

This Never Would Have Happened Indoors:  
Supporting Preschool-Age Children's Learning in a Nature Explore Classroom in Minnesota

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## Prologue

What good is a stick?

In professionally landscaped public spaces and neatly manicured suburban lawns, a stick might be considered debris. In a school setting, a stick might be considered dangerous – a tripping hazard or possible weapon. In a childcare space, a stick might be whisked away in the name of dirt and germ control. In the toy manufacturing world, the stick might be considered...well, nothing at all. It makes no sound, it is drab in its appearance, costs no money, and has no apparent function. The stick is inferior to brightly colored pieces made from hygienic plastic on toy retail shelves. The stick falls far short from the perfectly proportioned miniature toy replications of the adult world. It carries no gold-foil sticker stating its endorsement of educational value. It doesn't speak, flash, or even balance on its own.

So really now, what good is a stick?

To adults the stick may appear lowly, or even invisible, but in the hands of a child, a stick can be *anything*. It is graspable, portable, and plentiful. It can be a storyline prop, a construction tool, an accessory to scientific inquiry, and a music maker. It might be humble and it might be free, but to a young child, the stick is anything but simple. We know this because children have shown us – *in ways that never would have happened indoors.*

## **Introduction**

Current literature suggests that when children play outdoors, the opportunities for learning and skill development are endless. Children engage in social interaction with one another to work cooperatively, share ideas and solve problems (Burdette & Whitaker, 2005; Hart, 2002; Kellert, 2002; Malone, 2003; Maxwell, Mitchell & Evans, 2008; Thompson & Thompson, 2007; White & Stoecklin, 1997; Wilson, 2007). These social interactions with peers often inspire rich dialogue and complex language (Frost, Wortham & Reifel, 2001; Maxwell et al., 2008).

Children exercise mathematical and scientific thinking as they investigate patterns and sequence, explore cause and effect, and experiment with elements in the outdoor environment (Burdette & Whitaker, 2005; Hewes, 2006; Olsen, Hudson & Thompson, 2009). Children manipulate materials to learn principles – sometimes very sophisticated principles – related to construction and engineering (Derr, 2006; Lester & Maudsley, 2007; Wardle, 2000).

Children make meaning of the world through imagination and creative representation (Blizard & Schuster, 2004; Hart, 2002; Moore, 1989; Wilson, 2007). As natural curiosity and inspiration is ignited outdoors, children use kinesthetic movement to gather and use materials, test physical limits, and carry out child-initiated play themes (Fjortoft, 2004; Lester & Maudsley, 2007; Wardle, 2000; Wilson, 2007).

Often, children are developing these skills simultaneously (Miller, Tichota & White, 2009) with multiple skills working together in an interdisciplinary fashion (Stephens, 2007). As children construct a “castle” out of tree limbs they share ideas through language, experiment with concepts of size, scale, weight and balance, move hands and bodies through space to manipulate objects, and work cooperatively on a shared plan all at the same time.

Many of these skill development opportunities can be attributed to the unique qualities of outdoor environments that set natural spaces apart from indoor settings. Open spaces allow for voices that can be louder and movement that can be bigger (Frost et al, 2001). A greater range of sensory stimulation occurs outdoors (Olds, 1987) that is different from the predictable walkways, consistent lighting and controlled climates of the indoors. Forgiving ground cover surfaces allow children to take risks, test physical limits, and explore in unique ways.

A study at the University of Texas found that outdoor environments can have a greater influence on symbolic play than indoor environments due to natural materials and spaciousness (Shin & Frost, 1995). Natural environments provide “a richness and level of complexity that is impossible to duplicate” (Stephens, 2007, p. 5). Opportunities for manipulation and exploration are built in. Outdoor environments often afford a larger degree of freedom for child-initiated activity and a smaller degree of adult control (Sutterby & Frost, 2006).

The opportunity for learning and skill development within outdoor play, however, depends greatly on the environment. Many “traditional” outdoor play environments designed for children are comprised of static playground equipment that limits multi-faceted skill development due to the fixed, unchanging nature of the structures (Blizard & Schuster, 2004; Hart, 2002; Lester & Maudsley, 2007). Many experiences in natural play spaces are not available in traditional playgrounds (e.g., plant discovery, natural topography, messiness, wildlife) (Stephens, 2007). Safety concerns and litigation fears have resulted in the “dumbing down” of traditional playgrounds, perpetuating a growing decline of opportunities that cultivate developmental benefits (Sutterby & Frost, 2006).

The contrast to traditional playgrounds that provide a limited platform for skill development are natural environments that contain a variety of dynamic materials that children

can move and manipulate (e.g., sticks, rocks, dirt). Nicholson (1971) is credited with establishing the theory of “loose parts”, the phrase commonly used to describe such materials, characterized this way by Lester and Maudsley (2007)...“The theory of ‘loose parts’ proposes that the possibilities for play, interaction, exploration and discovery, creativity, etc. may be directly related to the number and kinds of features in the environment” (p. 29).

Children prefer action-oriented materials over static equipment (Ihn, 1998). Natural materials are what captivate young children in outdoor spaces. They allow for more creative and constructive play than most built environments (Lester & Maudsley, 2007). A 2008 study of the impact of natural materials on preschool children’s play behavior found that the introduction of loose parts into an outdoor play space inspired a wider range of skill development, especially for socio-dramatic and constructive play (Maxwell et al., 2008). Natural materials in the form of loose parts simply allow children to engage more deeply with the environment at hand (Moore, 1989):

Natural materials that are alive, ever changing and renewing themselves have very high play value. They stimulate imagination and fine muscle coordination through play with vegetation parts, sticks and dirt. They engage children in problem solving when making clubhouses from natural materials. They support large muscle activities through games like hide-and-go-seek played among bushes and weeds and in climbing rocks and trees (p. 100).

Though many have cited skills that children are developing in outdoor settings in an anecdotal way, little research has been conducted to identify these skills through rigorous field documentation. Taylor and Kuo (2006) suggested we may have leaned in favor of intuition

versus research, though “overall, there is a great deal of encouraging evidence linking green space to important developmental outcomes” (p. 126).

Previous studies have focused on an older age range of children versus a particular emphasis on early childhood (Blizard & Schuster, 2004; Broda, 2007; Lester & Maudsley, 2007; Malone & Tranter, 2003; Moore, 1989; Titman, 1994; Young, 1990). Though studying the skill development of older age groups is a vital contribution to the literature, it is important to consider skill development in early childhood for the potential impact on access, materials, curriculum, and design.

The environments within which studies have taken place vary greatly. Some have observed play in “wilder” spaces with minimal to no design intervention (Derr, 2006; Derr, 2002; Fjortoft, 2004; Kytta, 2006; Wardle, 2000). Other studies have been conducted in existing school or childcare settings that have had natural materials added to their outdoor environments (Ihn, 1998; Maxwell et al, 2008; Shin & Frost, 1995). A third group of studies has been conducted in intentionally designed outdoor environments, in which a set of formal design principles has been applied (Broda, 2007, Malone & Tranter, 2003, Miller et al., 2009; Moore, 1989, Sobel, 2008; Stephens, 2007). The range of environments should be considered as study findings are reviewed.

Some authors have formally called for expanded research to gain more empirical insight into the health and academic benefits of outdoor play (Burdette & Whitaker, 2005; Kytta, 2006; Taylor & Kuo, 2006). Hewes (2006) called for “more tools to assess the quality of (outdoor) play environments and experiences” and stated a need to “articulate the learning outcomes of (outdoor) play” (p. 6). In addressing the lack of research on materials and their role in children’s

outdoor play, Maxwell (et al.) noted that “the role of specific physical features of play equipment and materials in outdoor settings has received scant attention” (p. 37).

The purpose of this qualitative case study was to explore preschool children’s (ages 3-5) skill development in a Nature Explore Classroom. Data were collected by teachers who closely observed children’s play outdoors, providing in-depth inquiry related to preschool-age children that has had limited representation in the literature. Our goal was to go beyond the intuitive commentary prevalent in the literature to pursue rigorous, systematic analysis of children’s skill development and their use of materials. Four broad research questions guided our inquiry:

1. What skills were children developing in their play in the Nature Explore Classroom?
2. How did children’s choice of materials influence their play and learning in the outdoor setting?
3. What types of learning or development would not occur indoors because of materials available exclusively in the outdoor setting?
4. How did children respond to naturally occurring materials as opposed to those intentionally placed in the Nature Explore Classroom by teachers?

This study explored the skills young children developed in an intentionally designed outdoor classroom as they engaged with a variety of natural materials. The Nature Explore outdoor classroom model, collaboratively developed by the Dimensions Educational Research Foundation and the Arbor Day Foundation, uses an established set of research-based principles to guide the design of outdoor environments for young children (Learning With Nature Idea Book, The National Arbor Day Foundation and Dimensions Educational Research Foundation, 2007). Nature Explore designs are based on the premise that young children need to explore,

touch, manipulate and experiment in order to understand (Hart, 2002). The designs of many traditional playgrounds and other outdoor play spaces do not incorporate this philosophy.

The list of potential benefits to children interacting with nature in outdoor environments has gained academic and public attention in recent years, due to the release of new studies linking outdoor time to health and learning outcomes. Researchers have concluded that interaction with green spaces has a positive influence on children's concentration, impulse control and delayed gratification (Taylor & Kuo, 2006). Other studies have found that increasing rates in myopia (nearsightedness) (Mertens, 2009), pediatric asthma and allergies (Akinbami & Schoendorf, 2002; Ring, Kramer & Behrendt, 2005), and childhood obesity (Bouchard & Katzmarzyk, 2010) can be positively affected by increased outdoor activity and play.

To realize these benefits, however, children need to spend time outdoors. Recent studies of media influence and time use indicate that children are spending approximately half the amount of time outdoors as they did a decade ago (Hofferth, 2008), a phenomenon that helped launch the phrase "nature deficit" (Louv, 2005) into the public domain. Site-specific Nature Explore outdoor classrooms address this growing decline in outdoor exposure and acknowledge the increasing amount of time many young children are spending outside of home environments (e.g., in childcare settings and educational programs). Little research, however, has been dedicated to the investigation of learning outcomes in intentionally designed outdoor environments such as Nature Explore Classrooms. This study will add to the literature by exploring the value of these spaces in supporting children's learning.

A number of authors have noted deficiencies in the literature related to the learning outcomes children realize through outdoor play and interaction with natural materials. The qualitative data collection tools and analysis structures used in this study drive a deeper

understanding of learning outcomes. The careful investigation of natural materials used by children in this study addresses the lack of literature devoted to the components of quality outdoor environments that support skill development. These contributions bear implications for a wide range of stakeholders.

The findings of this study will be useful to parents and caregivers, educators, administrators, policy makers and funding entities. Parents and caregivers, eager to provide high-quality learning experiences for children, will learn how daily contact with nature promotes development – socially, cognitively, emotionally and physically. Recognizing the ability of simple, open-ended natural materials to promote creativity and sophisticated thinking will also be useful to parents and caregivers as they consider the toys and equipment placed in home and care environments.

Skill development in the Nature Explore Classroom occurs across learning domains. Unique properties of outdoor learning (e.g., space to move and manipulate large materials, high levels of child-initiated activity, broad opportunities for sensory exploration) can support curricular objectives in ways that complement and expand indoor learning. High stakes testing is a reality within the current educational system. Evidence of learning outcomes in outdoor settings should reassure educators and administrators that optimal learning is not limited to indoor environments. We will also discuss the balance between risk-taking and safety – helpful to teachers and administrators as they consider supervision and instruction dynamics. Skill development implications for children with special needs will also be helpful to those within the early childhood special education community.

The results of this study will be helpful to policy makers and funding entities as decisions and dollars are applied to children’s programming and the design of children’s environments.

The breadth and depth of children’s skill development found in this study substantiates the value of “unplugged” time in nature, as it relates to the benefits children are realizing outdoors. This information will help policy makers and funding entities counteract the pull to market technology use to younger and younger age groups. Tangible evidence that outdoor play is vital to children’s development will allow this study to serve as a vehicle of influence for those equipped to reach a wider audience.

### **Research Approach**

The research approach we used in this study was a qualitative single case study (Creswell, 2007) to understand the significance of children’s play and interaction with materials in the Nature Explore Classroom (NEC). Our study was conducted at one early childhood education program that was purposefully selected. The study was conducted in collaboration with the Dimensions Educational Research Foundation in Lincoln, Nebraska. The Forest Lake Family Center was selected because of its association with Dimensions and the fact that its NEC was created in 2007 and had been in use for three years. In September 2009, all staff members were trained to closely observe and record children’s activities in the NEC.

Seven teacher/co-researchers documented their observations using a standardized format referred to as Nature Notes (*Appendix A*). Early childhood and parent education teachers at the Forest Lake Family Center recorded Nature Notes from September 2009 – May 2010. Co-researchers submitted a total of 60 observations for analysis. Observations of preschool age children (3-5 yrs) comprised the majority of the data although older children in the infant/toddler program were also observed. All of the observations used in this narrative met the following criteria:

1. Children observed were at minimum 2.8 yrs of age.

2. Children were observed in an outdoor setting, primarily in the Nature Explore Classroom at the Family Center. Occasional exceptions included other areas of the school grounds.

Nature Notes were often accompanied by teachers' sketches, children's drawings and photographs.

We analyzed the Nature Notes over a period of nine months to identify skills children were developing in the NEC. Along with skill development, we also examined the materials children were using, areas on the NEC that children were using, teacher or parent involvement during the observation, the children's gender and weather conditions at the time of the observation. We returned the analysis to teachers to be used in parent/teacher conferences and children's portfolios.

We analyzed each Nature Note systematically, spending an average of 20 minutes on each observation initially. Using a specific analysis form for each Nature Note (*Appendix B*) we examined the materials children were interacting with, the knowledge and emotions they were communicating, and the skills they were practicing and developing. These skills were categorized in seven domains:

- Math
- Science
- Language/Literacy
- Kinesthetic
- Social/Interpersonal
- Intrapersonal
- Construction/Engineering

Our analysis also noted the teacher's role in supporting children's learning and what we felt was most significant about the observation. Later in the analysis process we identified additional skill domains that emerged, including creative representation and visual-spatial skills.

We analyzed our data in numerous ways to identify patterns across the 60 Nature Notes. In this process we compiled lists of all the skills we observed and the materials children used. We also noted the number of observations that documented child-initiated activities as opposed to adult or teacher-initiated activities.

## **Findings**

### **The Site**

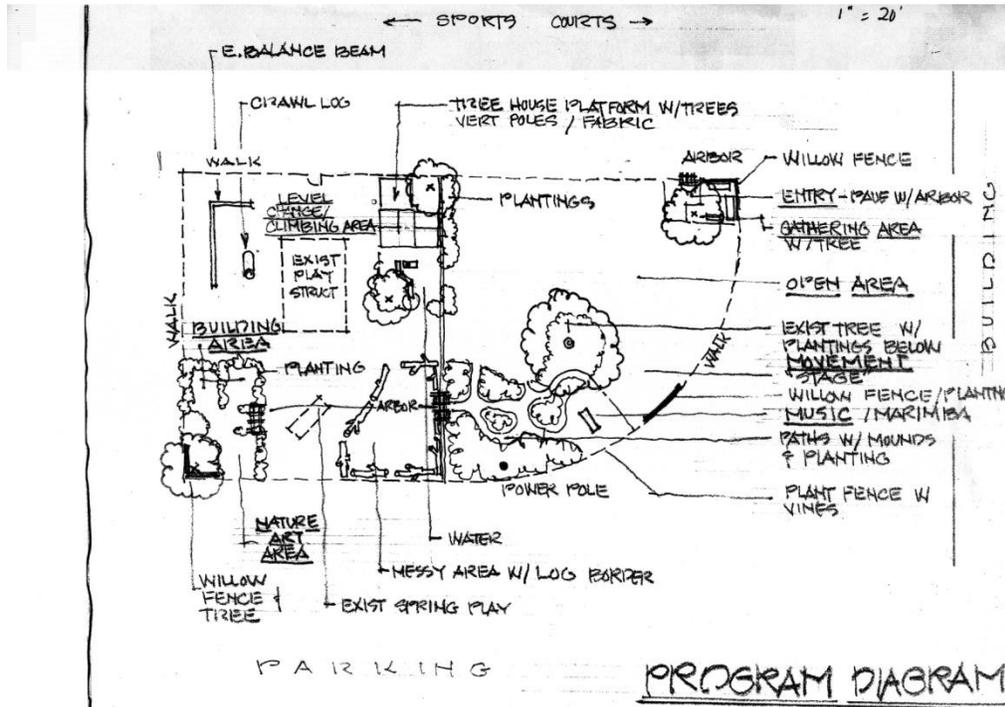
The Forest Lake Family Center is part of Independent School District 831(Forest Lake Area Schools) and is located in Forest Lake, Minnesota. The Family Center serves families with children from birth to five years (or until they enter kindergarten). The building that currently houses the early childhood programs of the Family Center also serves as home to a K-6 Montessori program, the Strive program (an alternative setting for grades 7-9), and the Alternative Learning Center for grades 10-12. Set in an established residential neighborhood the grounds of the building allow for a generous dedicated outdoor space for the preschool programs as well as access to a small wetland, residential streets and open fields.

The Family Center offers a variety of programming to any child in the school district, with varying levels of involvement. We offer full integration for children with a variety of abilities and income levels. Approximately one-third of our preschool children are supported by early childhood special education staff and over 50% receive financial assistance. Forest Lake Area Schools is one of the largest districts in Minnesota geographically, encompassing 273 square miles. Eleven towns, cities or townships lie within the district boundaries.

Family Center programming was established in 1989 as part of a statewide network of school based programs for young children and their parents. Involving families through direct parent education classes is a hallmark of the Minnesota Early Childhood Family Education (ECFE) and School Readiness programs, which receive partial funding from state aid and local levy dollars. Along with these state wide programs the Family Center also offers additional preschool classes, home visits, family literacy services, intervention services and early childhood screening. The teaching staff in Forest Lake consists of early childhood and parent education teachers. All are licensed by the Minnesota Board of Teaching and hold at minimum a four year degree, with 75% holding graduate degrees in their respective fields.

In the spring and summer of 2007 the Family Center began the process of transforming the existing outdoor space into a certified Nature Explore Classroom. The space was certified in October of that year and has continued to evolve and develop since that time. Following the guiding principles established by Nature Explore, our NEC provides children with an outdoor space similar to a well-designed indoor classroom with defined areas of learning. The Nature Explore Classroom includes areas designated as Music and Movement, Climb Crawl and Balance, Messy Materials, Open Area, Building Area, Pathways and Plantings, and Nature Art Area. Each area provides particular resources and materials so that children can engage in activities in that area, but the design does not constrict children's imagination or freedom to move from area to area (See Figure 1 for the NEC design sketch).

Figure 1: Nature Explore Classroom Design



The Nature Explore Classroom at the Family Center is a flat space, relatively small in size, defined by chain link fencing around the perimeter. It is surrounded on the north and west by the K-6 Montessori playground. The south side borders a sidewalk and driveway, and another sidewalk and the building define the space on the east. The only changes in elevation are in the form of three small mounds that have come to be known as “the toddler hills”. They were constructed using discarded sod and dirt when planting beds were initially installed. The hills are a wonderful place to experiment with balance and motor planning and are a favorite place for even the youngest children. Ground cover consists of mulch and grass. Willow fencing, large birch tree branches and ivy planted along the fence soften the existing chain link fence and the view of hard surfaces, buildings and the primary parking lot for the building.

Although the surrounding neighborhood has a variety of mature trees, none exist within the preschool space. In the initial construction of the NEC, six trees were added to an existing tree that had been planted five years earlier. An additional tree was added in 2009 and another in 2010 for a current total of nine trees in the space. Since all of the trees are immature, messy materials such as sticks, logs, tree cookies and stumps are intentionally placed in the space as part of the design.

From the basic beginning of the NEC in October 2007, the program has added numerous features along with the trees. We installed the dirt digging area and arbor in 2008. The next year (2009) we added two large feature logs, small activity tables, and a memorial area with a birdbath, plantings and a bench. In the spring of 2009, we doubled the size of the dirt digging area to accommodate more children, because of its popularity. Most recently (2010) we added raised bed planters, entry flags and storage.

Prior to the development of the Nature Explore Classroom, the preschool outdoor space consisted of commercial climbing equipment, a plastic playhouse, an empty plastic sandbox, a grassy area with a picnic table and one lone tree. The playground was primarily used as large motor space with the expectation that children would run, chase and climb. Teachers usually scheduled a short amount of time outdoors and only in favorable weather. Use of the space was very limited in the colder months, which comprise the majority of the school year at this site.

The installation of the Nature Explore Classroom has produced significant changes in how children and teachers perceive the use of outdoor spaces. Children go outside each day unless weather is prohibitive. Parents have learned to send the full complement of outdoor gear every day and have come to expect that children will come home with evidence of their outdoor adventures such as mud-stained knees, pockets of wood chips and dirt in their pant cuffs.

Teachers see the outdoors as a place for children to explore, develop complex play themes, experience rich sensory input and find focus in a less confined space. Most importantly they have discovered that outdoors is a place of learning and focus that offers opportunities that may not be available in the indoor classroom.

One of our teachers illustrated the change in her thinking when she described her response to a particularly noisy and chaotic day in the classroom. Instead of shushing and chiding the children to settle down, her first thought was to get them outside. She quickly bundled up the snack for the day and took the children outdoors to enjoy a calm moment over crackers and conversation. As she stated, “A few years ago outside would have been the last place I would have taken a group of children who were wound up. Now I know that just being outdoors can really help them focus and calm down.” (Endthoff, R. Focus Group Interview: April 2010).

The development of the Nature Explore Classroom is a very visible symbol of one of our program’s focus points; connecting children and families with nature. This focus is also reflected in our curriculum for children and parents as well as the design of our indoor spaces. Over the past three years teachers and parents have come to fully embrace the value and benefits of outdoor learning, play and discovery for the children at the Family Center.

### **Key Research Themes**

As we analyzed the Nature Notes recorded by teachers, two broad themes emerged: Developing Skills in the Nature Explore Classroom and The Role of Materials in Skill Development. As we dug more deeply into the rich details provided in the data, a series of sub-themes became evident. Table 1 provides an overview of the two themes and related sub-themes.

Table 1: Overview – Themes and Sub-themes

<b>Key Research Themes/Related Sub-Themes</b>	
<b>Skill Development</b>	<ul style="list-style-type: none"> <li>• <i>Social/interpersonal</i></li> <li>• <i>Kinesthetic</i></li> <li>• <i>Language/Literacy</i></li> <li>• <i>Math</i></li> <li>• <i>Science</i></li> <li>• <i>Construction Engineering</i></li> <li>• <i>Creative Representation</i></li> <li>• <i>Intrapersonal</i></li> <li>• <i>Visual-Spatial</i></li> </ul>
<b>The Role of Materials In Skill Development</b>	<ul style="list-style-type: none"> <li>• <i>Naturally occurring</i></li> <li>• <i>Permanent features/equipment</i></li> <li>• <i>Added to NEC by teachers/parents</i></li> </ul>

### **Key Theme - Developing Skills in the Nature Explore Classroom**

The first key theme that emerged in our analysis addressed the skills young children were developing in the Nature Explore Classroom. We identified over 1200 individual skills in 60 Nature Notes. We examined children’s skill development in nine learning domains, identified as sub-themes in this study (identified on Table 1). In this section we have included 18 observations (taken directly from teachers’ Nature Notes) that illustrate children’s skill development in the Nature Explore Classroom. While we have selected two Nature Notes to illustrate each skill, we recognize that this categorization is somewhat artificial. In reality, each observation describes skills children are developing in multiple domains simultaneously. However, we have selected specific Nature Notes to highlight particular skills. Each narrative, describing a single observation, is followed by an examination of the specific skills children were demonstrating. In the following narratives, we substituted pseudonyms for children’s names in order to protect their identity.

### **Social/Interpersonal Skills**

Fifty-four (90%) of our teachers' Nature Notes illustrated specific social skills children were developing as they interacted with other children, adults, materials, and nature in the outdoor classroom. For example, during their play children engaged in often elaborate conversations with their peers. They worked and played together cooperatively. They asked questions, asked for help, and asked for turns. They made their needs and requests known. They helped others by modeling specific skills for peers. Children assumed leadership and follower roles, and sometimes those roles changed fluidly within the context of the same activity. Children imitated and learned from one another. They were inclusive in their play, often inviting peers to join them and welcoming peers who inserted themselves into an activity. They dialogued with each other and engaged in problem-solving together. They built on each other's creativity as they expanded their play scenarios. Often they accomplished tasks through teamwork. They shared ideas, experiences, space, and materials in the Nature Explore Classroom with little to no conflict. The following observations illustrate some of the social skills children were developing through their play in the outdoor classroom.

#### **Building a Tent and Bonfire**

The teacher observed four children building in the messy materials area. Billy (age four) announced to Britta (age three): "I'm building a tent." Billy and Britta worked together to collect tree cookies to add to the tent. Britta placed her tree cookies inside and announced, "We have food for our tent." As four-year old Liza entered the play, Britta added, "We are making bonfires." She noticed that Liza was attempting to carry a large log and said: "I will help." They carried the big log together, one at each end, moving toward the tent. Billy greeted a fourth child, Osvaldo (age four) who entered the play and explained, "We are building a tent." Osvaldo stood

and watched for awhile, then found a log to add to the bonfire. Liza asked Britta, “We’re making bonfires, right?” Billy countered, “No, we’re making a tent.” Britta responded, “We’re all strong, let’s get more, let’s do it together.” Billy said, “Somebody help me” (Bigelow, R. Nature Notes: September 2009).

These children demonstrated teamwork as they collected tree cookies together and shared the weight of a large log to add to their tent and bonfire structure. They offered help and asked for help in appropriate ways. They shared their ideas and plans with each other and allowed new children to enter their play. When there was disagreement over what was being built, Britta redirected the group’s focus from potential conflict to the benefits of working together. As was often evident in our Nature Notes, as children played together they used inclusive language (i.e., “we”, “our”, “let’s”) and each child had the opportunity to contribute to their collaborative effort.

### **Dragging Trees**

Five-year-old Adam was trying to pull a recycled Christmas tree (live trees had been donated by families after the holiday season) across the music and movement area, but it was too heavy for him. He approached the teacher and said he needed help. When the teacher asked what he needed help with, Adam replied, “Moving the trees to the forest.” The teacher responded, “Let’s ask friends to help.” Adam then went up to a group of three boys, ages four and five, and said, “Help me.” The three boys immediately came over and together the four pulled several trees into a circle. One boy asked, “What is it?” to which another replied, “A dungeon.” Adam said, “No, it is a knocked down forest.” Satisfied, the boys began to move around and in and out of the trees (Bigelow, R. Nature Notes: February 2010).

When Adam asked the teacher for help in moving a heavy tree, she encouraged him to ask friends for help. Trusting her advice, Adam proceeded to ask a group of peers for help, without needing further support from his teacher. The group not only cooperated to help Adam move the first tree, but expanded the play to move several more trees. The plan for what they were creating was not clear to all in the beginning (i.e., “what is it?”), but as the structure was completed, the boys shared their ideas with each other. In the end, the group deferred to Adam’s original “forest” idea without challenge as they moved about their shared structure together.

### **Kinesthetic Skills**

The Nature Explore Classroom provided rich opportunities for children to develop fine and gross motor skills, and to engage in whole body movement. This was evident in almost all of our Nature Notes (59/98%). The space and materials provided opportunities for children to develop body awareness and body competence through practice (i.e., repetitive activities and trial and error). Children developed body awareness in relation to their own physical abilities and an awareness of their bodies in space and with other objects and people. They used their hands and bodies as tools, and learned to manipulate tools with their bodies. They engaged in a variety of fine motor activities (e.g., drawing, painting, tracing, sifting through soil with their hands, threading), non-loco-motor activities (e.g., transferring materials from one container to another, sitting in the dirt area using hand trowels, stacking materials, wrapping/tying), and loco-motor activities (e.g., walking, running, climbing, jumping, rolling, dragging heavy objects, carrying and gathering materials). Children manipulated sticks of various sizes, lengths and weights, pushed and pulled objects to designated locations, and had ample opportunities to test their physical limits. The following two examples illustrate the kinds of kinesthetic experiences children engaged in regularly in the NEC.

## **Raking Leaves**

A group of 10 children worked together to figure out how to share four rakes in moving leaves into a pile. Some children tried counting to 10 as a way to measure turns, while others decided to help by grabbing leaves with their hands. When children saw the teacher using her feet to push leaves into the pile, some chose to imitate her. As a group the children decided to create one large pile instead of several small piles. It was a windy day, so occasionally the leaves would blow away and the children would have to redo their raking. When they decided the pile was large enough, the children jumped in. They were careful to watch out for others, but were “okay” with occasionally landing next to or on a friend, smiling and laughing as they jumped in the pile (Endthoff, R. Nature Notes: November 2009).

These children demonstrated a variety of kinesthetic skills as they moved leaves into a community pile. They used tools with their bodies as they worked together to creatively solve the problem of how to share the rakes (also social/interpersonal), they expanded their options by engaging their hands and feet as tools. When they observed their teacher’s foot movement, they responded by purposefully imitating the action. They used both fine motor skills (grabbing leaves, grasping rakes) and gross motor skills (jumping, piling, raking). Children demonstrated body awareness as they watched for others before they jumped into the pile, and the teacher indicated that they maintained a positive attitude even when they misgauged their action. This task allowed children to engage in a whole body activity that would not have been practical indoors.

## **Playing Pirates**

Four five-year-old boys pretended to be pirates in the messy materials and building areas. Doug said, “There – the treasure is over there” (pointing to a bush). As Anthony moved under the climber, he instructed his friends to “Look at the map” (referring to a tree cookie he was holding – also an example of creative representation), which indicated that “the treasure is over there”. Doug ran to join Anthony. A third boy, Frank, looked at his tree cookie and added: “There’s more treasure over there” (pointing to the fence in the building area). A fourth boy, Andrew, sat on top of a log and announced, “This is my ship. A pirate ship. Hey guys, over here! Treasure’s over here.” Frank, Doug and Anthony came running. They all sat on top of the log together. Anthony looked at his tree cookie, got up and urged: “C’mon guys, we have to go find more treasure.” Doug agreed, “Yeah, let’s go...over here,” and he ran back under the climber (Matlon, M. Nature Notes: October 2009).

The fast pace evident in this Nature Note suggests that these children used many kinesthetic skills as they moved about the outdoor classroom as “pirates”. The boys picked up, held and manipulated tree cookies as maps. They practiced agility and balance when they climbed and sat on top of a large log. The log became a 100% scale (in relation to their bodies) “ship” that they could use with their whole bodies. They used full-body movement and coordination to run from one place to the next, carrying their tree cookie treasure maps in their hands as they moved. They adapted to a variety of levels as they moved their bodies on top of the log and under the climber. The pace of the movement flowed naturally as the boys adjusted their actions to carry out a playscape of their own design.

We identified kinesthetic skills in every Nature Note but one. Running was the most frequently cited kinesthetic skill. The kinesthetic skills culled from our analysis suggest that

children in the NEC were indeed using a great deal of large or gross motor body movement (balancing, climbing, crawling, jumping). However, beyond these types of large body movements, children were also using a broad range of smaller, fine motor skills to carry out more focused, precise tasks (drawing, drumming, painting, pouring, wrapping and tying fabric, digging with hand trowels). Fine motor kinesthetic skills were more material-driven, with children using tools and natural play props that inspired particular types of movements.

### **Language/Literacy Skills**

Fifty-seven of our Nature Notes (95%) illustrated that children were developing language/literacy skills as they interacted with peers, adults and materials in the outdoor classroom. They engaged in rich verbal conversations and story telling. They developed vocabulary and shared their knowledge as they labeled items (e.g., an “ant castle”, a “habitat”, “Muskie”, a “secret lair”, a “dungeon”, a “forest”, “a tassel”). They used words like “magical” and “crystallizing”, used similes (e.g., snow looks like frosting, “it’s round like a ball”), and described their observations (e.g., “it looks old”, “it has big leaves”, “it’s a big garden”). Often children in the NEC verbally narrated their actions as they worked (e.g., “I’m dumping snow on the bush”, “I’m painting it”, “I’m decorating my house”, “I’m digging a hole”) and verbalized their plans (e.g., “I’m gonna make an airplane”, “I’ll get us some food”). Children gave instructions to their peers (e.g., “You have to get it wet”, “you pat it down”, “quick, close the door”) and shared ideas (e.g., “let’s go to the moon”, “we need a fire”). They used language to state their intentions and needs (e.g., “I just want to help”, “I want red”, “I need a carrot”, “I want to sing, too.”). Children observed letter shapes in tree limbs and created sketches, drawings and paintings, often inspired by nature. They connected concepts they had learned previously

from books to observations they were making outdoors. The following two examples illustrate ways children were developing language/literacy skills in the NEC.

### **Exploring “Y’s”**

Three four-year-old boys were playing in the messy materials area when one noticed a letter “Y” shape in part of the large climbing log. “Look, a “Y,” said Nathan. Jayden thoughtfully responded, “I have a “Y” in my name.” Alex said (to the teacher), “Hey, I go to the “Y” with my Daddy.” Nathan said, “Yeah, let’s make more “Y’s” and Alex urged, “Let’s get some sticks.” Jayden watched for awhile, then helped carry some sticks that the boys used to create more “Y” shapes (Endthoff, R. Nature Notes: September 2009).

In this simple exchange, children revealed much about their emerging literacy skills. They recognized the letter “Y” in a large, natural feature in the Nature Explore Classroom and transferred what they knew about that letter to a variety of situations. Through close observation (also a visual-spatial skill) one child recognized a “Y” shape in the climbing log and announced it to his friends. This prompted a second child to make a correlation between the letter “Y” in the large forked log and a letter in his name. A third child made a more abstract, auditory match to the “Y” in YMCA, demonstrating an awareness of letters as symbols. As a group, the children translated their knowledge of “Y” as a two-dimensional symbol to three-dimensional representations made from tree limbs. The children told stories and used conversation to expand the concepts they were exploring, which led to their quest to collect more sticks to create additional “Y”s.

### **Watercolors in the Snow**

Toward the end of February, four girls, ages four and five, chose brushes and watercolor paints from a basket the teacher had supplied. They ran over to a large, clear patch of snow.

Jackie urged Lily, “You have to get it wet – here, watch.” Jackie stroked the brush across the snow, then across the watercolors. She did this several times. A yellow streak appeared in the snow. Hannah said, “Hey, it’s working.” Lily did the same thing with her brush. Jackie marveled, “Look at all that wetness”. Asia speculated, “It’s snow water” and Jackie echoed, “Yeah, snow water”. Hannah announced to her friends, “I’m making a fun picture,” as she painted with red, back and forth across the snow. Jackie told her friends, “I want black,” and Lily said, “Me, too.” Hannah laughed adding, “Me, three”. Then Jackie said, “I want red now.” (Matlon, M. Nature Notes: February, 2010).



These girls used verbal language to communicate instructions to each other (i.e., “you have to get it wet”), articulate observations (i.e., “look at all that wetness”), label their work (i.e., “a fun picture”), and state their desires (i.e., “I want black”, “I want red now”). As the girls played cooperatively, they used language to affirm and acknowledge their peers’ actions. They experimented with descriptive language (i.e., “wetness”, “snow water”) and narrated their play as they painted on the snow. When Lily used an inclusive phrase, “me, too,” Hannah used humor to follow with, “me, three.” In doing so, Hannah demonstrated a sophisticated awareness of

homophones (long before she has the vocabulary to call them such) – that “too” and “two” sound alike, but have different meanings.

### **Math Skills**

Many of our Nature Notes (45/75%) noted specific math vocabulary words children were using and early math skills they were developing. These positive, early experiences with mathematical concepts and language provide a rich foundation for later learning. In their documentation, teacher/co-researchers described children experimenting with angles, making comparisons, identifying shapes, counting, sequencing, estimating, and measuring. The outdoor classroom provided children with rich opportunities to understand whole-part relationships (e.g., parts of trees and whole trees planted in the NEC, parts of plants and whole plants they could observe first-hand). Children had opportunities to learn about scale relationships and size concepts. They physically experienced math concepts as they played (e.g., height, depth, length, weight, quantity, lines, slope, temperature) and used early math vocabulary (e.g., “there is only one”, “a lot”, “dig it deeper”, “too big”, “we need lots”, “big enough”, “it’s full”, “pretty heavy”). The following observations illustrate the kinds of math skills young children were developing in the NEC.

### **Planting Pumpkin Seeds**

A preschool class (comprised of four-and five-year-olds) took a bowl of pumpkin seeds (from a pumpkin they had explored the day before) outside to plant in cups. The teacher asked, “Does anyone know what a pumpkin plant looks like?” Alecia answered, “It’s round with a stem that goes around, I think.” “It has big leaves.” Nolin added, “It gets pumpkins on it.” The teacher showed children a picture of a pumpkin plant in a book. Jade asked, “Can I plant?” The teacher asked her, “What do you need to plant?” Jade replied that she needed “dirt,” and Nolin added,

“Pumpkin seeds. A cup.” Jade carefully put dirt in a cup. She looked through the bowl of pumpkin seeds and picked out two. She pushed them into her dirt. “What are you doing?” asked David. The teacher prompted: “Can you tell David what you are doing?” and Jade explained, “Planting seeds, pumpkin seeds.” Anna came by and added, “We went to the pumpkin patch. I got corn seeds.” (She pulled out kernels of corn from her pocket.) Jade added, “I got pumpkins at my house.” David said, “I found three different size seeds – small, big and middle size” and added, “I’m going to plant these.” (Matlon, M. Nature Notes: October, 2009).



When the teacher asked what a pumpkin plant looks like, children demonstrated an awareness of part-to-whole concepts as they identified stems, leaves, and pumpkins. Alecia demonstrated an awareness of shape when she used the word “round” to describe a pumpkin. Children illustrated their ability to identify patterns when they connected having pumpkins at school, pumpkins at the pumpkin patch, and pumpkins at home. They also discovered a pattern between two types of seeds – pumpkin seeds and corn seeds (a classification skill). Children experienced quantity in a tactile way as they selected seeds with their fingers for planting and

volume as they filled their cups with soil. They used descriptive vocabulary to articulate size differentiation – “small, big, middle size”.

### **Pumpkins on the Akambira**

Three-year-old Bella was tapping on the akambira (a small marimba-like musical instrument) in the Nature Explore Classroom when she noticed some straw and several small pumpkins nearby. She gathered an armful of small pumpkins and lined them up, one by one, across the keys of the akambira. Bella then proceeded to knock them down and then replace them – an activity she repeated several times. When the teacher asked Bella to tell her what she was doing, Bella replied, “It’s a sidewalk.” The teacher continued, “Where does it go?” and Bella explained, “To the Dairy Queen. They’re getting a drink of pop. The big one in front, the little one in back.” Bella then picked up a small ear of harvest corn and began to stroke the large pumpkin. “I’m painting the pumpkin yellow, green and blue. I have a pumpkin at my house. It’s really big.” Bella then gathered an armload of straw and began covering the pumpkins with it. When the teacher asked about the straw, Bella replied that she was covering the pumpkins, “So the bears don’t get them” (Wilcox, S. Nature Notes: November 2009).



As Bella gathered and placed small pumpkins on the akambira, she created a line parallel to the keys of the akambira. She later identified her creation as another kind of line – a sidewalk. She used positional words, “front” and “back,” to indicate where the pumpkins existed within the line. As she worked with the pumpkins, she was physically and visually experiencing the mathematical concepts of quantity, size, weight, diameter, and shape. She explored the concept of patterns, both physically (knocking down and replacing the pumpkins in a repeated fashion) and mentally (pumpkins are at school, pumpkins are at home). Bella demonstrated her understanding of size concepts as she used math vocabulary (i.e., “big”, “little” and “really big”). She explored the concepts of area as she filled the surface of the akimbira, and height, depth, width and length as she worked to protectively cover the pumpkins with straw.

### **Science Skills**

Seventy-five percent (45) of our Nature Notes documented specific science skills children were developing in the Nature Explore Classroom. They learned first-hand about animals, insects, birds and their natural habitats. Children learned about their environment as they physically experienced changing weather conditions and about lifecycles as they observed the changing seasons. They went outdoors in ice, snow, wind and sun, on wet days and dry days. They classified types of birds, animals, plants and trees. They physically experienced scientific concepts such as force, compression, gravity, and friction. Outdoors children had the opportunity to observe cause and effect relationships (e.g., the effect of wind on a pile of leaves, the effects of weather on plants). They regularly used close observation skills (e.g., examining animal tracks, examining the growth of seeds, observing living creatures) and had many opportunities to engage in scientific inquiry (e.g., “I hear a bird, where is it?”, “what is it?”). They noted changing weather conditions (e.g., “it’s icy”, “it’s sunny”). As they used their bodies and

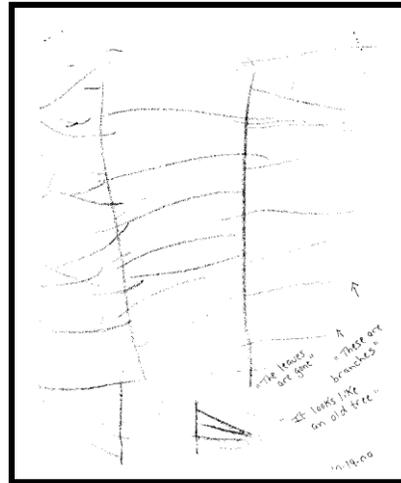
materials in the NEC, children speculated and hypothesized, and tested their hypotheses. The examples below illustrate science skills children were developing in the NEC.

### **Changing Seasons**

During group time a preschool class of four-and five-year-old children discussed the seasonal changes that occur when fall arrives. After their teacher read a story about fall, the class went outside to explore the changes that were taking place in the Nature Explore Classroom. Connor noticed, “That tree is losing its leaves... It’s dead, I think.” Elsa looked up at the big tree and added, “It looks old.” Phoebe said, “My friend’s tree lost its leaves...I jumped in the leaves. Do you know how tall? It was up to this monkey bar” (she pointed to the exact spot). Elsa asked the teacher, “Can I color?” She drew a tree, and identified it as “the old tree on the playground.” She then drew a picture of “a Christmas tree.” The teacher asked, “What else do you see that has changed?” Elsa answered, “The flowers are dead.” Connor added, “Yeah, they’re all dead,” and Jack noticed, “There’s no bees anymore.” Connor agreed: “I don’t see any bees.” Phoebe observed another phenomenon and announced to her friends, “There’s colored leaves (pointing to a tree) like in our book” (Matlon, M. Nature Notes: October 2009).

An indoor group discussion and a story about seasonal changes prepared children to focus their attention when they entered the Nature Explore Classroom. They observed signs of the life-death cycle in trees first-hand, as they noticed “colored leaves” and trees losing their leaves. They made connections between the trees at school and trees in other places (“My friend’s trees lost its leaves.”). They demonstrated an understanding that plants die at the end of the growing season (e.g, they observed “dead flowers”). They noticed the absence of insects (i.e., bees) that had inhabited the outdoor classroom in warmer months. In her drawings of two trees – one from a visual image, one from a mental image – Elsa demonstrated an awareness of

tree classification, labeling one tree (deciduous) as “the old tree” and a second tree as “a Christmas tree” (evergreen).



### **Bees on a Sunflower**

Four-year-old Cale had been playing in the Nature Explore Classroom. He ran to line up at the gate when all of a sudden he stopped by the sunflowers and said to the teacher, “There are two honey bees on the flower collecting honey...Oh no, I think they’re fighting.” The teacher asked, “Why do you think they are fighting?” Cale answered, “Because one is pointing his stinger at the other. The one that uses his stinger is going to die.” His teacher asked, “How do you know this?” and Cale responded, “My daddy told me so.” (Endthoff, R. Nature Notes: September 2009).

Cale used close observation skills to locate bees on a nearby sunflower, even as he was running. He used descriptive classification skills when he referred to the bees specifically as honey bees. He also exhibited some understanding of honey bees’ role within the ecosystem (i.e., “collecting honey”). He illustrated his awareness of bee anatomy by identifying “stinger” and conjectured over how the bees were using their stingers (i.e., “the bees are fighting because they are pointing their stingers at each other”). He formulated a hypothesis to interpret a natural

phenomenon as he speculated about what would happen next in the lifecycle of a honey bee (i.e., “the one that uses his stinger is going to die”). As he observed the bees in their natural habitat he contemplated life/death themes, allowing nature to guide him into deeper abstract thinking.

### **Construction/Engineering Skills**

Almost two-thirds of our Nature Notes (38/63%) described construction and engineering skills children were developing as they interacted with materials in the NEC. They built, modified and decorated structures. They used a variety of materials to create a cabin, a fort, a castle, an airplane, a nest, a crocodile house. They created pathways and walls, and built towers. They used skills identified on the construction typology created by Dimensions Educational Research Foundation including balancing, combining/connecting parts, covering, piling, propping, making lines, making enclosures and stacking. Children also created plans, selected spaces and materials to carry out their plans, and engaged in activities that included both construction and de-construction. These examples illustrate specific construction and engineering skills preschool age children were developing in the NEC.

### **Making an Airplane**

Two four-year-old boys, Jake and Robert were building in the messy materials area. The teacher asked Jake what he was doing with the logs. He answered, “I’m gonna make an airplane.” He took longer limbs and put them over and across the large climbing log. Robert joined him and put tree cookies in a circle. Jake told Robert he was making an airplane, and Robert identified the tree cookies as “steps to the airplane”. Robert said, “We are both pilots,” as he climbed in front and Jake climbed in back. Jake picked up a tree cookie as he climbed on the plane and after he sat down, he turned it around and around in his hands. “I’m driving,” he said.

Robert had a longer limb he was moving back and forth. He called it a lever (Bigelow, R. Nature Notes: September 2009).

Jake engineered “wings” for his “airplane” (also creative representation) by carefully placing long limbs across the top of the large climbing log. As he lifted the heavy limbs, he experimented with angles as he laid the limbs in perpendicular lines, attempting to balance them on top of the log. When Robert joined in the play, he used his knowledge of perimeter to place tree cookies in a circle around the log to create his version of “steps”. Clearly he was thinking about what the “users” would need to board the “airplane.” The boys learned about scale relationships as they created a 100% scale airplane that they could physically climb into.

The actions of both boys suggest they had some first-hand knowledge of airplanes. Jake’s narrative description of “driving”, and his round and round hand motions made it clear that he had fashioned a steering wheel from a tree cookie, possibly indicating his awareness that airplanes move along the ground in addition to flying in the sky. He demonstrated that he was considering various parts of the airplane as he created a structure with a particular function in mind. Robert shared the word “lever” with his friend; not a common word in a four-year-old’s vocabulary. His purposeful back and forth motion of the large limb that he called a lever suggests prior knowledge of a lever’s basic movement. Creating the airplane structure allowed both boys to experiment in a meaningful way with both the form and function of building.

### **Building a Cabin**

John, Alecia, Laura, and Noah were dragging large, recycled Christmas trees to the open area to make a “cabin.” They placed the Christmas trees end to end, creating an enclosed space. Two other children, Doug and Chris, came over screaming, “Shipwreck! We’re dinosaurs and bad guys!” Alecia said, “no bad dinosaurs allowed” as Doug growled, “Roar!” John barked out

an order, “Quick, close the door, so the dinosaur monster can’t get in!” He moved a tree as if he was closing a door. Noah suggested to his friends, “Let’s make this (cabin) smaller to hide better.” Alecia cautioned, “Don’t make it too small – we need 5, 6, or 4 people in here.” They moved two trees to make their structure smaller (Endthoff, R. Nature Notes: February 2010).

These children demonstrated a variety of construction skills as they created a “cabin” with large Christmas trees. They had some concept of a design in mind and collectively gathered materials to create their “cabin.” They used their understanding of an enclosed space to create a walled structure out of the recycled Christmas trees. John demonstrated his knowledge of functionality (i.e., the need for users to have an entrance) and engineered a working “door” from one of the trees. The children explored concepts of size and scale as they worked through the problem of how to construct a space that was small enough to hide in, but large enough to fit their entire group (i.e., “5, 6, or 4 people”). They modified their original structure by removing two trees. This example also illustrates the relationship between math and construction skills. These children estimated the number of trees they would need to create a 100% scale structure that would accommodate the number of children in their group. They changed the size of the area by subtracting trees from the structure as they estimated how many trees they could remove and still keep it large enough for multiple bodies. During the construction process they also physically experienced the weight, length and height of the trees as they placed them in a circle (geometric shape) in the open area. They experienced the concept of positionality, i.e., inside and outside space, as they created and used an enclosure.

### **Creative Representation Skills**

Almost half of teachers’ observations (27/45%) illustrated children’s symbolic thinking. This was especially evident in their transformation of one material to another. For example,

pieces of wood became rocks, animals, and a castle. A tassel of grass became a duster. Tree cookies became a bridge, a ladder, steps, a steering wheel, a “rolly rock” to take to the forest then a “frog thing” – used as a lily pad, a treasure map, a ladder to a house, a horse’s tail, French bread and toast. Snow became frosting, a piece of ice became a magic crystal, leaves became food for frogs, and woodchips became a dog treat and ants. Children also transformed “found objects” into tools and musical instruments. Later in this paper we note the multitude of creative ways children used sticks. Open-ended, natural materials sparked children’s imaginations and fostered their creativity. The examples below illustrate children’s emerging creative representation skills.

### **The Old, Empty House**

Tony and Lauren, age five, ran from the climber to the messy materials area in the Nature Explore Classroom. Lauren crawled into an existing teepee structure. Tony followed. Lauren said, “This is an old, empty house...I’ll go get us food.” She ran out of the teepee and stabbed at a nearby shrub with a stick. She ran back to the teepee structure and pretended to hand Tony some food. “Here, deer,” she said. Lauren again ran out of the teepee to the big log and poked it. “We need fire,” she said. She poked and dug at snow under the log. She then used her stick like a saw and pushed and pulled it back and forth on top of the log. Tony came out of the teepee and said, “I’ll make a fire, too.” He picked up a stick and mimicked what Lauren was doing with her stick (Matlon, M. Nature Notes: January 2010).



Lauren and Tony carried out an interesting survivalist theme in their play, fashioning pretend tools that helped supply the most basic needs of food and warmth. Lauren used her imagination to pretend that the

teepee structure was an “old, empty house”. She assumed a caretaker role by offering to go get food. At that point she picked up a stick and used it for three specific representations (demonstrating the fluidity of her symbolic thinking). First she used her stick as a hunting tool, apparently for deer. Second, she transformed the stick into a poker to stir an imaginary fire under the large log. When she announced the need for fire, she used the stick as a saw, moving it purposefully back and forth across the large log, as if cutting wood. Her peer, Tony, imitated what his friend was doing and transformed a second stick into a saw to help build a “fire”.

### **Sunshine in a Can**

Three-year-old Jorge approached his teacher in the Nature Explore Classroom with a watering can in his hand. He said, “I’m growing a garden.” When the teacher asked, “Where?” he pointed to a 3’x 6’ area where the snow was sprinkled with dried pine needles. He pretended to pour water on the needles as he said, “It’s growing. I need to water.” The teacher asked, “What else do gardens need to grow?” Jorge replied, “I don’t know,” and the teacher replied, “Sunshine.” Jorge grinned and held up his watering can as he pretended, “This is sunshine.” He then used an imaginary watering can in his other hand to water (Pratt, S. Nature Notes: January 2010).

Even in the middle of winter, Jorge was drawn to create a pretend garden, inspired by a patch of dried pine needles that symbolically represented plants (likely left from the dragging of recycled Christmas trees). He used an actual tool (the watering can) to help care for his garden, but pretended that there was water inside. When the teacher helped him understand that gardens also need sunshine to grow, he quickly transformed his watering can into a container for “sunshine”. He adeptly transferred the task for watering to his other hand (using an imaginary

watering can since the actual can became “sunshine”), demonstrating a level of creative abstraction quite notable for a three-year-old.

### **Intrapersonal Skills**

Howard Gardner (1983), in his book *Frames of Mind*, identified intrapersonal skills as one of several learning styles or intelligences. Intrapersonal skills relate to the “self” and include developing an awareness of and sensitivity to our feelings, needs, wants, desires, strengths, potential, goals, and plans. They relate to executive functioning and self-regulation. They are the skills individuals need to manage themselves successfully and are considered a pre-requisite to interpersonal skills. The primary intrapersonal skills that emerged as we analyzed our data included: displaying individual initiative; making plans, choices and decisions; stating preferences and intentions, displaying sustained focus; taking risks and developing confidence; displaying the ability to think critically; displaying persistence, and problem-solving. The following examples illustrate some of the intrapersonal skills children were developing as they played in the NEC.

### **The Garden Nest**

Two four-year-old children played with dirt and trucks in the digging area. Collin announced, “We are making a garden nest.” The teacher asked him what a garden nest was and Collin replied, “It’s a place where plants grow up.” He added, “We need a river stream.” Anna came over and sat by Collin and he asked her, “Can you help me get this out?” (He was trying to get dirt out of the cement truck drum.) Together Collin and Anna tried to use a scoop to empty the cement truck. Anna got a big stick and started poking inside the drum. Collin said, “No, that’s too big,” so instead Anna found a rock and handed it to Collin. He instructed Anna, “Put it

on my shovel.” She put the rock on his shovel and found more (Bigelow, R. Nature Notes: November 2009).

Collin demonstrated his initiative in devising a specific plan to create a “garden nest.” When he encountered packed dirt in the cement truck drum, he asked Anna for help. Together they used critical thinking skills to solve the problem. They first tried to remove the dirt with a scoop, then Anna had the idea of using a stick. Collin used his critical thinking skills to evaluate the tool and determine that it was too big for the job. He confidently re-directed Anna, letting her know the stick would not work. Anna accepted Collin’s feedback, and persisted in identifying a third possible tool, rocks, and introduced them into the play. During this scenario both children were very focused and engaged in their play.

### **The Horse**

Three-year-old Jeffrey played on a “horse” that he had constructed with two other boys, using the large log in the messy materials area as the horse. Jeffrey brought over an 8” tree cookie to make a tail for the horse (also creative representation). He announced that the tree cookie was a tail, and he stacked it against the smaller, tapered end of the large log. He then proceeded to use his foot to drag a circle through the mulch around the entire perimeter of the log (approx. 10’ long and 16” in diameter) (Pratt, S. Nature Notes: October 2009).

While Jeffrey had initially constructed the “horse” with peers, it was his sustained focus that kept this three-year-old engaged in this play scenario. As he made the horse his own, Jeffrey demonstrated his initiative when he went in search of a material that could be used for a “tail”. He used critical thinking skills to determine what to use and to determine that the tree cookie tail should be placed at the “end” of the horse. He deliberately chose a material that was much smaller than the body of the horse, giving us some insight into his knowledge of horses. He had a

specific plan in mind and demonstrated a great deal of persistence in using his foot to create a circle around the entire body of the “horse” (a large log). Jeffrey’s teacher later added an addendum to this Nature Note, indicating that Jeffrey is “much more focused and organized when he plays outdoors (compared to) when he is inside.”

### **Visual-Spatial Skills**

We identified 47 Nature Notes (78%) that described ways children were developing visual-spatial skills as they played in the Nature Explore Classroom. In particular, they used close observation skills, noticing and examining natural phenomena on the NEC such as rocks, insects, flowers, ice, plants, leaves, trees, and soil. They used close observation skills as they noticed even the most subtle shapes and changes in the space. They exercised their visual memory (i.e., visual imagery was often a trigger) as they recalled past experiences and places they had been (e.g., “getting a drink of pop” at the Dairy Queen, going to the “pumpkin patch”), and linked their current discoveries and activities to previous knowledge. Children used visual-spatial skills to pay attention to even the smallest details on the NEC, such as seasonal changes. They used visual-spatial skills to navigate through the NEC, to gather materials, to visually analyze where and how to place materials, and to negotiate their bodies and materials around objects, other children and adults. Sometimes children used visual-spatial skills to translate their images of a three-dimensional experience or observation to a two-dimensional representation (through drawing, sketching, painting). The following observations illustrate the visual-spatial skills children were developing.

### **Going on a Shape Hunt**

A group of five five-year-olds took part in a shape hunt in the Nature Explore Classroom with their preschool class in March. Andrew looked at the sky and said, “Hey, it’s sunny.”

David noticed, “Look, those dead flowers (pointing to sunflower plants near the sidewalk) are circle shapes.” Andrew exclaimed, “The bricks are rectangles...so is the door!” Foster added, “The fence has diamond shapes.” Hanna, tapping into another sense, said “Hey, I hear a bird,” and wondered aloud, “Where is it?” Andrew speculated, “Maybe in a tree.” Hannah looked up into nearby trees and said, “Where? I don’t see it.” She picked up a forked stick and announced, “A triangle shape.” David was over by the teepee structure dragging a recycled Christmas tree. He laid it down parallel to other trees. He said, “A rectangle shape,” as he traced the outline of it with his finger. Anthony said, “Look (pointing to an oak tree trunk). See, a line down” (Matlon, M. Nature Notes: March 2010).

These children closely observed their surroundings to identify shapes in both the natural environment (i.e., sunflowers, sticks, trees) and in the built environment (i.e., bricks, door, fence). They were able to follow shape lines that were very clean and clear (e.g., the diamond shapes in the fence), as well as those that were more abstract (e.g., the rectangle line around the trees placed parallel to each other). They used their other senses to support their visual-spatial thinking (e.g., following an auditory cue to look up into a tree for a bird, tactilely tracing the line of a rectangle with a finger). Most of the shapes children found on their shape hunt were in pre-existing objects, but David used visual imagery to create what he identified as a rectangular shape out of trees positioned parallel to each other, filling in the outline of the rectangle.

### **Birds in the Sky**

On a cool, cloudy September day four boys (all four-years old) noticed birds flying in the sky. Timothy commented to his teacher, “Look at all the birds. There must be a million of them.” Leon added, “They are in a “V”.” Their teacher said, “I see all the birds. I wonder where they are going?” Leon speculated, “Maybe my house.” “No,” Timothy countered, “they go South.” The

teacher continued, “Why would they go South?” to which Leon simply replied, “I don’t know.” Timothy left briefly to play in another area and the teacher explained that birds “go South where it is warmer to find food and to eat.” Leon noted, “It’s cold.” And Henry added, “I eat food.” Timothy came running back to his friends and exclaimed, “Look, they’re in a circle now.” Harry watched the birds in a circle and added, “They don’t know where to go to find food.” When the birds changed formation a third time, from a “V”, to a circle, to a line Timothy considered the formation and said, “Now there’s a leader. Now they can get food.” Leon added, “They look like planes” and Timothy suggested, “Let’s be planes” as the children “left to go flying around the (NEC) as planes.” (Endthoff, R. Nature Notes: September 2009).

Timothy used visual-spatial skills to notice a group of birds in the sky, which gave him the opportunity to exercise his distance vision. Through close observation this group of boys noticed specific details about the birds’ changing formations. Leon associated the shape of the first formation with an alphabet letter (a “V”), then Timothy, who had been playing in another area, noticed the formation had changed to a “circle.” The boys continued to observe the birds and noticed a third formation when they formed a “line.” Leon then made a visual analogy when he announced that the birds looked like “planes”. These boys had the opportunity to contrast two very different visual perspectives – ground level and the sky. In the end, they used their visual-spatial skills to safely navigate (i.e., “go flying around”) the NEC classroom.

### **Simultaneous Skills: The Hunting House**

All 18 observations we have used to illustrate children’s skill development in the Nature Explore Classroom suggest that children were developing many skills simultaneously. This was evident in 100% of our 60 Nature Notes. For the purpose of this paper, we somewhat artificially dissected them to illustrate individual skills. However, the following Nature Note illustrates how

children were practicing and developing skills in multiple domains simultaneously as they worked together to develop a complex play theme. It captures the rich dramatic play of four five-year-old children during a 15-minute observation in January.

Travis picked up a stick and announced, “I’m going hunting.” The teacher asked, “What are you hunting for?” He replied, “Birds. Ones that are not flying. I see one over there.” He ran over to a recycled Christmas tree and poked at an imaginary bird with a stick. A second child, Oliver, came over to the nearby teepee structure and crawled in. Travis asked, “You checking it out? Wanna hunt with me?” as he joined Oliver in the teepee. Travis suggested, “Let’s stay in here – it’s getting dark, I think,” as he poked a stick out of the teepee. “Shhh...I see a deer.” Charlie, a third child, crawled toward them, barking like a dog. Travis said, “Charlie, noooo!” but Oliver suggested, “He can be our dog.” Travis agreed, “Yeah, but dogs stay outside.” Charlie crawled out barking and laughing. Then Oliver said, “Let’s make our fort bigger, guys!” and Travis agreed. Charlie returned making barking and panting noises. A fourth child, Libby, entered the play. She asked Charlie (still pretending to be a dog), “boy, want a treat?” and gave him a wood chip. She promised him, “I’ll come over and bring you a treat every day.” Oliver explained to Libby, “This is our hunting house.” And Travis added, “Yeah, and no dogs allowed inside – there’s a sign right there.” (He pointed to the messy materials area sign). Libby said to Charlie, “You can come with me, doggie – dogs are allowed at my house.” Charlie barked at the teepee door and Travis said, “OK, doggie, come hunting with us!” (Matlon, M. Nature Notes: January 2010).

In this dramatic play scenario, children demonstrated what they knew in an applied, authentic way. As Travis picked up a stick, he initiated a plan to go “hunting” (an intrapersonal skill). He confidently shared specific knowledge about hunting with his teacher, and used

classification (a science skill) to explain that he was hunting for “birds that (were) not flying” (a likely reference to pheasant hunting, common in this locale). Travis differentiated between math quantities in his vocabulary. He explained his plan to hunt for “birds”, “ones” that don’t fly (i.e., multiple birds), then identified “one” imaginary bird in a tree. He used his imagination as he discovered a bird in a tree on the ground, and later a deer (creative representation). As other children joined in the play, they assumed specific roles – Oliver became a hunting partner, Charlie became a dog, and Libby stepped in as caretaker to the dog (creative representation, social/interpersonal skills). Natural materials further inspired creative representation in these children’s play as a tree limb structure became a “hunting house”, a stick became a hunting tool, and a wood chip became a dog treat.

Within this group of older preschoolers, rich social exchange occurred, representing both the social/interpersonal and language/literacy domains. The children expressed themselves within their roles, experimented with notions of inclusion and exclusion, and demonstrated creativity and flexibility to accommodate a range of ideas. For Travis, this play scenario began as a solitary activity, but he invited Oliver into his play (“Wanna hunt with me?”). When a third child appeared, pretending to be a dog, while Travis initially said “nooo”, Oliver found a way to include him (“he can be our dog”). Travis agreed, but created a rule (“no dogs allowed inside”). A fourth child, a girl, entered the play and perhaps as a way to create a place for herself in this group of boys, immediately assumed responsibility for the dog (“I’ll bring you a treat every day”...“You can come with me...dogs are allowed at my house.”). In the end, Travis invited the “doggie” to go hunting with them.

Three children joined Travis in play. Even when they expressed different ideas and values, which could have resulted in conflict, they accepted each other’s differences of opinion.

They were inclusive in their actions and in their language (using words such as “our”, “let’s”, “us”). They also used a large variety of vocabulary words. Toward the end, Travis offered a wonderful example of print awareness (the messy materials sign interpreted as “no dogs allowed”).

### **Key Theme – The Role of Materials in Skill Development**

The second key theme that emerged in this research was the role of materials in children’s skill development. During the nine months of this study, teachers documented 92 different materials used by children in the Nature Explore Classroom. These materials fell into three sub-themes:

- Naturally occurring materials
- Materials introduced into the Nature Explore Classroom by teachers/parents
- Permanent features/equipment that were part of the NEC design

We will discuss each of these sub-themes and provide examples of observations that illustrate ways children used materials in the outdoor classroom.

#### **Naturally Occurring Materials**

Naturally occurring materials recorded in teachers’ Nature Notes included items such as dirt, snow, insects, plants, trees, grass and mulch. Materials such as plants, dirt and trees are constant in the Nature Explore Classroom although they take on different properties with the seasons. Other materials in this category, such as snow and insects, may only be available during distinct seasons. Children used dirt in many of the play scenarios along with shovels, pails and trucks.

In many of the observations that featured dirt, children were involved in digging activities, as one might expect, frequently using shovels and pails. Other dirt-related activity

included planting (both actual and symbolic), adding water to loosen dirt for digging or to create mud, and using toy trucks to manipulate and transport dirt. Children also used dirt as a ground cover surface to build a variety of structures in the dirt digging area (e.g., a “house for sale”, “garden nest”, “habitat” for frogs, “ant” and “butterfly castles”). Table 2 illustrates a sampling of ways teachers observed children interacting with dirt.

Table 2: A Sampling – Children’s use of Dirt

<b>Tch</b>	<b>Date</b>	<b>Dirt in Nature Explore Classroom</b>
SW	11/16/09	Child is filling pail to create a "habitat" for frogs. Frogs sleep until Christmas and then wake up for a little chocolate.
SW	10/26/09	Group of three children mixing water, dirt and sand - experimenting with consistency and wetness of the mixture - used a stick to "paint" on a nearby tree trunk to make it beautiful.
RB	11/10/09	Adding dirt, leaves and sticks to cement truck to create a "garden nest". Children needed to negotiate and use problem solving skills to resolve conflicts.
RB	11/6/09	Digging holes and putting dirt into cement truck to build a "house for sale".
RB	4/2/10	Digging dirt using shovels and pail - a group of children have differing opinions about where to dig and how deep to dig. Children exercise a variety of social skills to resolve differences.
SP	4/1/10	Teacher works with child with autism to create patterns with holes, dirt and water. Child is often non-responsive indoors but more verbal and participatory outdoors. Addition of patterns seemed to also be a positive.
SP	11/19/09	Child is digging a hole outdoors to dig flowers for the teacher. Pretends the hole and flowers are part of a big garden. Later creates a "garden" indoors using paper and leaves to make it real.
AD	10/20/09	Child experiments with filling different size buckets and trucks with dirt, transferring dirt from smaller to larger buckets and to truck. Pats dirt down to create space for more dirt.
MM	11/19/09	Children are choosing pumpkin seeds to plant. The discuss what a plant needs to grow.

### **Creating a Frog Habitat**

It was not unusual for children to spend significant lengths of time in the dirt-digging area. For example, in late fall, before snow cover and cold weather set in, Macy (age 3) headed

directly for the dirt digging area and remained there for the entire time her class was outdoors. She selected her tools, a hand-held shovel and pail and as she shoveled dirt into a pail told her teacher that she was “making a habitat”. Her teacher asked her “Who lives in your habitat?” and she quickly replied that it was a “habitat for frogs”. She worked for a long time, even adding leaves to the pail as “food” for the frogs to eat. When her teacher asked Macy how long the frogs stayed in their habitat, she confidently said, “they nap for long, long, long time, all the way to Christmas. When they get up, they go out to get a little bit of chocolate.” (Macy’s mom told the teacher that her daughter woke up every morning asking if that day was Christmas) (Wilcox, S. Nature Notes: November 2009).

The digging area provided a venue for a three-year old child to showcase her knowledge about habitats and frogs. She also incorporated a personal point of reference into her dialogue (i.e., Christmas) and her play became a storyline. The open-ended properties of dirt enhanced her imaginative story and allowed her to use the materials (dirt, shovel, leaves, pail) to develop an inventive, language-rich scenario. Macy had a specific plan that she initiated and was intentional about the tools she selected. She focused on the task at hand and stayed with the activity for a concentrated period of time, approximately 20 minutes (sustained focus – an intrapersonal skill).



In this example, the materials available on the NEC allowed a young child to exercise fine motor skills using a hand tool, and to physically experience the mathematical concept of volume in a dump and fill activity. Macy used symbolic thinking as she considered how to feed hungry frogs (i.e., leaves were food for her imaginary frogs – creative representation). In the

conversation with her teacher, Macy was prompted to conceptualize the length of time (a mathematical construct) frogs would stay in the habitat she had created as she connected that concept of time with a seasonal event that was approaching.

### **“I’m Painting the Tree to Make It Beautiful”**

The dirt-digging area provided children with rich opportunities to experiment. They experienced how loose or solid the material was, depending on the day and the season. They learned about the scientific properties of dirt; its weight, texture, color, smell, mass, and occasionally even its taste. Children’s experimentation was enriched with the addition of another element – water. For example, toward the end of October a group of three children (two girls, age three; one boy, age 2.9) played in the dirt digging area, adding water to pails of dirt with shovels. The teacher noted that the children were “fascinated” by their experimentation as they combined dirt and water to create new mixtures and consistencies. The children shared conversation as they mixed for three to four minutes. Then one girl, Martha, picked up a stick from nearby and began dipping it into the mud mixture in her pail. At this point she transformed her stick into a “paintbrush” and began to “paint” the trunk of a nearby tree with careful back and forth strokes. When the teacher invited Martha to describe what she was doing, she smiled and said, “I’m painting the tree to make it beautiful.” Soon after, the other two children found sticks and began “painting” too (Wilcox, S. Nature Notes: October 2009).

This Nature Note captured specific developmental tasks as they relate to younger preschoolers, featuring dirt as the driving material. During this observation, these children played independently as they shoveled and stirred, though they shared brief conversation. As they experimented with volume, quantity, and consistency (science and math skills), children very closely observed their peers. The leader-follower dynamic, a common theme in young children’s

play, became evident when children watched then followed as Martha shifted the activity, which began with a math and science focus, to an artistic focus (with an aesthetic goal to make the tree “beautiful”). Aside from a single question from the teacher, the children were left to complete the teaching-learning circle at their own pace. The open-ended nature of the materials and accessibility to them (including the availability of water) allowed these children to successfully pursue their plans. From the materials to the activity that ensued, the “messiness” of this scenario, valuable as it was, suggests it would not have happened indoors.

### **Materials Added to the Nature Explore Classroom by Teachers/Parents**

Teachers or parents intentionally added nearly two-thirds of the materials used by children (63 different materials) to the NEC. Most items were natural materials (e.g., apples, corn, pumpkins, sticks, straw, wood), while some were items traditionally found in an indoor classroom and transported outdoors (e.g., books, crayons, paper, water colors). In a more mature space items such as sticks, fallen logs, leaves and tree parts would occur naturally. Since the NEC at this site is relatively young teachers supplied these items to ensure that children had rich experiences with a variety of natural materials.

### **Sticks**

In terms of frequency, what we call the humble stick was the material most often recorded in teachers’ Nature Notes. Sticks appeared in nearly one-third of all of the documented play scenarios. Table 3 illustrates how sticks were used in the NEC. It is likely that the quantity, portability, and accessibility of sticks encouraged children to choose them as play props. Because of these features, sticks tended to migrate from one area to another, which made them a handy material of choice. Many of these “stick-centered” play themes were symbolic or make-believe in nature, and children demonstrated apt skill in creative representation.

Table 3: Children's use of Sticks

<b>Tch</b>	<b>Date</b>	<b>Sticks in Nature Explore Classroom</b>
MM	11/16/09	Sticks and branches used to build a fort, house, and jail. Children try to replicate the structure in future days.
MM	2/20/10	Child drags a stick through the snow to replicate the activity in the book "Snowy Day".
MM	1/19/10	Children create complex play theme with sticks - hunting with stick, poking at Christmas tree, hunting for deer out of a teepee.
MM	3/30/10	Child picks up a stick and identifies Y shape during a class "shape hunt".
MM	1/15/10	Two children use stick like a fishing pole to "pull the moon closer" in their travels to the moon. Stick also used as tool to "get food" – child pokes at bush and pretends to bring back deer meat. Stick becomes a saw to cut firewood.
RE	9/16/09	Children gather sticks to make Y shapes after identifying the shape in the climbing log.
RE	2/19/10	Children gather sticks to make a pretend fire.
RE	2/26/10	Child using stick to play a tune on akambira - another child brings a stick and tries to join in.
VB	9/23/09	Child uses large stick to compare length - his height compared to the height of the stick and the height of his mother.
RB	11/6/09	Digging holes and filling them with various materials - including sticks.
RB	11/5/09	Fishing for muskies - stick used as fishing pole.
RB	1/14/10	Placing long sticks against the fence to create a wall - structure became a castle and motor home.
RB	11/10/09	Mixing cement - building a garden nest. Sticks offered as an ingredient for the cement and used as a tool to help empty the cement mixer truck.
SW	11/9/09	Children building in dirt digging area - building structures that include an "ant castle with sticks on top".
SW	10/26/09	Children mix dirt and water to make mud. Stick used as a paint brush - dipping it into the mud and "brushing" it back and forth on a tree. Other children copy the activity and also paint with sticks "to make it beautiful".
SP	11/17/09	Child with limited verbal ability (autistic) is playing in sandbox using sticks, shovel, pail, pumpkins. He engages in conversation during side by side play with other children and teacher.
SP	11/10/09	Children and teacher use various objects - including a stick - to drum on a pail, trees, fence and akambira. Children compare sounds that the objects made.
SP	9/24/09	Children playing the akambira using sticks as mallets. They share sticks and show each other how to use them. They use grass tassels in the same way (comparative process).
SP	9/21/09	Using twigs to make a bird nest ("The birds will find them"). Child considers that because it is a windy day the birds will not be able to find the nest since the twigs will blow away.

## **Fishing for Muskies**

In this example, sticks were transformed into fishing poles. Initially Leo and Isaiah gathered large tree cookies (thin cross sections of a tree trunk) and spread them on the ground to represent water. Each of the boys selected a stick, and extended their sticks in front of them over open ground as they sat on the large log in the messy materials area. Leo initiated a conversation with his fishing friend Isaiah: “We are fishing”. When Isaiah agreed, Leo added more specifically, “We are fishing for muskies” (short for muskellunge, a member of the pike family, commonly found in the waters of the upper Midwest). Isaiah exclaimed, “Yeah, BIG muskies” and instructed Leo to “Pull the muskies up.” As the boys examined their imaginary muskies, Isaiah asked his friend’s opinion. “Is this a pretty big muskie?” (referring to an imaginary fish dangling from the end of the stick that had been transformed into a fishing pole). Leo responded, “We’re going to bring all the muskies home” (Bigelow, R. Nature Note: November 2009).

The play represented in this brief Nature Note is significant for several reasons. First, both boys demonstrated prior experience with fishing and the materials allowed them to share their knowledge. They understood the mechanics of casting, reeling and pulling in fish. They understood that fish are called by different names and that “muskie” is a type of fish (a classification skill) that can be found in local waters. They knew that fish must be a certain size to keep, and that bigger is better. The teacher who recorded this observation noted that these boys do not typically interact with one another in the indoor classroom. Perhaps it was the outdoor setting – as fishing naturally occurs outdoors – that helped inspire this increase in social exchange. Though the boys described threads of their play to the teacher, she was not otherwise involved. The boys were free to set the parameters of their play, and selected sticks as the primary tools for their exploration and expression.

In “fishing for muskies”, Leo and Isaiah used a stick for a single symbolic purpose. In other play scenarios multiple sticks were combined to build large structures (e.g., a castle, a motor home, a hunting shack, a fort, a house, a jail) and smaller structures (e.g., an ant castle, a fire, a bird’s nest). In some cases, sticks were used to explore math concepts (e.g., a child measured his height and then compared it to the height of his mother) and literacy principles (e.g., a group of children recognized the “Y” shape in the large climbing log and collected more sticks to create smaller scale letter shapes). Some children used sticks to create music and experiment with sound. Others used sticks for their sheer utility as a tool – to paint, to stir, to scrape, to drag, and to poke.

### **Seasonal Items**

Within the sub-theme of added materials, a sub-category emerged that is worth noting and that was the role of seasonal items in the Nature Explore Classroom. Where sticks and other messy materials are available more consistently throughout the year, seasonal items are added as seasons come and go and are more temporary in their availability. Seasonal items add authentic diversity to the outdoor classroom space, while maintaining the integrity of the season at hand. These materials were not only an asset for play in the outdoor classroom, but also helped children make valuable connections to experiences outside of school (e.g., “I have pumpkins at my house!” “My friend’s tree lost its leaves.” “I once raked leaves.” – direct quotes from Nature Notes). Seasonal items intentionally added by adults included such things as Christmas trees, pumpkins, apples, straw and corn. Table 4 illustrates how children used seasonal items as teachers observed their play.

Table 4: Seasonal Items in the Nature Explore Classroom

Tch	Date	Item(s)	Seasonal Items in the Nature Explore Classroom (Added by Teachers)
SW	11/2/09	pumpkins / straw / corn	Child recreates an event - lining small pumpkins up on akambira to represent her family walking down the sidewalk to the Dairy Queen. Uses a corn cob to "paint" a large pumpkin on the ground describing the colors that she is painting. She covers the pumpkins with straw to prevent the birds from "getting them from the woods."
RB	2/26/10	recycled Christmas trees	Child asks for help from peers to move trees - created a circle of trees to form a "dungeon" and "knocked down forest".
VB	9/24/09	basket of apples	Child works with parent using apples to count and measure.
SP	11/17/09	pumpkins	Child buries pumpkin and digs it up as a discovery.
SP	1/14/10	Christmas trees / pine needles & branch	Child shakes tree in an attempt to obtain "seeds" for the imaginary garden he is creating with pine needles in the snow. Uses two long evergreen branches to grow a "beanstalk".
MM	10/28/09	pumpkin seeds	Children plant pumpkin seeds that they had scraped out of a large pumpkin.
MM	1/19/10	Christmas trees	Large group of children create a "hunting house" structure with logs, sticks and trees.
MM	2/10/10	Christmas trees	Child pretends that the trees are "where they live" during imaginative play.
MM	2/20/10	corn cob	Child uses corn cob to stamp "tracks" in the snow. He also rolls the cob in the snow to create a different type of track.
MM	2/26/10	Christmas trees	Large group of children drag trees to create a large structure or "fort" to accommodate all of the children playing together.
MM	3/3/10	Christmas tree	Child creates a rectangle shape using trees during shape hunt activity.
RE	11/2/09	leaf rakes	Children rake leaves with child-sized rakes.
RE	10/19/09	gourds / straw / pumpkins	Child throws straw in the air. Covers (hides) a number of small pumpkins and gourds with straw and then challenges peers to find the "surprise". Children take turns hiding and finding.
RE	2/19/10	Christmas trees	Children use trees to make a "tree cabin".

## **The New Fort**

Winter can pose particular challenges to programs located in colder climates, as many forms of animal and plant life become nonexistent or inaccessible for a time. The intentional introduction of authentic materials can help supplement this wane in natural items. One of the best and most versatile of these materials came from a Bev Bos-inspired idea. Families were invited to donate their natural Christmas trees to the Nature Explore Classroom space in January. During the winter in which this study was conducted, 15 donated evergreen trees facilitated rich play well into early spring, including the following scenario that involved a large group of children – five girls and four boys, ages four and five.

On a previous day this group of children had constructed a large fort with the Christmas trees and upon returning to the Nature Explore Classroom, expected to find their structure intact. They arrived with hopes of resuming their play but quickly discovered that their structure had been dismantled. Informing the others in the group Ann yelled “Hey, someone moved our fort!” Patty added, wondering outloud, “Yeah, who moved it?” Linnea suggested that they move it back and pointed to another area of the NEC where there was space to re-create their fort. Four small children pulled the Christmas trees through the snow, sometimes by themselves, other times working together. They lay the trees end to end. Patty invited her classmates to come and check out the newly constructed fort. She pointed to a small opening in the trees “You enter here” she instructed the group and then demonstrated by walking through the opening. Four children ran over and walked through the doorway. Charlie preferred to observe from the outside of the fort and commented to his teacher, “Look at all the people in there.” He walked closer and stood on the outside of the fort, looking in. Linnea offered a new suggestion “Hey, I got an

idea...let's make a hotel" to which Patty replied, "Yeah, and we can put on a show" (Matlon, M. Nature Note: February 2010).

This play scenario demonstrated how bigger, heavier materials were used to create a



large-scale structure in the Nature Explore Classroom. Children quickly rebounded from their initial disappointment that their fort was moved, to initiate a new creation. They used large muscle (gross motor) skills to drag heavy trees to their intended destination,

individually and as a group. Children love to imitate adults. How amazing it must have felt for preschool children to move and manipulate entire cut trees – typically handled only by adults – all by themselves. These children shared knowledge of construction/engineering concepts and demonstrated skill in visual-spatial thinking (to move these large objects to a particular location and to create a walled enclosure with an entrance – they were clearly considering the “users” of this space as they created a fort large enough to accommodate the group and with an entrance/exit). They used rich vocabulary to identify features of their structure. Their play experience also involved several math concepts. They created a large-scale structure in a geometric (circular) shape by combining several (quantity) trees, which multiple children could fit inside (a physical experience with volume). It would be highly unusual to find a typical indoor classroom space that could accommodate nine children engaged in a single play theme, particularly with items as large, cumbersome and prickly as cut evergreen trees.

### **Permanent Features / Equipment**

The second sub-theme that emerged related to the key theme of materials was the role of permanent features and equipment in children's skill development. Permanent features or equipment were the static elements in the NEC that were familiar and known elements to children. They often provided gathering spots, security and inspiration for imaginative play themes.

### **Holiday Decorations**

On a winter day in December Padma (age five) picked up a loose piece of green fabric and held it in the air. She then wrapped it around her body and ran over to Janessa (age five) and announced: "Janessa, look I'm a Christmas tree!" Padma twirled around and Janessa followed her lead, trying to get another piece of fabric from the upright posts of the deck structure. Padma took the piece of fabric that she was wearing and wove it through the bottom of the climber. She said, "I'm decorating my house!" Anna (age five) offered to help and found a piece of fabric on the ground. Soon another child, Emma, joined the three girls as they "decorated the house for Christmas". Padma took a piece of fabric to the deck structure and wrapped it around a post. The rest of the girls soon followed, wrapping their fabric in the same way. Padma climbed up on the bench seat on the structure and began to sing. Janessa joined her as Anna stood in front of them and pretended to direct, moving her arms back and forth like a conductor. Padma called to her classmates: "Come see our show" (Matlon, M. Nature Note: December 2009).

In this example, the girls incorporated the climber and the deck structure into their play theme. These permanent, solid features on the NEC were transformed by children's imaginations into a house and a concert venue. Because of the features of this permanent structure these girls had a variety of kinesthetic experiences. Their play included large, whole-body movement as

they manipulated the fabric and covered a large amount of physical space as they moved between the two structures. They had opportunities to climb, experience different levels, and view things from multiple perspectives. In addition to developing gross motor skills, weaving fabric into the structure also allowed the girls to develop fine motor skills. In addition, they were able to explore the dynamics of peer relationships (including leadership and followership) using familiar references from their home environments as the foundation for their creativity.

## **Discussion**

We identified three key conclusions as we analyzed our teacher/co-researchers' documentation. First, *skill development and material use function in a very interconnected way* in the Nature Explore Classroom. Throughout the data, material use drove and supported skill development; as skills became honed, material use became more complex. This interconnectedness was particularly evident in the characteristics and types of play we observed. Second, we found *a high level of child-initiated play* supporting children's skill development, which bears strong implications for the role of adults in outdoor teaching and learning. Third, *specific material properties* have a significant impact on children's skill development and should be considered in the design of outdoor spaces for young children.

### **The Interconnection between Skill Development and Material Use in the Nature Explore Classroom**

The access children had to a high number of diverse natural materials allowed for a broad range of skill development. We know that complexity and variety are key qualities when considering natural materials for outdoor spaces (Wilson, 2007). Children used many open-ended loose parts in the NEC to support problem solving, imagination, and creativity in ways

that would not likely have occurred on a traditional playground or indoors. In the NEC outdoor play was no longer a time when staff stood back, detached from the action, and supervising from a distance. Rather, the outdoor classroom became a purposeful space for teaching and learning across the curriculum, as has been documented at other sites (Thompson & Thompson, 2007).

Teachers recorded Nature Notes in 13 different areas in the Nature Explore Classroom. The largest number of observations was recorded in the Messy Materials Area (19), followed by the Dirt Digging Area (13), the Open Area (11), and Pathways and Plantings (11). The number and variety of materials in the NEC design contributed to richer, more focused play, and less “run and chase”. The play that occurs on traditional playgrounds is often dominated by large motor activity, leading to the misperception that outdoor time is only good for “recess.” Children still run and chase in the NEC’s open area, but their play extends far beyond that basic activity.

As children manipulated different kinds of materials and honed their skills across the nine skill domains, we observed several play themes. Play activity fell into two broad categories: dramatic/creative scenarios (e.g., playing “pirates” with tree cookies as maps, creating a “cabin” with whole cut trees) and task specific themes (e.g., filling pails with dirt, dragging trees, going on a shape hunt). It was interesting to note that in a number of cases play scenarios reflected local culture (e.g., “hunting house”, “cabin”, “knocked down forest”, “muskie”) – an indication that children were developing an important “sense of place” (Lester & Maudsley, 2007) as they participated in outdoor activities.

Dramatic/creative play scenarios in the NEC often involved a relatively large number of children. On 11 occasions, teachers’ Nature Notes cited five or more children involved in a single play theme. Though it is typical for preschool children to play in dyads and triads, space

often limits the formation of larger groups in indoor settings. For many children, being part of a large group without the direction of an adult is a rare but valuable occurrence. The expectation is that conflict increases in proportion to group size. Yet this was not evident in our Nature Notes where relatively little conflict was recorded. When conflict did occur it was minor and was resolved through child-initiated negotiation.

Surprisingly, teachers observed some of the most complex, creative play themes during the winter months when snow covered the ground and some features of the outdoor space were unavailable. This was also the time of year when the largest number of children was observed playing together. The primary change to the space in winter was the addition of discarded Christmas trees donated by families. These trees played a prominent role in the complex play themes that developed during this time of the year, which underscored the impact that thoughtfully chosen, inexpensive, creative materials can have on children's skill development.

### **A High Level of Child-Initiated Play**

Children initiated the majority of play teachers observed in the Nature Explore Classroom. Only eleven (18%) of the 60 Nature Notes represented adult-directed activities. Many observations made no mention of the teacher or noted the teacher's presence in a very peripheral manner. It is evident that complex, adult-directed activities were not required to produce the type of rich skill development observed in our data. For young children, the emphasis of experience over information is important...“Too often in schools, we're trying to inject knowledge without providing the experiences that allow love (of the subject) to slowly take root then flourish...One transcendent experience in nature is worth a thousand nature facts” (Sobel, 2008, p. 13). Authentic learning requires access to real objects and open-ended materials that can be freely manipulated. Both are in abundant supply in a Nature Explore Classroom.

Authentic learning also requires children's investment and interest. This too is in abundant supply when children are encouraged to explore and discover as they choose (Hughes, 2001). Young children are instinctually drawn to learning that is concrete, experiential and touched by whimsy. The role of materials cannot be underestimated when creating an environment to support and encourage creative, authentic learning. The basic, un-prescribed qualities of natural items such as sticks and dirt require children to make "something of nothing". The limits to learning are restricted only by the depth of children's imaginations and resourcefulness. This is the very essence of critical thinking skills, which are highly valued yet elusive in education today.

Though the majority of play in the NEC was child driven, the data also provided excellent examples of the way teachers supported children's learning through inquiry, scaffolding and structured activities. These activities were often an opportunity to add experiential learning to concept learning that began earlier in the indoor classroom. This was most commonly accomplished in one of two ways: by teachers adding enriching materials to the space and/or by guiding children's inquiries and observations. For example, the teacher who documented the "Changing Seasons" Nature Note supplied children with books, clipboards, paper, and pencils to further the discussion about fall changes, a discussion that had begun indoors (Matlon, M. Nature Notes: October 2009). Within this context children were encouraged to use materials in any way they chose, transferring the power of the learning experience back to them.

Our data repeatedly demonstrated that teachers used guided observation to encourage children to dig deeper in their explorations and skill development. For example, when a child needed help moving a heavy tree, rather than stepping in to provide assistance, the teacher gently

redirected the child to ask a peer, knowing this would more fully support his social/interpersonal skill development (Bigelow, R. Nature Notes: February 2010). Teachers often used well-timed, open-ended questions to help children articulate and expand their understanding of concepts (e.g., “How are you planning to use the logs?” “What else do you see that has changed?” “How do you think you could get a turn?”). Within this supportive learning relationship, children were given control of their own learning. The teacher’s role was primarily to set the wheels in motion and allow children to follow their natural yearning for genuine learning experiences.

Concerns regarding safety and risk often accompany discussions of freedom and unrestrained learning. The literature describes the sometimes precarious relationship between adults needing to contain children in order to keep them safe, and children’s desire for freedom in exploration (Hart, 2002; Lester & Maudsley, 2007; Miller et al., 2009; Sutterby & Frost, 2006; Thompson & Thompson, 2007). Allowing children to engage in appropriate risk taking gives them the ability to manage their own safety more effectively (Hart, 2002).

Our data offered numerous examples of risk taking as teachers observed children maneuvering large logs and evergreen trees in cooperative groups, carrying sticks in active play, climbing on log structures, jumping from stumps, jumping from one tree cookie to another, and balancing logs and other loose parts while building. Rather than danger, these activities afforded children opportunities to develop body competence (spatial awareness and balance) and motor skills (muscle strength, coordination, and motor planning) – the very foundation for the personal safety skills that parents, teachers and caregivers so desire for the children in their lives.

### **The Impact of Specific Properties of Natural Materials on Skill Development**

To make further sense of the materials used by children in the Nature Explore Classroom, it is helpful to scrutinize the ways children’s play was affected by the properties represented in

specific natural materials. In the literature, many authors have referred to these properties in the context of *affordance* (Cosco & Moore, 2009; Fjortoft, 2001, 2004; Fjortoft & Sageie, 2000; Gibson, 1986; Heft, 1988; Kytta, 2006; Lester & Maudsley, 2007; Maxwell, et al, 2008).

Affordance is the range of functions environmental objects can provide to an individual (Fjortoft, 2004), addressing the relationship between perception and action (Cosco & Moore, 2009). “If a rock has a smooth, flat surface, it affords a person to sit; if a tree is well branched it affords the opportunity for a person to climb it” (Lester & Maudsley, 2007, p. 27).

In essence, affordance allows children to match material properties to their own behavior, development or ability. For example, the particular size, shape, and density of a stick may lead a toddler to choose it as a simple tool to support sensory exploration – the sound it makes when tapped on a rock, the notion of balance it provides to a new walker navigating uneven terrain, the visual indent it leaves in the dirt with a poke. For preschool children who are moving toward more abstract thinking, a stick’s physical properties (length, circumference, shape) allow it to symbolize real-life experience, as it did for the boys who used sticks as fishing poles in their quest for muskies. The particular size and sturdiness of sticks afforded the three children in the digging area use as stirring tools for mud, leading one child to craft a symbolic paintbrush with hers. Children learn about functional properties and about themselves by using materials according to their abilities (Cosco & Moore, 2009).

Given that tree parts (e.g., sticks, tree cookies, logs) and dirt were the most frequently cited materials in Nature Notes, could it be the sheer simplicity of these materials that afforded the greatest range of play and learning? If affordance “implies that people assess environmental properties in relation to themselves, not in relation to an objective standard” (Fjortoft, 2004, p.

23), might the “objective standards” set forth in many commercial toys and play props limit thinking, learning, and creativity?

Though most of the materials documented in Nature Notes were supplied and placed in the NEC by adults, children demonstrated that their use of those materials was not prescribed or predetermined. Use of specific guiding principles for an outdoor classroom design allowed teachers to intentionally set up the environment just as they would an indoor classroom. As in all good classroom designs that incorporate “best practice” strategies, the NEC design encourages exploration and discovery, while allowing children the freedom to choose what, how and where they wanted to play and what materials they wanted to use. Whether part of the original NEC design or added as seasonal artifacts, all of the materials in the NEC were chosen thoughtfully to promote child-directed learning. Placing authentic materials in a well-designed outdoor classroom affords all the benefits of free exploration coupled with the gentle support and guidance of caring adults.

### **Additional Implications**

Three additional implications in this study center around children with special needs, implications for high stakes testing within the educational system, and the ways we have come to define “toy” within our culture at large.

#### **Children with Special Needs**

As we began this study the experience of children with special needs was of particular interest since there is limited information regarding this population in outdoor settings. In focus group interviews teachers reported that children with sensory integration issues or who struggled to stay on task indoors were often calmer and more focused outdoors. Other teachers reported increased communication outdoors (Teacher Focus Group Interview: April 2010). Though this

study did not purposefully identify children with special needs in data collection, approximately one-third of the children at this site have been identified as children with special needs. We believe that teacher's anecdotal observations certainly warrant more research.

One valuable observation featured Jason, a four-year-old boy diagnosed with autism. Jason rarely spoke or interacted with other children in the first two months of the school year. After two months at school he was able to engage in his first-two sided conversation with the teacher while digging in the sand box with her and a classmate. His teacher noted that he also established eye contact more readily when engaged outdoors as compared to the indoor classroom. Later in the year Jason was able to direct the actions of a peer – again while involved in a digging activity using dirt and water. While placing water and dirt in a pattern he told a classmate to “Put it here, put water here”. His teacher noted that indoors “Jason sometimes sits facing a wall and corner. When asked to play, read or participate he says no.” She added her observation of this to the Nature Note: “It occurred to me there are no walls outside to hide by. I think this encourages Jason to move about, participate and communicate” (Pratt, S. Nature Notes: April 2010).

For this child the outdoor environment, coupled with the opportunity to dig was instrumental in his progress. Each time that Jason moved to a higher level of communication it occurred outdoors. Rather than seeing accessibility to the outdoors as a bonus when available, this child demonstrated that access to the outdoors was essential. Further investigation of the role of nature and outdoor environments for children with special needs is clearly of interest. At the very least, we recommend that educators and caregivers ensure that *all* children – regardless of ability and needs – have daily contact with nature, knowing that nature supports skill development in unique and often powerful ways.

## **High Stakes Testing**

This research on children's skill development in a Nature Explore Classroom has implications for the systemic pressure of high-stakes testing within the educational community. Children who have had the time and opportunity to master concepts in age-appropriate ways versus "learning to test" have better chances of academic success at every level. Our data illustrate that, for young children, outdoor learning promotes mastery. Materials are "real", open-ended, and accessible. Children can repeat self-initiated experiments and refine skills at their own developmental pace until they achieve mastery.

Though limited research has been done on the relationships between the aspects of outdoor play (increased attention span, increased opportunities for dramatic and object play) and academic performance (Cosco & Moore, 2009; Maxwell et al., 2008; Sutterby & Frost, 2006) more evidence-based research is needed to support the work of teachers and administrators who desire to provide regular outdoor learning. We recommend that administrators and policy makers recognize the important role of outdoor skill development as they establish learner outcome objectives and adjust curriculum, methodology and environments accordingly.

## **The Ways We Define "Toy"**

New insight into the brain development of very young children has led to a surge in manufactured toys that are marketed for their "educational value" (Kluger & Park, 2001). As the digital age evolves, more of these toys are produced in screen form, and many represent commercial character merchandizing. Well-intentioned parents feel obligated to purchase these items – sometimes at great cost – to give their children an edge in learning.

This research suggests that children do not need screens or commercial toys for optimal learning. In fact, it was interesting to note that in all of the Nature Notes that documented

dramatic play, there were no examples of children taking on the roles of commercial characters. We recommend that funding entities allocate more research dollars toward studies that can support the educational value of simple, three-dimensional, nature-based materials in classrooms and homes. The good news for teachers, parents, and caregivers is that placing natural materials in outdoor spaces is relatively inexpensive, and materials are readily accessible.

## **Recommendations**

The findings of this study lead us to offer several specific recommendations to our target audiences. The following recommendations are for parents/caregivers, educators, administrators, policy makers and funding entities.

### Parents/Caregivers:

- Provide opportunities for children to experience nature outside every day in their home and childcare environments.
- Dress children for outdoor play so they will be comfortable in a range of seasons, temperatures, weather and activities, and recognize that children’s clothing may get dirty outdoors.
- Provide a variety of simple, open-ended natural materials that children can explore, manipulate, and incorporate into their imaginative play.
- Accompany children outdoors, observing their actions and choices closely to learn about existing and emerging skill development.
- Allow children to initiate and “write the script” for their play outdoors, using an occasional question or suggestion to help children expand their own ideas.

- Advocate for children to have quality time outdoors during the school day in well-designed environments that are rich in nature’s “loose parts.”

Educators:

- Participate in professional development opportunities devoted to children’s learning outdoors. Look for training that addresses the development of intentionally designed outdoor spaces, the use of natural materials, and the incorporation of field documentation (e.g., Nature Notes) to understand the depth of children’s skill development outdoors.
- Provide opportunities for children to spend time outdoors in well-designed spaces during each school day, making sure that all children and adults are dressed to enjoy a variety of seasons and weather.
- Allow children to work individually and collaboratively to initiate their own play themes. Closely observe children’s actions, intentions, and creations as they play, noting the skills exercised and where those skills fall across curricular objectives.
- Provide a variety of simple, open-ended natural materials that children can explore, manipulate, and incorporate into imaginative play. Maximize the use of authentic seasonal items, both those that occur naturally and those that can be introduced into the space.
- Recognize that recess is far from the only curricular component that can take place outdoors. Embrace the unique teaching platform that an outdoor space presents and adopt the motto: “Anything you can teach indoors, you can teach outdoors”.
- Communicate regularly with parents regarding the value of using of open-ended natural materials and providing opportunities for outdoor play and learning in the

home environment, sharing examples of creative materials and children's skill progression in conversations, newsletters, and conferences.

Administrators:

- Make a long-term commitment to children's learning outdoors, beginning at the highest level of decision-making within the organization.
- Devote time and financial resources to the development of an intentionally designed, well-maintained outdoor space that will be used as an expansion of the educational facility, rather than simply a playground.
- Dedicate staff development time and financial resources to training related to children's learning outdoors.
- Insist that the same high level of developmentally appropriate practice expected indoors occurs outdoors, regarding environments, materials, teaching, and assessment.
- Assess natural materials in the outdoor space with safety in mind, but do not compromise opportunities for children to exercise age-appropriate risk taking as they discover and explore.
- Provide tangible support for teachers who are committed to taking children outdoors regularly (e.g., advocating for: a) the value of time outdoors, b) flexibility of scheduling, c) the acquisition of materials that support hands-on learning outdoors, and d) staffing support).

Policy Makers and Funding Entities:

- Establish curricula, methodology and learner outcomes that reflect the important role of skill development outdoors.

- Make nature-based teaching and learning coursework a part of teacher preparation programs.
- Develop policy that supports daily outdoor learning in schools and childcare settings.
- Develop criteria for excellence in outdoor learning environments and practice that can be used by licensing agencies and accreditation entities.

## **Epilogue**

Children are innately connected to whimsy, to wonder, and to nature itself. These connections, so deeply imbedded, do not need objects of the manufactured world to flourish.

When we see a child playing with a flower, or in the dirt, or skipping or playing tag, we should remind ourselves that what we are looking at is the child-like result of a deep and irresistible urge to interact with and have knowledge of the world and everything in it.

(Hughes, 2001, p. 13).

In teachers' close observations of children's play in the Nature Explore outdoor classroom, we have been reminded again and again how extraordinarily pre-wired young children are to learn, to express, to discover and grow – we need only give them good space, good tools, and thoughtful support. The very characteristics of nature foster child development differently outdoors than indoors. To a child, the sky and everything beneath it becomes a canvas and laboratory, and it often begins *when a child picks up a stick...*

*Tylar and Lexi are playing on the climber in the outdoor classroom. "Tylar, let's go to the moon." Lexi jumps off the climber and picks up a stick. "I got an idea. We can use this." (She casts the stick like a fishing pole.) "Let's pull the moon closer."*

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**Appendix B: Analysis Form**

**Analysis Form**

Teacher/Obs: \_\_\_\_\_ Observation Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Analysis Date \_\_\_\_/\_\_\_\_/\_\_\_\_  
 Analyzed by: \_\_\_\_\_

Child(ren)'s Name(s):	Birthdate/age	Gender

What are children doing? What is the activity/story?

Materials/tools/props children are interacting with:	Kinesthetic skills/Body competence:
Social/Interpersonal Skills (child-to-child only):	Construction/Engineering Skills:
Teacher-child interaction/teacher support/scaffolding:	Intrapersonal Skills (e.g., initiative, confidence, making choices)
Math Skills:	Other Skills (e.g., visual-spatial, problem-solving, decision making, critical thinking, creative representation):
Science Skills:	Emotions children are communicating/processing:
Language/Literacy Skills:	Significance of this entry: