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# Playscapes: Designs for Play, Exploration and Science Inquiry

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**Abstract**
*The Cincinnati Nature Center and the Arlitt Child and Family Research and Education Center at the University of Cincinnati partnered in 2008 to create the Nature Playscape Initiative (NPI). The organization aims to promote playscapes: nature-based environments designed for children's open-ended play and learning. This field report describes the activities emerging from this collaboration including building two demonstration playscapes and training preschool teachers to promote their students' science learning in a playscape setting. These and other activities are meeting NPI's vision that all children in Cincinnati have access to a safe place to play in nature.*

**Keywords:** early childhood education, young children, preschool, informal science, informal learning, nature play, play, natural playgrounds, playscapes

## Introduction and Goals

We believe that young children are naturalists at heart. The key characteristics of childhood—curiosity, observation, experimentation—are important traits for natural scientists. The instructional strategies early educators use within developmentally appropriate practice encourage children's scientific thinking by prompting them to ask questions, scaffolding their observations, locating resources to extend knowledge, experimenting with materials, and drawing conclusions about their work—all accomplished through play. The natural environment is an ideal venue for this learning to occur because the space and materials allow children to explore with their whole body and use all their senses. The outdoor environment is also relevant and interesting to children, thereby engaging them in the *practice* of science learning. Despite the clear connections between outdoor environments and the opportunities for children to learn science, many childcare centers still have playgrounds as their only outdoor space. While plastic and metal playgrounds do allow for gross motor activities, they lack variety of colors, shapes, smells, loose parts and movable materials, and biodiversity. The following field report details our efforts in Cincinnati, Ohio to strengthen the connections between early childhood science and designed natural environments that we call playscapes.

Over the past several decades, early childcare centers, like most American families, have shifted to an indoor life due to concerns about safety in the outdoors, a focus on structured programs to promote academic achievement, and engagement in enticing indoor electronic entertainment. In 2005, journalist Richard Louv wrote *Last Child in the Woods*, a powerful wake-up call confirming that nature is good for children and they are not getting enough of it. The Children & Nature Network and dozens of local Leave No Child Inside groups exemplify the strong community response to what Louv termed "nature deficit disorder." Two Cincinnati organizations responded to this call: the Cincinnati Nature Center (CNC) and the University of Cincinnati's Arlitt Child and Family Research and Education Center (Arlitt). Together they formed the Nature Playscape Initiative (NPI) to develop demonstrations sites that show what beautiful outdoor spaces for children, *playscapes*, can look like and how parents and teachers can use these sites to help children learn science concepts.

NPI's vision is for every child in Greater Cincinnati to have access to a safe place to play in nature. Our mission is to increase the number of natural play environments designed to engage children with nature in Greater Cincinnati and promote learning about the natural sciences. Playscapes should provide for free, creative, spontaneous play, but also elicit exploration and inquiry, thereby increasing children's knowledge of the natural world. For example, it is anticipated that science learning occurs as children observe the bugs and animals local to their region, watch as plants sprout and mature, and wonder where a stream begins and how it moves. Because everything in a playscape is touchable, children have unique opportunities to experiment with the physical properties of water and soil. With adult scaffolding, we expect that children will increase their science vocabulary, learn to use tools like magnifying glasses and binoculars, and seek to learn more from field guides and expert naturalists. More specifically, we anticipate that playscapes will engage children in informal science learning as delineated by the

National Research Council (2009) in the following ways: 1) children's interest in and attitudes towards nature and science will be generated by self-initiated play in exceptional natural environments; 2) their use of language related to science concepts and facts relating to science will increase as they access playscape affordances; 3) their engagement in scientific inquiry processes will strengthen as they use materials and artifacts intentionally designed within the playscape; 4) they will reflect on their learning within the playscape environment to parents, teachers, and caregivers; 5) they will engage in scientific activities with other children; and 6) their self-efficacy as science learners will increase after playscape access.

This article traces the evolution of NPI as an organization, from our goals of providing spaces for free play and outdoor learning labs to our current activities demonstrating how to design and investigate environments for children that promote science (Figure 1).

**Figure 1. A result of the NPI partnership, the completed playscape is designed to address informal science learning**

## Partnerships

In order to understand how NPI projects have emerged and function, it is important to know how each organization has contributed to the partnership. CNC is located 30 miles outside of Cincinnati on over 1,000 acres of preserved land and has a large, diverse membership base. Their 1.6-acre playscape opened to the public in August 2011. Their naturalists and educators bring a scientific knowledge base of the natural world to our programs and are integral in choosing plant material and developing curriculum for programs. Arlitt is a laboratory preschool where pre-service teachers can observe best practices and complete internships. The center serves approximately 140 community children each year, ages 3-5, from both Head Start and tuition-paying households. The staff at Arlitt brings expertise about young children to ensure that curriculum and playscape materials are developmentally appropriate. The partnership between these two organizations began with a casual conversation about the nature center's desire to provide more meaningful nature experiences for very young children.

It was not difficult to find commonalities and shared visions among staff at the two founding partner NPI organizations. This is because environmental education and early education have common key characteristics. Both disciplines emphasize meaningful, child-initiated learning strategies that rely on first-hand experiences and active participation, cognitive and affective process development, and an interdisciplinary and holistic approach to problem-solving and concept development (NAEYC 2009; Vanorny 1999). Further encouraging partnership, the team members from Arlitt recognized that play in nature engages children as inquisitive young naturalists, providing a venue for scientific experiences, exploration, and problem-solving. Through play, children can hone science inquiry skills and behaviors: to wonder, question, explore, investigate, discuss, reflect, and formulate ideas and theories that are directly related to informal science learning (Chalufour and Worth 2003; National Research Council 2009).

Start-up funding for NPI was provided by a seed grant from the Harriet Downey Fund at the Greater Cincinnati Foundation. This funding provided for training for local landscape architects to design nature playscapes; the designs for two demonstration playscapes in Greater Cincinnati (one completed at CNC, one to be completed at the University of Cincinnati in 2012); and outreach to the local community about the benefits of nature play. These first activities leveraged the NPI partners to receive a two-year (2009-11) *PNC Grow Up Great with Science* grant. This PNC Bank grant funded CNC experts in natural science and Arlitt experts in early childhood education to develop a science curriculum to provide professional development for Head Start preschool teachers. The resulting curriculum promoted the use of playscapes and natural settings as places for young children to explore and learn about natural science concepts. These accomplishments and their relevance to science learning for young children are explored in the following sections.

## Playscapes: Natural Settings Designed for Children

NPI defines a playscape as an intentionally designed, dynamic, vegetation-rich play environment that nurtures young children's affinity for nature. We established a set of principles for designing playscapes and elements they might contain.

Our established playscape principles that encourage young naturalist behavior are as follows:

1. Playscapes elicit hands-on, multi-sensory, unique and personal experiences for children where nature is the focus, not man-made materials.
2. Areas within the playscape are designed to be open-ended with multiple and divergent uses. Materials and spaces are not designed to be used in pre-determined ways.
3. Playscape plants and materials are ones that can be found in nature, preferably indigenous to the local landscape.

4. Playscape materials provide affordances, or opportunities to be touched, manipulated, dug, moved, picked, dammed, climbed, built, and experienced by children as they choose to do so.
5. Playscapes are built to encourage risk-taking, investigation, language, sensory experiences, child-directed dramatic and themed play, and collaborative and active play.

Within the scope of these principles, playscapes should also have the following features as shown in the photographs of the CNC playscape:

- Accessible water – streams, fountains, wading ponds
- Unlevel topography
- Gardens and/or edible landscape materials
- Sand, rocks, boulders
- Trees, grasses, shrubs, flowers, herbs, etc.
- Nature-themed art or some play equipment may be included, but should not intrude upon or dominate the playscape
- Pathways and gathering spaces
- Hiding places, tunnels, felled logs, and digging pits
- Seating for adults to observe children's play
- Storage for child-sized equipment (shovels, binoculars, bug boxes, etc.)

Our most successful way of teaching the philosophy and design of playscapes is the demonstration site opened at the CNC in 2011 and the site at the University of Cincinnati that is currently under construction. These playscapes exhibit the components and design principles that can be used in a natural play environment.

**Figure 2. Meandering paths provide orientation and mental geographical maps of the playscape**

**Figure 3. Natural materials inspire creativity, and promote categorizing and investigation of physical properties**

**Figure 4. A small structure is quickly embellished using a child's knowledge of physics**

**Demonstration Playscapes**

The NPI partners knew from their own learning process that to understand what a playscape looks like and how it functions it is necessary to see it in action. Therefore the demonstration playscapes in Cincinnati are a defining element of NPI's work in the community. The team searched for information about designers who specialize in children's environments, particularly natural landscaping, and very quickly identified and reached out to Robin Moore, Professor of Landscape Architecture at North Carolina State University. Moore's long career studying children's environments began with careful research on how children play (Moore

1986). He and his partner, Nilda Cosco, have written some of the most extensive research on playscape theory and evaluation. Additionally, they have contributed to playscape and park designs around the world. Over their three years of involvement with CNC and Arlitt, Moore and Cosco created the conceptual designs for both Cincinnati demonstration sites and trained eight local landscape architects in the art and science of playscape design. This training, designed jointly by Moore, Cosco and NPI, was highly successful and increased the local design capacity so organizations could pursue playscape projects with trained, knowledgeable designers. Arlitt and CNC both chose their local playscape architects from this cohort.

To begin the design process, Moore and Cosco conducted design charrettes at CNC and Arlitt. These charrettes, or workshops, were conducted to solicit ideas from the end users of the space (e.g. Arlitt teachers and visitors to CNC) so that the design reflects their needs and desires (Sanoff 2000). From these charrettes, we learned that each partner had very different goals and that together the playscapes would illustrate a range of possible designs. CNC had 1.6 acres and wanted only indigenous plant materials, very few built structures, and to preserve much of the existing woods and prairie. Arlitt had only 10,000 square feet designated for their playscape and wanted to demonstrate how playscapes could specifically meet the needs of very young children. It also required a design that would complement the University of Cincinnati's acclaimed contemporary campus architecture.

A unique aspect of Moore and Cosco's design process was seeking children's opinions in a charrette dedicated to soliciting their ideas about what elements a playscape should contain (Clark and Moss 2001). At CNC, children ages 5-11 began with a guided walk in the woods where they were encouraged to point out their favorite sights and share ideas about how they like to play in nature. Then they were invited indoors to visually depict their ideas of ideal outdoor play spaces. Through the children's presentations we learned that they were particularly interested in refuges (e.g., forts) and thrilling experiences (climbing heights, swinging fast, spinning around, etc.). Our landscape architects accommodated these wishes by designing cozy, child-size spaces and elements of varying heights into both playscape designs.

It took two to three years to finalize the playscape designs. During this time, the landscape architects refined the designs based on regular collaboration with Moore, feedback from CNC stakeholders, and accommodating the very specific requirements of the University of Cincinnati's campus. The CNC playscape opened in August 2011 and received over 6,500 visitors in its first two months. The Arlitt playscape began construction in November 2011. Both designs emphasize native plant materials that attract wildlife and appeal to children's many senses. Though requiring different spatial solutions, one principle guided the design of both sites and is critical to playscapes: the space allows and encourages children to explore nature. The natural elements included (boulders, sticks, water, soil, etc.) are based on affordance theory (Heft 1988) to maximize interactivity. Both site plans reflect the design principles outlined by Herrington and Lesmeister (2006): character, context, connectivity, change, chance, clarity, and challenge. The thought-

provoking environments and variety of intriguing and open-ended materials invite children to wonder, question, explore and experiment, thereby engaging in *self-initiated* (and thus more meaningful and intrinsically motivating) investigations (Vygotsky 1986; NAAEE 2010). While children pursue these investigations through free play, adults can observe how they inherently use and practice science inquiry skills and develop natural sciences content knowledge.

Though formal evaluation of the playscapes is scheduled for upcoming months, observations of the CNC playscape and the large visitor count reveal its initial success. Because of the careful design of the CNC playscape, children who enter are drawn to the different spaces within and observe the surroundings with a sense of wonder. It is common to find children working in an area (building forts and studying the stream are very popular) for long periods of time. Children are heard describing the animals they see or sharing unusual facts about wildlife with their peers. Some of the observed naturalist behavior may be because children who come to CNC are often from families who already value nature. We expect to observe similar behaviors and conversations in the Arlitt playscape, which will serve a very diverse, though younger in age, range of children.

As CNC and Arlitt began to develop their own playscapes, the focus could have shifted away from the partnership. However, the demonstration sites were only a part of the partners' broader mission to proliferate the playscape concept, which includes reaching out to community organizations. Thus, the Nature Playscape Initiative presents information and images to various audiences in Cincinnati and Northern Kentucky, creates professional development to improve the connection between playscapes and schools, and stays involved in the policy and political initiatives of Leave No Child Inside.

## Informal Science Learning in Outdoor Environments

Playscapes are an ideal venue for children to investigate natural science concepts. Additionally, NPI believes and teaches that *any* outdoor space has the potential to teach science, especially if knowledgeable adults encourage children's explorations. One of our goals as an organization is to make sure that groups who do not have the resources to build a new landscape can still take advantage of the benefits of outdoor play and learning. Thus, Arlitt staff collaborated with CNC to obtain a PNC Bank *Grow Up Great with Science* grant, targeting informal science learning in traditional schoolyards with the goal of giving Head Start teachers ideas about how their own backyard (mostly dominated by jungle gyms) has potential for science lessons. The emphasis of science instruction was based on extending child-initiated themes that emerge during exploratory play outside. The partners created a two-year program that served approximately 36 teachers and 320 students. All participating children were enrolled in Head Start, meaning that all were between the ages of 3-5 and considered low-income. Most of the children lived in apartment buildings or mobile homes and teachers reported that very few of their students had access to nature at home. Each classroom had several children who were English language learners.

The first year of the program provided the classrooms with routine visits to the nature center so teachers could observe the CNC educator engaging children in outdoor learning. However, at the year-end assessment, we determined this setup was not adequately meeting our goal of demonstrating how teachers can conduct science lessons outdoors under normal conditions at their own center. Thus, in the second year, the team changed the program to be located at the teachers' respective schools instead of having them bring children to CNC. It began with CNC naturalists documenting all the potential natural resources they could find around the centers. The CNC educator observed children's play outside and designed ways that the resources at hand, sometime only soil or a patch of grass, could extend the students' interests. Carr and Luken (2011) reported that teachers found this approach far more educational because they could focus on the teaching strategies in a more relevant manner, particularly within the nature environments immediately outside their own classrooms. Overall, teachers noticed positive changes in their students, such as overcoming biophobia—a fear of the outdoors or living things. Children were excited to share their discoveries (such as a worm or an oddly shaped pinecone) with their peers and parents. They eagerly awaited the following week's excursion and at the end of the program recalled their favorite memories (e.g., being introduced to hissing cockroaches and watching an apple weekly to see it decompose). Teachers' reflections indicated that they had previously underestimated children's abilities to focus, to be proactive, to contribute thoughtful responses, to use one-to-one correspondence, and to empathize; once teachers knew what children were capable of they could design lessons to build upon children's emerging science skills.

**Figure 5. A CNC educator engages children in an outdoor exploration of worm scat, asking open-ended questions such as "What do you think this is?" and "What animal do you think this came from?"**

We discovered that frequent, repeated exposure is critical for young children to develop a comfort level from which science inquires can emerge. After the third week in the first year, teachers reported that children were more accustomed to noticing and talking about observations on the weekly hikes. Children generalized these experiences back in their classrooms by initiating inquiries about found items

on the playground, routinely watching the bird feeder, or gathering nature collections. This works to confirm our belief that playscapes work best when they are accessible to children at home or school.

Encouraging nature play and science investigations in children's routine settings can be very challenging. Both of our demonstration playscapes had high budgets and would not be accessible to neighborhoods or organizations under normal conditions. Urban areas may be so hardscaped that there is little room to plant anything in the ground and rural or suburban areas may lack diversity, with large expanses of turf but little to attract wildlife or foster children's curiosity. This second case was most prevalent in the Head Start centers that participated in our grant.

Child Focus Inc., a participant in the *Grow Up Great with Science* project, beautifully illustrated what a motivated group can do without the guidance of a landscape architect. Following the vision of their director and obtaining input from NPI, they transformed a corner of their property into a butterfly garden by adding paths winding through a variety of plants and creating rolling hills. The teachers who participated in the *Grow Up Great with Science* project use the butterfly garden regularly. Sometime they hold recess there instead of the playground and other times they use classroom time to go outside and investigate. In this garden are areas for children to plant sunflowers, bulbs, and herbs and a small cornfield to walk through. A deck overlooks the steep, wooded edge of their property providing visual observations of birds and other wildlife. In the beginning, the site was overrun with tall honeysuckle bushes, but the center decided to use this to their advantage. Instead of removing all the honeysuckle, they cleaned it out, cut off low branches, and put down mulch over the 50 square-foot area. Children now crawl through the branches, sit under the canopy, and build with fallen branches. This center is an excellent example of what a group (applicable to a family, church, or childcare center) can do all on their own with an innovative director and allowing plenty of time for small improvements towards a bigger vision.

**Figure 9. The Child Focus center butterfly garden with a young sunflower patch in the foreground, a variety of local plants, and the honeysuckle/woods area in the background**

**Figure 10. Volunteers building a mini-playscape at a Head Start center are standing in a "room" made of young ornamental grasses**

Many centers, including those with whom we worked, do not have a director who is knowledgeable about playscapes and willing to invest resources and make decisions that move the project along. We dedicated a portion of our PNC grant money to add natural elements to the traditional playgrounds at six participating centers. A local landscape contractor completed some of the technical work (such as building shade pergolas) and donated logs and plants to the effort, much of which were planted by PNC Bank volunteers. These naturalized areas provide a very basic beginning upon which the centers could build.

## Next Steps

This field report detailed how NPI is promoting informal science learning in Cincinnati by building the first two nature playscapes and training teachers to extend informal science learning that children gain by playing outdoors. Our preliminary observations and theoretical framework for informal science learning in a playscape environment requires rigorous research connecting design elements to science learning. Dr. Victoria Carr was recently awarded a grant from the National Science Foundation to conduct the research necessary to better determine in which areas of a playscape informal science learning occurs among preschool children. Results from this research will provide the NPI partners with detailed information about the propensities of playscapes to promote science learning. This information will inform the designs of future playscape sites and programs for children and their caregivers.

***Eleanor Luken*** *was an early member of the Cincinnati Nature Playscape Initiative. She coordinated a professional development program for landscape architects to learn about designing nature-based play areas for children. She currently manages research activities at the University of Cincinnati's Arlitt Child and Family Research and Education Center. This includes mixed-methods research on the effectiveness*

*of natural play environments. She also co-teaches a Reggio-Emilia inspired art studio for preschool children.*

***Dr. Victoria Carr**, Associate Professor in Early Childhood Education and Human Development at the University of Cincinnati, is Director of the Arlitt Child and Family Research and Education Center and Executive Producer for Arlitt Instructional Media. She has generated over $8M in funds related to early childhood education, including Head Start and NSF grants to study instructional strategies and playscapes, respectively. She collaborates with the Cincinnati Nature Center, particularly with regard to The Cincinnati Nature Playscape Initiative. She has published two books on challenging behaviors and publishes and presents on topics related to playscapes, curriculum-based assessment, and pedagogy.*

***Rhonda Douglas Brown**, Ph.D. is an Associate Professor of Cognitive Developmental Psychology in Early Childhood Education and Human Development and Co-Director of the Developmental & Learning Sciences Research Center in at the Arlitt Child and Family Research and Education Center at the University of Cincinnati. Her research interests include math and science learning, memory development, and using functional magnetic resonance imaging (fMRI) to understand cognitive development and learning.*

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