careen out of control. The teacher stopped the trucks about halfway down the hill so children would not get hit by the trucks, but still allowed them to continue to send the trucks down the hill unattended (Ryan, Nature Note, 12/18/09).

Figure 4: Truck Play



These children were working on a variety of skills as they took their trucks down the hill. They were visually mapping where they would be taking their trucks. They were getting a view from multiple perspectives, both from the top of the hill and from the bottom. They were estimating space and distance and recognizing landmarks (they had to know when it was time to turn their trucks to avoid hitting the fence at the bottom of the hill). They navigated their bodies through space and worked with spatial concepts of behind, in front, up and down and had to mentally calculate how to avoid collisions with other trucks and children.

In another example, fourteen month old Kelly, a girl, crawled across the older infant yard and made her way up to the sandbox at the top of the hill for the very first time. As she climbed up and over the small retaining curb to the sandbox, she immediately began investigating the sand, bringing a handful to her mouth. She continued crawling and headed over to the storage cupboard. Once there she began pulling all of the toys out of the shed, tossing them into the sandbox. When it was empty, she crawled inside and sat down in the cupboard pulling the door

closed. She pushed open the door, crawled out and retraced her path back to the room. (Sable, Nature Note, 5/25/10). Kelly was able to view the yard from multiple perspectives, from the bottom of the hill, at the top of the hill and points in between. She moved her body successfully through the space and had to visually map out her course as she made her way to the sandbox. She made some visual estimations of size and calculated her body placement as she moved her body into the cupboard. She experience visual-spatial concepts of inside, outside, up, down and over in her exploration. She developed eye-hand coordination as she reached out to grab the toys and move them out of the cupboard.

Another example of visual-spatial skills was when 11 months old Jackson, a boy, noticed a squirrel in the yard on a cool, sunny day and began crawling after it. As Jackson approached, the squirrel ran to another part of the yard. Laughing, Jackson pursued the squirrel as it ran to and up the fence. Jackson watched it as it ran down the fence, ran passed him to the tree and scramble up the trunk to disappear into the branches. (Roldan, Nature Note, 12/21/09). Like Kelly, Jackson viewed the yard from multiple perspectives as he moved around the yard. He spotted the squirrel using figure-ground discrimination and used visual tracking skills as he followed the path of the squirrel. He mapped his own path in pursuit of the squirrel and experienced visual-spatial concepts of up, down, across and into as the squirrel darted around the yard.

Visual-spatial skills were a strong component of the skills children developed. They experience the world through these skills, observing, tracking, mapping and estimating distance and size. Through their observations and movements they learned important visual-spatial skills, which lead to greater knowledge about themselves and the world around them. The thoughtfully chosen natural materials available to children to observe, manipulate, explore and engage with

provided opportunities for children to gain important visual-spatial skills. The unpredictable elements of the yard also encouraged children to engage in visual-spatial learning whether it was physically exploring the spaces or making close observations of the nature found around the yards.

Intrapersonal Skills

Young children learn about themselves as they interact with the world around them. They begin to understand who they are and what they can do as they navigate through each day. The strength of this is seen in our data. Intrapersonal skills were noted in 122 of 126 Nature Notes (97%). We tallied 390 skills, 43 of which were unduplicated.

An example of intrapersonal skill development occurred on a cool rainy day when Edwin, a 22-month-old boy, decided he wanted to go outside. His teacher, Teresa, helped him get his shoes, socks and a jacket on then said to him, "I'd like you to put your hood on so your head doesn't get wet." Edwin didn't respond so Teresa said, "I'll put it up" then she pulled his hood up onto his head. He quickly responded, "No!" pushed it off his head and went out into the yard. He hadn't gone far when he stopped to observe the rain flowing off of a shade tarp. He watched this for about a minute then followed the flow of the water to where it dripped on the sand. The recent rains had created ruts in the sand. He pointed to the ruts and said, "Da" and Teresa replied, "Yes, the water made ditches in the sand." He nodded and walked, following the ditch. He stopped, squatted and pointed to a pinecone and looked at Teresa. "Yes" she said, "I see the pinecone. It's in the ditch." He began looking for more pinecones and brought them over to drop in the ditch. He deposited about 15 pinecones in the ditch before he moved on. He noticed the other shade tarp was also dripping water and walked over to watch for a few minutes before he put his hand under the drips. He moved his hand as the drops came down so the water fell on

different parts of his hand. He did this for several minutes before he leaned forward and moved his head towards the water. He wasn't close enough for the water to drop onto his head so he stepped forward until he felt drips landing on his head. He looked up at Teresa and she said to him, "How'd that feel when the water dripped on your head? Is it cold?" "Cold" he said (Roldan, Nature Note, 12/22/10).

Figure 5: Puddles and Pinecones



Edwin demonstrated a series of intrapersonal skills during this narrative. He expressed independence from his teacher and confidence in his decision when he told Teresa, "No" and headed out into the yard. He demonstrated an ability to focus and have sustained attention, collecting 15 pinecones before moving on. He showed persistence in problem solving as he tried to get the drops to land on his head. He was curious about the wet environment and took initiative to form a plan, showing industriousness in his efforts. He included Teresa in his investigation at times, but largely relied on himself to find out about the puddles, dripping rain and gravity.

In another example, Miles, a 29 month old boy, came outside after a long weekend of gusty winds. The yard was littered with acorns and leaves. He picked up a green acorn, looked at it and said, "Acorn." His teacher, Juliet, said to him, "Do you know what eats acorns?" Miles told her, "No." She explained that squirrels eat acorns. He asked, "Squirrels eat acorns?" She

replied that they did. Miles soon discovered more acorns and got a blue bowl to collect them in. When his bowl was half full he found a large brown acorn on the ground, picked it up and said, “Papa” as he put it in his bowl. He picked up a medium sized acorn and said, “Grandma” dropping it into his bowl. He began to climb the steps onto the tree house structure and on his way up found more brown acorns, one in particular that was larger than the others. He said, “Daddy” as he dropped it into his bowl, then reaching down to pick up another he said, “Mommy” and added it to the bowl. When he got to the top of the tree house steps he found a small acorn. He held it up, smiled and said, “Miles” and put it in the bowl with the rest (Jones, Nature Notes, 12/2/09).

Miles demonstrated his understanding of family as he collected his acorns. Like Edwin, he showed initiation and focus as he went about his self-assigned task of collecting acorns. He was able to make choices and problem-solve about where to go to find the acorns, to get a bowl to collect them and to name them as members of his family. He showed satisfaction as he smiled and named the last acorn “Miles.”

For infants, the intrapersonal skills looked different in some ways, but also had many of the same qualities. For example, when 5 ½ month old Anthony’s teacher took him outdoors to help soothe him, he became interested in the trees overhead. He studied them for a bit then rolled off of the quilt and onto the deck. He spent 20 minutes exploring the wooden decking, putting his fingers between the wooden slats and touching the small nail heads visible in the wood. His teacher described him as being, “very focused” during this investigation (Valadez, Nature Notes, 11/29/10). Anthony initiated his exploration of his surroundings. He was focused and sustained his attention on his investigation for a long time. He demonstrated curiosity, awareness of his surroundings, and persistence in his investigation and an ability to concentrate.

Intrapersonal skills were plentiful in experiences teachers recorded in the Nature Notes. Children were focused, curious, persistent and confident. They were developing a sense of self and an awareness of how they fit into the world around them. They took initiative and made many, many choices as they moved about and explored their surroundings.

Math Skills

Math skills were abundant in the Nature Notes collected. A total of 465 math skills were pulled out of the data with 49 unduplicated skills identified. In fact, there were math skills noted in 110 of the 126 Nature Notes (87%). While not always able to name the concepts, children were working with a wide variety of math skills, laying down the foundation for increasingly complex learning. A sampling of math skills noted include volume, quantity, one to one correspondence, size, shapes, colors and negative spaces.

For example, fourteen-month-old Frank crawled outside after eating his breakfast. He quickly saw some of the children in the sandbox, which had been set up by the teachers to interest children in exploration. He crawled to the top of the hill to reach the sandbox and immediately crawled through the waffle block structure. He then moved over to one that was lying over a hole dug in the sand, crawled to the middle of the circle in the waffle block and sat down. He got out of the hole and crawled over to sit in the middle of the tire. He did this sequence three more times. (Santos, Nature Note, 5/28/10).

Figure 6: Sandbox Exploration



There were a great deal of math skills Frank used in this seemingly simple experience. He experienced the shapes (circles and squares) and colors (red, blue, yellow and green) of the objects he encountered. He explored both vertical and horizontal planes as well as the negative spaces of the holes in the waffle blocks. He experienced perimeter as he sat in the tire, the area of the sandbox and the depth of the hole he sat in. He physically experienced the distance between the objects as he moved from one to another and created a pattern as he repeated his sequence three times. He experienced quantity in the number of objects he encountered and the number of times he repeated his sequence.

Liesel, a 20 months old girl, was in the sandbox and picked up two plastic plates, one in each hand. She counted aloud, “One, two.” She gave one plate to Naomi, her teacher, and said, “One” and held up the plate she was still holding and said, “One.” She put the plate down and picked up a stick said, “One” then picked up another stick and said, “Two” (Fox, Nature Note, 3/19/10). Liesel had a very clear understanding of one to one correspondence and was exploring the skill of numbering the objects. She used number language to name them but also classified them by counting the plates and sticks separately. In a different example of math skills, Linda, a teacher, was sitting on the edge of the sandbox scanning the yard for children. As she counted she said, “I see one, two, three, four, five children out here. That means there are 12 inside.” Lauren, a 28-month-old girl, was nearby. She overheard Linda and responded, “Yes, there are many inside and not so many outside” (Palkovic, Nature Note, 12/9/09). Lauren demonstrated her understanding of quantity by naming five as “not so many” and 12 as “many.” She also compared these two quantities and put them into categories.

Children engaged in a wide variety of math skills in the outdoor classrooms. Infants and toddlers counted estimated, classified, sorted and created patterns and sequences. They

experienced math concepts such as perimeter, area, volume, distance and time. These are foundational math skills that they will continue to build upon. These physical experiences with properties of mathematics are the foundations to later math skill development.

Science Skills

Young children are scientists. They investigate, hypothesize, test their hypotheses and learn about the natural world. Our data showed just how much infants and toddlers engaged in experiences that enhance their understanding of scientific principles. A total of 499 science skills were noted in our analysis with 74 unduplicated skills occurring in 118 of the 126 Nature Notes (94%).

Nine-month-old Jackson, a boy, crawled outside after a light rain. He crawled up onto the deck and noticed that there were several small puddles. As he crawled across the deck his hand landed in a puddle. He stopped and lifted his hand to look at it. He touched the puddle again, and then crawled on. After moving further along he found a green leaf. He picked it up then sat down and passed the leaf from one hand to the other a couple of times. He lifted the leaf to his mouth and moved it around with his tongue. He tugged on the leaf, but held on tightly with his mouth. He pulled it out and looked at it. He continued to manipulate and explore it for several minutes (Roldan, Nature Notes, 10/12/09).

Figure 7: Rainy day



Jackson explored many properties of nature through close observation, an important science skill. He learned about the effects of weather and the properties of water through his exploration of the puddle. He discovered the properties of the leaf as he manipulated and mouthed it. He explored the concept of cause and effect as he touched the puddles. He tested his theories about this different, wet environment through repeated experiences of touching and manipulating.

In another example, Edwin, an 18 month old boy, was outdoors on a warm, sunny day. There was a blue tumbling mat out on the deck and a portion of the mat was in the sun and the other in the shade. He stood in the shade and leaned over, touching the sunny mat and said, "Hot." He started to walk away but turned around and came back repeating his process, again saying, "Hot" (Sable, Nature Note, 5/25/10). Edwin was learning about the effects of the sun. He tested his hypothesis by touching the mat and then confirmed his conclusion by coming back and touching it again. In another example, Zeshawn, a boy, and Alena, a girl, both 5 months old and Jared, a 6 month old boy, were outside on a sunny, windy morning and all were crying. As soon as the wind began to pick up, rustling the leaves and ringing the wind chimes, they stopped crying. They watched the leaves move in the breeze for a few minutes. After the wind stopped blowing, Jared started to cry. Melissa, his teacher, took him over and put him near the garden. He immediately stopped crying and began exploring the plants. He tore a leaf off and put it in his mouth. (Chau, Nature Note, 11/11/09). Jared engaged in close observation of nature, learning about the properties of the plant and its leaves. All three were engaged in observation of the effects of the breeze on the trees, watching the leaves move as the wind hit them. They also heard the effects of the breeze as the wind chime sang in response to the breeze.

Infants and toddlers engaged in many science skills as they experienced their outdoor classrooms. They spent a great deal of time exploring the natural elements and learned about the properties of natural items such as sticks, leaves, trees, plants, logs and seeds. This exploration of nature enhanced their understanding of and connection to nature. They experienced gravity, force and cause and effect. They experimented, hypothesized, tested ideas and came to conclusions. They experienced a variety of different weather conditions and the effects of weather on them and their surroundings. The scientific exploration of their surroundings helped them more fully understand how the world works. Much the same as math skills, these physical experiences lay a strong foundation for later science learning.

Language Skills

Even the youngest of infants communicate, using body language and vocalizations. Infants and toddlers are working hard to learn language, both receptive and expressive. Our Nature Notes revealed 267 language skills children used with 54 unduplicated skills in 83 of the 126 Nature Notes (66%). Children talked to each other, made gestures to express their needs or were engaged with the teacher, asking questions or responding to teacher initiations.

For example, Angelica, a 34 month old girl, stood quietly next to her teacher looking at the ground. Winnie, her teacher, asked, “What are you looking at?” Angelica asked, “Who made the tracks?” indicating the tracks left in the mud by some toy trucks. Winnie asked her, “Who do you think made the tracks?” While still carefully studying them, Angelica replied, “I don’t know.” She then ran across the mud, creating tracks of her own. Angelica looked at the marks left by her shoes and said, “Maybe I made the tracks. Maybe you made the tracks.” Winnie responded, “Yes, you ran over the mud and your shoes left some tracks, so maybe you made the new tracks. What else do you think can make tracks?” Again, Angelica said, “I don’t know.

Maybe you made the tracks.” Winnie saw a spiked rubber ball and rolled it across the mud. Angelica looked at it and said, “Yes, it make dot tracks.” She then explored this further by rolling the ball back and forth in the mud for the next few minutes. A short time later, Angelica came back to Winnie and said, “It’s a beautiful day, Winnie” (Yu, Nature Notes, 12/9/10).

Figure 8: Making tracks



Angelica used complete sentences as she shared her thoughts and ideas about the tracks in the mud. She initiated the conversation with her teacher by asking a question. The teacher encouraged her language by responding and asking questions of her own. Angelica used contractions and proper names and used descriptive language to describe the tracks as “dot tracks.”

In another example of older toddlers using language, Ansel, a 28-month-old boy, was putting small pebbles into an empty bottle. His teacher, Carlos, noticed and said, “Hi Ansel, what are you doing?” Ansel replied, “I’m putting rocks in here.” Carlos responded by asking, “What are you putting them in?” Ansel paused, and then said, “In the bottle.” Carlos asked, “Oh, why are you doing that?” Ansel explained, “Because I want to do this” and proceeded to dump all of the pebbles out. Carlos smiled at Ansel. Ansel smiled back and said, “It’s fun.” Carlos got up to leave and said, “Thanks for sharing, bye-bye my friend” (Hidalgo, Nature Notes, 12/8/09). Like Angelica, Ansel used complete sentences to express himself to Carlos. He understood the

questions Carlos asked him and his responses were clear and made sense in the context of their conversation. His language skills enabled him to communicate his ideas to his teacher.

While infants and young toddlers do not have the language skills of the older toddlers, they were still able to understand their teachers and to communicate their needs through nonverbal cues and vocalizations. When 11-month-old Kelly, a girl, noticed a string on a mat blowing in the breeze, she pointed to it. Her teacher, Mel, said, “Yeah, the string is being blown by the wind.” A moment or two later Kelly pointed up to the tree. The breeze was making the leaves dance at the end of the branches. Mel said, “The wind is blowing the trees too” (Coyne, Nature Note, 3/23/10). In this example, Kelly was letting Mel know that she noticed the moving string and leaves. Mel understood the gesture and narrated for Kelly what was happening.

A wide variety of language skills were used by infants and toddlers in the outdoor classroom. They practiced the rhythm of language and the give and take of a conversation. They used gestures and vocalizations to communicate with one another and with their teachers. Teachers encouraged language use by asking questions and being nearby for children to engage. Teachers also narrated for children as a way to increase their understanding of verbal language.

Social Skills

Young children are very curious about others around them. Our data revealed that even very young infants noticed and reached out to other infants. The social skills children developed were many with 54 unduplicated skills and 356 social skills noted overall. Sixty-three (50%) of the Nature Notes had social skills noted in them. Many of the Nature Notes for the youngest children were an observation of only one child, as would be appropriate for infants but we did identify social skills in some of the Nature Notes involving infants.

For example, Anthony, a 6-month-old boy, was sleeping on a mat on the deck. Sadie, an 8-month-old girl, was on her stomach playing on a mat adjacent to where Anthony was sleeping. When Anthony woke up, he scooted over to where Sadie was playing. They began exploring each other, touching hands, jackets and faces. After a few moments, Anthony scooted over so he could touch the deck beside his mat. Sadie watched and copied his movements so that she, too, was at the edge of her mat. They both reached down and began exploring the wooden decking with the whole hand (Kärkkäinen, Nature Note, 11/10/10). These two young infants were interested in each other. They reached out and engaged and shared their experience. When Anthony moved to explore the deck, Sadie watched and followed his lead.

Toddlers, on the other hand, had more sophisticated engagements and in the following example, there are signs of the beginnings of cooperative play. A group of toddlers were dancing outside next to the camellia bush when Rorke, a 19 month old boy, stepped behind the bush. Elliot, also a 19-month-old boy, saw Rorke and stopped dancing. He smiled at Rorke, walked over and flipped a branch and said, “Boo!” Rorke began laughing loudly which caught the attention of 21-month-old Adara, a girl, who quickly walked over to the other two. The three of them then stood next to each other with their backs against the wall behind the bush. They began squeezing their bodies closer and closer so they could all be behind the bush. Rorke was between Elliot and Adara and as they tried harder to get behind the bush they squeezed him between them. His laughing soon turned to crying. At this point, Adara said, “Ba!” (her version of boo) as she flipped a branch in imitation of Elliot. All three children began to giggle (Chan, Nature Note, 11/9/10). The children were already engaged in a group experience as they danced. When Rorke broke from the group and began a new game, Adara and Elliot followed his lead. Elliot displayed a sense of humor in engaging Rorke when he flipped a branch and said “Boo!” When Adara

heard Rorke crying, she remembered Elliot's humor and tried it out for herself, making all of them laugh in an apparent attempt to help Rorke to feel better. These three toddlers engaged in a shared experience and played the same game. They also shared the space behind the bush. They were able to be in close proximity to one another, though perhaps too close for Rorke's comfort, and they all shared in the joy of the game.

Figure 9: Hiding behind the bush



In another example of developing social skills, Andrea, a girl, who was 33 months old and learning English as a second language, noticed two other girls, Shawna, 26 months and Clarissa, 32 months, playing together and wanted to join them. She approached them as they played in the dirt digging area, batting at the balls suspended from the tree. “Clarissa, Shawna, I want basketball please.” Shawna told them, “No.” Shawna and Clarissa moved away but Andrea followed them. Andrea found a black tube near the other girls and looked into the tube and said, “Hello! How you doing?” Clarissa looked up and said, “How you doing?” The girls giggled. Andrea walked back over to the dirt digging area and this time Clarissa and Shawna followed her. Andrea hugged Clarissa and said, “Un abrazo, Clarissa” (translated to “A hug, Clarissa”) and they hugged (Vargas, Nature Note, 1/21/11). Humor once again helped bring children together. Andrea was practicing her new skills in English as she tried to establish friendships with Clarissa and Shawna. Clarissa and Shawna were testing their own skills of choosing who to

allow into their game. Andrea also tried some strategies to engage the other girls, even after being rejected by them.

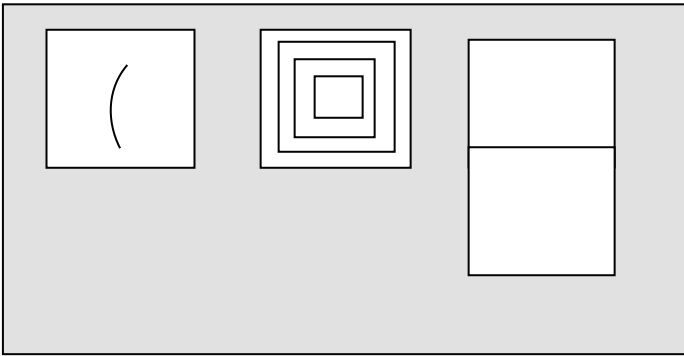
Infants and toddlers, from the youngest to the oldest, were interested in others and sought to engage their peers. The skills they were developing were wide ranging including noticing and showing an interest in peers; sharing space and materials; sharing an experience; leading and following; using humor as a way to solve a problem; being in close proximity to one another and engaging in cooperative play or the beginnings of cooperative play.

Construction and Engineering

The Nature Notes revealed 62 construction and engineering skills in the experiences teachers recorded with 26 unduplicated skills identified. These skills were identified in 32 of the 126 Nature Notes (25%). The most frequently noted skills were emptying and filling (14 times), piling (8 times) and stacking and balancing (5 times each).

For example, Tate, a 26-month-old boy, came over to a table where he found set of colorful blocks in a variety of shapes and sizes. He declared, "I want to build with blocks" and he sat down at the table. He began shifting the pieces around, first sorting them by color, placing the arch shapes inside the squares (which resembled picture frames). Next he collected all of the squares and put one inside the other (they were sized to fit inside one another). He then gathered all of the arched pieces and lined them up from largest to smallest. Caelan came over and joined Tate at the table. They were soon stacking the squares on top of one another. They continued for a few more minutes before pushing all of the blocks together in a pile and moving on to another activity (Fiore, Nature Note, 9/14/09).

Figure 10: Block building

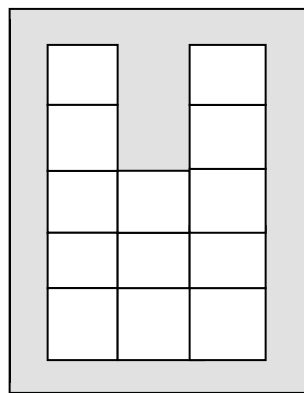


These boys were gaining important construction and engineering skills in this Nature Note. They stacked and balanced one block on another, and made walls and enclosures, fitting blocks inside of blocks. They made repeating patterns, and lined blocks up according to different attributes. They packaged the blocks as they put them one inside the other.

In another example, Rorke, a 35-month-old boy, extended an invitation to his teacher, Naomi, to build together with the milk crates. Naomi sat nearby as Rorke started building with the 22 crates that were scattered around the area. He began stacking the crates and created a 'U' shape with six of the crates. He then got another crate and climbed onto the structure to stack crate number seven onto his structure. He stepped down and added number eight at the base of the 'U'. He continued adding to the structure. When a crate fell off, Collin, a 36-month-old boy, who was observing Rorke, picked up the fallen crate and handed it to Rorke, who then placed it back on his structure. Rorke and Collin continued building, climbing up onto the structure to add more crates, making it four crates tall. Artie, a 35-month-old boy, had been observing the other two boys building, got some crates and began adding them to the structure. They made steps out of the crates at the bottom, which assisted them in placing more crates on the top. The teacher provided support by holding the crates steady as they climbed and was near enough to help them

if needed. When they had a structure five crates high, using 16 of the 22 crates available, both Collin and Artie took a moment to walk around the structure. As Naomi held the crate stack steady, Artie climbed up the structure and sat inside the top crate, now about five feet high. Rorke observed this and declared, “Look, I made a big hotel. I’ll stay in the top floor. I want to sit in Artie’s place.” Naomi said, “Now Artie is staying in that room. It’s occupied.” Rorke seemed content to find another “top floor” crate to sit in and climbed aboard. The boys spent a few minutes climbing up and down and in and out of the crates, eventually leaving their crate structure to play in the sandbox (Fox, Nature Note, 6/3/11).

Figure 11: Crate structure



Rorke, Artie and Collin were developing important construction skills. They learned about stability and creating a foundation. They balanced the crates on top of one another and created steps. They made the two towers equal in height and embedded crates, surrounding them with other crates.

Young children frequently engage in games of filling up a container and emptying it out, over and over again. Examples of emptying and filling include 19 month old, Lyle, a boy, collecting rocks and dropping them in a plastic bottle, (Kärkkäinen, Nature Notes, 3/19/10) and 18 month old Liza, a girl, filling her watering can with sand, carrying over to another part of the

sandbox and dumping it out, only to go back and do it over again (Santos, Nature Note, 9/29/10). Piling was also prominent in the construction and engineering skills. Three boys, Joel (33 months), Simon (36 months) and Mathias (32 months), were creating a fireplace by piling the branches they found in a sensory table (Frame, Nature Note, 6/23/10). Cristina, a teacher, watched as four children from 18 to 23 months discovered a pile of leaves a teacher had created to pique the interest of children. As they gathered around the leaf pile, they began gathering up the leaves and throwing them into the air (Michel, Nature Note, 10/28/09).

Children engaged in simple construction skills. They filled and emptied containers and dug holes in the sand. They stacked blocks and other materials and learned about balance. They piled up objects and learned about foundations and stability. These simple construction and engineering skills are essential elements to young children's later experiences with building. They explore seemingly simple concepts and gain important knowledge about how materials can be manipulated successfully.

The skills children gained while spending time outdoors were many and varied. They physically experienced math and science concepts. They explored numerous aspects of the natural world, discovering different aspects of nature, using natural materials, and noticing and experiencing weather. They were able to assert their independence, demonstrate initiative and sustain focus on activities. They communicated both verbally and nonverbally with peers and teachers. They engaged one another, inviting peers into their play or engaging them with a gesture. The outdoor classroom provided infants and toddlers with important, foundational skills necessary for their continued growth and development.

Theme #2 – Children’s Focus

It is a misconception that young children, in particular infants and toddlers, do not have an ability to focus on an experience for any length of time. Our data puts that misconception to rest. The second theme we noted was children’s ability to focus and sustain attention. Teachers recorded children focusing for up to 60 minutes on a task or repeating an experience over and over. This was unsolicited data and yet 30% of the Nature Notes had some reference to focused attention. Children stayed with self-selected activities and explored elements of nature, demonstrating a both an ability to focus and attend as well as showing curiosity that held their attention and supported their engagements.

The following is an example of focused attention. Alton, an 8-month-old boy, crawled outside and began exploring the mud that was adjacent to the deck. This was his first experience with mud. He made a face as he touched it. He picked up some sticks, looked at them and put one in his mouth. He reached down and put his fingers in the mud. He lifted some mud up with his fingers and let it drop back down. He occasionally stopped to look around and see what others were doing but he kept coming back to the mud. He spent over 20 minutes touching and tasting the mud. (Santos, Nature Note, 12/15/09)

In a separate example, Skyler, a not quite 9-month-old boy, was out on the deck lying on his back on a mat. He soon rolled over, and then rolled off of the deck to where he could reach the dirt. He stretched his arm out and grabbed some dirt. He brought it close to his face then let it fall through his fingers. He then reached back and picked up a leaf he found in the dirt and put it in his mouth. He frowned and his teacher, Josie, said, “How does that taste?” He looked at her then looked down and focused on the leaf in his hand. Skyler spent about 30 minutes in this investigation (Valadez, Nature Note, 2/8/11).

In other examples four-month-old Aubrey, a girl, spent five minutes looking at the trees before falling asleep (Kärkkäinen, Nature Note, 9/23/10). Twelve month old Oscar, a boy, spent 15 minutes exploring and playing the drums that had been set out. He only lost interest when other children came to join him (Kärkkäinen, Nature Note, 11/20/09). Melba, a teacher, watched a nine-month-old girl, Shanika as she sat beside the fence that borders the Preschool's Nature Explore Classroom. She picked up handfuls of seeds, pushed her hand through the fence and let them go. She stayed at this task for 20 minutes (Santos, Nature Note, 11/18/09). When Stevie, 34 months old, found a lot of roly-poly bugs, he shrieked with excitement, "Look! Look!" He invited other children to him look at the bug and five others, ages 28 to 33 months, joined him in his investigation. They stayed and watched the bugs for a long time (Fox, Nature Note, 3/24/10).

Children were, indeed, able to sustain focus and attention. They demonstrated great interest in the natural elements of the outdoor classroom and even children as young as four months stayed focused and engaged. They did an activity over and over, gaining mastery of their own skills or knowledge about how the world around them works.

Theme #3 – It would not have happened indoors

Our third theme was the uniqueness of the experiences to being outdoors. Exploration of nature and natural materials is most authentically experienced outdoors. Because of this, and the fact that most teachers are hesitant or unwilling to bring elements like dirt, mud and sticks indoors, most outdoor activities involving nature and natural materials don't happen indoors. Some experiences in nature just can't happen indoors. We noted in our data that 99 of the 126 Nature Notes (79%) would not or even could not, have happened indoors.

So many of the Nature Notes already shared in this narrative are examples of experiences that would not have happened indoors, exploring mud, splashing in puddles, watching roly-poly

bugs or playing behind a bush. Here is another example of an experience that would not have happened indoors. Jackson, a 24 months old boy, was squatting down on the sidewalk, focused intently on something. His teacher, Teresa, walked over. He looked up at her and said, “Uh-eh” and pointed to the ground. Teresa looked around but could not determine what he was pointing to. Because there is usually sand on the sidewalk, she said, “Do you see sand on the ground?” He looked around and refocused, and ran about 3 feet before he stopped. He pointed to a small cottonwood seed tumbling across the sidewalk and said, “Uh.” He watched it as it slowly drifted along in the breeze. When it was just a few feet away he ran toward it once again. He went down onto his hands and knees, with his elbows bent, watching intently. He looked up at Teresa and then back down to the seed. He shot his hand out towards the seed to point at it and his movement sent the seed swirling around and away from him. He quickly pulled his hand back and stayed very still. The seed continued to move away and then he crawled after it a little while longer (Roldan, Nature Note, 1/19/11).

In other examples, Mathias, a 26-month-old boy, explored rainwater that had collected inside the large waffle blocks. As he hopped over the waffle blocks he noticed the water collected in the circles. He bent over and carefully examined the water. He picked up a leaf, dipped it in the water and began putting the water on his cheeks (Sequoias, Nature Note, 12/14/09). In a separate example, two boys, Oswin, 33 months and Simon, 32 months, were playing outside on a rainy day. They splashed in the puddles with their rain boots, laughing together. Oswin said, “Running in puddle!” The two then ran to the sandbox to retrieve some long handled shovels. They ran back to the large puddle and pushed the water for about 10 feet, repeating this action several times (Butler, Nature Note, 2/25/10). In a separate example, Zeshawn, a seven months old boy, found some mint growing in the garden. He plucked off a leaf

and carried it in his hand as he crawled around the yard (Belissimo, Nature Note, 1/12/10). And lastly, Edwin, a 24-month-old boy, woke up from nap to find a dripping garden hose. He grabbed it and shook it saying, “Edwin water plants” watching a few drops fall from the hose. His teacher, Kwanisha, got a bucket for him and together they filled the bucket with water from the hose. Edwin proceeded to water the plants (Turner, Nature Note, 1/19/11).

Figure 12: Watering Plants



The number of experiences that children had that simply would not have happened indoors is so large that these few examples just begin to demonstrate the experiences that would have been lost had children not been given ample opportunities to be outdoors. There are a multitude of experiences that can only occur outdoors that enhance children’s skill development in significant ways. The unique features of the outdoor classroom provide opportunities for engagement and discovery that could only happen outdoors.

Implications

Young children, even young infants, must be given opportunities to explore outdoors and engage with natural materials (Johnson, 2010). The findings in this research study support earlier research conducted at this site, as well as other research focused on skill development in the outdoor classroom. In a well-planned and thoughtful environment, full of natural materials, and ample space and time children gain important skills across all learning domains (Banning &

Sullivan, 2011; Chang, Miller & Veselack, 2011; Miller, 2007, Miller, Tichota & White, 2009).

Infants and toddlers benefit from spaces that encourage their exploration and that have an abundance of natural materials and opportunities for them to engage with nature (Raikes & Edwards, 2009). They gain skills, have sustained focus and attention and engage in experiences that simply would not occur if they were not outdoors.

Skill Development

Infants and toddlers, much like preschoolers, need to have concrete, meaningful experiences in order to learn (Copple & Bredekamp, 2009; Johnson, 2010). They must explore their surroundings, investigate all they encounter and engage in the very real work of early learners through hands on manipulation of a variety of materials (Banning & Sullivan, 2011; Copple & Bredekamp, 2009). Outdoor classrooms, when well planned and thoughtfully furnished, provide the ideal environment for these very young children to learn (Arbor Day Foundation, 2007; Raikes & Edwards, 2009).

Infants and toddlers gained important skills as they spent time outdoors. The skill development crossed all domains, covering every area of development for both infants and toddlers. The space and time that children had to explore the outdoor classroom played a role in their development, allowing them ample opportunities with a wide array of materials to encourage and provoke children to engage in meaningful experiences.

It is important to have an environment that is physically challenging so that children are able to learn about how their bodies move and to develop increased strength and body competency (Puckett & Black, 2007). The materials that teachers placed in the outdoor classroom encouraged physical engagement and enticed children to move into new spaces they hadn't explored before. Teachers encouraged children to take risks by allowing them the freedom

to explore natural materials such as stick and rocks and plants. Teachers also allowed children to take physical risks, trusting children negotiate over a rock wall, or to climb up onto branches or a tall stack of milk crates. At the Working Forum on Nature Education for Young Children in 2006, Helle Nebelong, from Denmark, talked about the need for young children to take risks, telling participants that children should be as safe as *necessary* rather than as safe as *possible*. Children do not need to be over protected from themselves or their environments (Johnson, 2010). Molly Dannenmaier talks about the difference between and risk and a hazard in her book, *A Child's Garden*. "Hazards are different from challenges...the safety philosophy I espouse is that hazards should be avoided and risks should be explored – cautiously." She goes on to say, "The attitude that dangers must be avoided at all costs will lead children to a distorted view of the natural world" (1998). A well-planned and implemented environment provides children with the opportunities to engage in appropriate risk taking while eliminating the hazards. It is through these challenging experiences that children have ample opportunities to gain important kinesthetic skills.

Children also gained visual-spatial skills through engagement in experiences outdoors. As they moved about the spaces designed for them, they found new ways to view the world around them. They were able to gain new perspectives, engage in mapping and tracking and make close observations. Again, the well-planned environment allowed children to use their visual-spatial skills as they moved about the spaces and manipulated materials. When teachers give children a wide range of freedom to explore, there are many more opportunities for children to use a variety of visual-spatial skills. These skills are more fully developed when children explore, experiment and engage with materials and the environment (Johnson, 2010).

Children's intrapersonal skills are often overlooked when assessing their cognitive development, but their ability to make decisions, to problem-solve and to initiate ideas are critical components of being a successful learner (Banning & Sullivan, 2011; Galinsky, 2010). It is important for children to feel competent and have a strong sense of self in order to take the risks necessary to learn. Children in the outdoor classroom had ample opportunities to develop these important skills. If a child does not have confidence to tackle a problem or task, he or she will be more likely to give up or ask someone else to do it for them. Children in the outdoor classroom demonstrated confidence, competence and a willingness to solve problems. The teachers allowed children to solve their own problems and set up an environment that was provocative and challenging for them in many ways. They asked open-ended questions and allowed children to come to their own conclusions. This meant that children had the time and space to engage in important critical thinking and problem-solving which leads them to develop a strong sense of self and independence in thinking (Johnson, 2010).

The unstructured nature of the play that infants and toddlers engaged in allowed them the opportunities to encounter and explore mathematical concepts. Young children need multiple hands on encounters with materials to develop an important fundamental understanding of basic math concepts (Copley, 2000; Copple & Bredekamp, 2009). Children must be able to physically manipulate objects of a variety of shapes, colors and sizes; to physically experience concepts of area, volume, diameter, depth and length; to create patterns and sequences and explore rhythm and speed; to experience quantity and to use numbers in the many different experiences they have in the outdoor classroom. The open ended nature and the variety of materials available to children enhance their opportunities for learning math and the richness of the natural materials creates an even greater palate from which to learn.

The natural elements of the outdoor classroom also encourage infants and toddlers to engage in a wide variety of science experiences. As children explored puddles, tasted mint or investigated bugs, they were engaging in close observation and learning about the natural world. Young children work as scientists do, forming hypotheses, testing their ideas and coming to conclusions (Chalufour & Worth, 2003, Johnson, 2010). They conduct experiments over and over and over, building on their previous knowledge and learning from each new experience. It is important that children have opportunities to experience the many different laws of science such as gravity and force and to engage in exploration of cause and effect. They must have a stimulating outdoor classroom rich with natural materials and opportunities for self-initiated exploration (Johnson, 2010).

Children used a variety of language skills to communicate with peers and teachers. Even very young infants found effective means to communicate whether it was babbling, crying, gesturing or making other sounds. Toddlers used complete sentences, pronouns, contractions and proper names in their interactions. An engaging and stimulating outdoor environment provokes verbal responses from children as they describe to others what they found, what they accomplished or ask questions of others about what they wonder about. Children included teachers in their investigations and play through verbal invitation and gestures of inclusion. Teachers play an important role acting as role models as they narrate what they see, ask open-ended questions about what children are engaged in and expose children to more sophisticated language. These experiences lay a solid foundation for strong language skills as children grow. There is ample evidence that when children are exposed to and use language from a very early age, they demonstrate strong verbal skills later on. (Barton & Brophy-Herb, 2006)

That same rich environment also encouraged children to engage their peers. When they made a discovery, such as finding a roly-poly, they called other children over to share in their exploration. Children also needed help from their peers and sought them out to accomplish tasks and to solve problems. The openness of the environment allowed children to find one another, to watch their peers and to pique their interest in engaging others. Even the youngest babies showed an interest in connecting with their peers. They shared both space and materials, not usually something expected of children this young and they shared experience and knowledge with one another. The unrestricted space of the outdoors and the abundance of appealing materials reduce conflict resulting in more harmony and happiness overall. This low rate of conflict then allows teachers more time to engage children, respond to their initiations and to guide and facilitate their experiences rather than spending the majority of their time resolving conflict.

Children engaged in construction and engineering outdoors and the natural elements of sand and rocks aided their exploration. Children used many natural materials to gain construction skills such as filling a bucket with sand, or collecting pebbles or piling branches. Children used the environment and materials in constructive and imaginative ways. The open-ended nature of the materials combined with the teachers' willingness to permit materials to be used unconventionally allowed for rich experiences for children and deeper learning. The outdoor environment must include a wide variety of open-ended materials that can be used in multiple ways by children. Children need to have the space to build and construct free from worry about other children encroaching on their space or taking their materials.

As younger generations of children are growing up disconnected from the natural world, it is increasingly urgent that even the very youngest children have opportunities to discover the wonders of nature (R. Louv, 2011). It is through hands on exploration of the natural world

around them that children develop a love of nature rather than a fearful one (Rosenow, 2005; Sobel, 1996). This happens most effectively when they are not only allowed, but encouraged to encounter nature and to go outside every day in an environment rich with natural materials (Arbor Day Foundation, 2007; Rosenow, 2005).

Children's Focus

There are two important factors in children's sustained focus and attention. One is that teachers encouraged children to follow their own interests and gave children many opportunities to initiate experiences. There was little teacher direction and when there was, it was in support of the child's demonstrated interest. Teachers gave children opportunities for problem solving and experimentation. The second is that teachers gave children the gift of time. They allowed children to engage in an experience until the children decided they were done. Children were able to have the full experience they wanted and needed. Teachers did not interrupt them, stop them or move them on to a new task or experience. This fostered a climate of initiation, exploration and engagement in very young children.

It was important for children to have large blocks of uninterrupted time to engage in the outdoor classroom. This is an important factor for preschool children (Chang, Miller & Veselack, 2011) and it is just as important for infants and toddlers (Johnson, 2010). These very young children were able to focus and attend to an experience for as long as they needed or were interested. Many children had the opportunity to repeat an experience over and over, without adult interruption. This repetition of experience is an important component of mastering a new skill (Johnson, 2010). The uniqueness of the outdoor classroom and the elements found therein intrigued children so much so that they spent long periods of time studying nature and a variety of natural elements found in the outdoor classroom.

While conventional wisdom has indicated over time that very young children do not have an ability to sustain focus for very long, the data in this study indicates that infants and toddler indeed have the ability and willingness to persist when they are interested in what they are doing and when they initiate those experiences. Children's ability to self select activities means that children are focusing in on what's interesting or engaging to them and therefore spend much longer attending to a single activity that they might otherwise (Johnson, 2010). Children learn concepts more deeply when they can sustain their attention and focus.

Experiences that would not have happened outdoors

Lastly, but certainly not least, are the many, many opportunities and experiences that children had outdoors that would have been lost had they not had the opportunity to go outside. Adults in general are much more protective of infants and toddlers than they are of older children, as they need to be, but this is often over extended when it comes to allowing these very young children to go outside and explore. There is also a common misconception that many adults hold that children do most of their learning indoors (Banning & Sullivan, 2011). The evidence presented in this paper strongly refutes that notion. There were so many skills infants and toddlers developed in the outdoor classroom, many of which were unique to being outdoors, but children would have been deprived of these if they were not spending significant time outdoors in a well planned, nature rich environment.

There is very little, if anything, that cannot happen outdoors but there are many, many experiences for children that cannot happen indoors (Bohling, Saarela & Miller, 2011; Child Educational Center, 2006). The skills infants and toddlers developed in the outdoor classroom were described in detail in this paper. While children can develop skills indoors, there are

countless opportunities for learning, unique to being outdoors and if children aren't outdoors every day for significant blocks of time, then that learning is lost.

Children can't directly experience the effects of wind and rain when they are indoors. They can observe weather phenomenon through the window but they cannot feel the wind in their hair, hear the rustle of the leaves in the trees, feel the rain on their bodies and smell the dampness of the earth or reach out and touch a puddle. They lose the experiences of exploring the plant life and natural wildlife found in and around the outdoor classroom. Plants can be brought inside for children to explore, but they are static and predictable and the wildlife found under rocks, on the trees and in the dirt can't be replicated indoors. They lose the opportunity for spontaneous discovery in the predictable environment indoors. They don't have the opportunity to move their bodies over the uneven ground or scramble up or down a hill or move big branches when they are indoors. Teachers can set up opportunities for physical movement inside, but these also become predictable and routine, losing important elements of discovery and challenge.

Children need ample time outdoors to engage in unstructured play and opportunities to engage in exploration and discovery of nature. When we keep children inside for long periods of time we are simply robbing them of the wonderfully rich and thought-provoking experiences they could be experiencing in the outdoor classroom: robbing them, in essence, of the opportunities to learn.

Recommendations

There are some clear recommendations coming out of this research for our target audiences: parents and teachers, administrators, the field of early childhood and educators of higher learning and policy makers.

Parents and teachers/care givers of young children:

- Take children outdoors more, every day if possible. Go out into the backyard, nearby park or botanical gardens. Let children experience weather, mud, sticks, rocks and wildlife.
- Give children the gift of time; time to investigate, to explore and to wonder; time to get lost in their work and to work until they are finished.
- Take a closer look at your own philosophy and practices. How often do you go outdoors with your own child or a group of children? How many excuses do you find to stay indoors? How many opportunities do children have to explore nature outdoors? Take the time to examine your own beliefs about the importance of nature in the lives of children and make changes to your routines and practices.
- Examine the outdoor space(s) you use regularly with children. Bring in additional natural materials for children to explore such as sticks, branches, rocks, plants, dirt, mud and sand.
- Allow children the opportunity to take discrete risks while reducing or eliminating the hazards from their environment. Go out in the rain, let them explore with all of their senses, let them push themselves physically, climbing up on a rock, in a tree or on a log.
- Go outside with the children and be near them but stay out of their way. Let them take the reins on their play, problem solving and discovery but be there with them to share in the joy. Be that caring adult Rachel Carson wrote about for the children in your care.

Administrators:

- Examine your center's written philosophy statement. Does it adequately discuss the importance of connecting children with nature? Does it support teachers taking children outdoors in all kinds of weather? Rewrite it if necessary to include language about the importance of children going outdoors.
- Educate parents and staff members on the importance of children spending time outdoors, if they aren't already on board. Use current research to support your philosophy.
- Take a deeper look at your outdoor spaces for children. Are they full of loose parts and natural materials for children to discover, manipulate and explore? Where are the opportunities for wonder? Engagement with nature? Begin to make changes with teachers to create more opportunities for children.
- Help staff make changes to schedules and routines to allow children freer and more frequent access to the outdoor space.
- Support teachers' efforts to bring in more natural materials for children. Provide additional funding, if necessary, to effect the changes that are needed.

Higher Education and the field of Early Childhood:

- Include course work on the outdoor classroom for Early Childhood degree programs. New teachers entering the field of early childhood should come into the workforce knowing about the importance of outdoor experiences for young children.
- Increase the class time spent on discussing the importance of the outdoor classroom. Include information on a well-planned, well-designed outdoor space,

the materials children have access to and the important role that nature plays in the development of young children.

- Conduct additional research studies on children's skill development in the outdoors to add to the growing body of research currently available.

Legislators and Policy Makers:

- Work with licensing agencies to add criteria that include the importance of the outdoor environment for young children, creating new guidelines for the outdoor spaces children use and the amount of time children spend outdoors.
- Add outdoor education and learning coursework to teacher trainings as a standard piece of teacher preparation in early childhood education.
- Create legislature and policies that recognize the importance of the outdoor environment for young children, creating more green spaces for children in neighborhoods that are devoid of parks or other nature based places for children to play.
- Dedicate funding to creating greener settings where children are spending the majority of their time.

Conclusion

Young children reap the rich rewards that nature has to offer when they spend time in a well-planned outdoor environment. They need an abundance of natural materials in a well-designed space, large blocks of uninterrupted time and caring adults to guide them in their discovery. They gain important skills and a deeper respect and love of nature as they have direct with the natural elements in their environment. Learning begins at birth and infants and toddlers need to have every opportunity to explore, engage, discover and wonder. "Infants and toddlers

are born scientists, born explorers, born to learn what they need to know to succeed in the environment in which they find themselves” (Johnson, 2010). Young children deserve the opportunity to succeed outdoors; take them outside and let the magic begin.

References

- Arbor Day Foundation & Dimensions Educational Research Foundation (2007). *Learning with nature idea book: Creating nurturing outdoor spaces for children*. Lincoln, NE: Arbor Day Foundation.
- Banning, W. & Sullivan, G. (2011). *Lens on outdoor learning*. St. Paul, MN: Redleaf Press
- Barton, R. & Brophy-Herb, H.E. (2006). *Developmental foundations for language and literacy from birth to 3 years*. Rosenkoetter, S. E. & Knapp-Philo, J.(eds). (2006). *Learning to read the world: Language and literacy in the first three years*. Washington, DC: Zero to Three Press
- Bohling, V, Saarela, C & Miller, D. (2011) How can something this good be so simple: Supporting parent engagement in children's learning outdoors. Dimensions Educational Research Foundation. Lincoln, NE. Retrieve on 11/15/11 at <http://www.dimensionsfoundation.org/research/>
- Carson, R. (1956). *The Sense of wonder*. NY, NY: HarperCollins.
- Chalufour, I. & Worth, K. (2003). *Discovering nature with young children*. St. Paul, MN: Redleaf Press.
- Chang, L., Miller, D. & Veselack, E. (2011). Young children develop foundational skills through child-initiated experiences in a nature explore classroom: A single case study in La Cañada, California. Dimensions Educational Research Foundation. Lincoln, NE. Retrieved on 3/23/11 at <http://www.dimensionsfoundation.org/research/>
- Chawla, L. (1988). Children's concern for the natural environment. *Children's Environments Quarterly*, Volume 5, Number 3, 13-20.
- Chawla, L. (2006). *Learning to love the natural world enough to protect it*. Retrieved 1/12/12 at http://www.childrenandnature.org/downloads/Chawla_LearningtoLove.pdf
- Child Educational Center. (2006). *The outdoor classroom: Program development and staff training guide*. Los Angeles: Child Educational Center
- Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood*, Volume 5, 68-80.
- Copley, J. V. (2000). *The young child and mathematics*. Washington, DC: National Association of the Education of Young Children.
- Copple, C. & Bredekamp, S. (2009) *Developmentally appropriate practice in early childhood programs*. Washington, DC: National Association for the Education of Young Children

- Creswell, J. (2007). *Qualitative inquiry & research design*. Thousand Oaks, CA: Sage Publications.
- Dannenmaier, M. (1998). *A child's garden: 60 ideas to make any garden come alive for children*. Portland, OR: Timber Press
- Galinsky, E. (2010). *Mind in the making: The seven essential life skills every child needs*. New York: Harper Collins.
- Johnson, J. (2010). *Babies in the rain: Promoting play, exploration, and discovery with infants and toddlers*. St. Paul, MN: Redleaf Press
- Kellert, S. (no date). Reflections on children's experiences of nature. Children & Nature Network. Retrieved on 8/16/11 at http://www.childrenandnature.org/downloads/CNN_LWS_Vol1_02.pdf
- Kellert, S. (2002). Experiencing nature: Affective, cognitive, and evaluative development in children. *Children and Nature*. Kahn, P. H. & Kellert, S. (eds). MA: Massachusetts Institute of Technology.
- Louv, R. (2005). *Last child in the woods: Saving our children from nature deficit disorder*. Chapel Hill, NC: Algonquin Books of Chapel Hill.
- Louv, R. (2011). *The nature principle: Human restoration and the end of Nature-Deficit Disorder*. Chapel Hill, NC: Algonquin Books of Chapel Hill
- McGinnis, J. (2003). Adventure playgrounds and outdoor issues. *Exchange Magazine*, Volume 23, Issue 3 No.150, 46-48.
- Miller, D. (2007). The seeds of learning: Young children develop important skills through their gardening activities at one Midwestern Early Education Program. *Applied Environmental Education and Communication*, 6, 49-66
- Miller, D. L., Tichota, K. & White, J. (2009) Young children learn through authentic play in a Nature Explore Classroom. Dimensions Educational Research Foundation. Retrieved 5/27/10 at <http://www.dimensionsfoundation.org/research/>
- Puckett, M. B. & Black, J. K. (2007). *Understanding toddler development*. St. Paul, MN: Redleaf Press
- Raikes, H. H. & Edwards, C.P. (2009). *Extending the dance in infant & toddler caregiving: Enhancing attachments & relationships*. Baltimore, MD: Paul H. Brookes Publishing Co.

- Rivkin, M. S. (1995). *The great outdoors: Restoring children's right to play outside*. Washington, DC: National Association for the Education of Young Children.
- Rosenow, N. (2005). *Helping children learn to love the earth before we ask them to save it: Developmentally appropriate environmental education for young children*. Dimensions Educational Research Foundation. <http://www.dimensionsfoundation.org/research/>
- Sobel, D. (1996). *Beyond ecophobia: Reclaiming the heart in nature education*. Great Barrington, MA: Orion Society
- Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.
- White, R. & Stoecklin, V. (2008). *Children's outdoor play & learning environments: Returning to nature*. Retrieved 5/28/10 at <http://www.whitehutchinson.com>
- Young, J., Haas, E. & McGown, E. (2010). *Coyote's guide to connecting with nature*. Shelton, WA: OwlLink Media Corporation.