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Addressing Policy, Practice, and Research That Matters

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**Creative by Nature:
Investigating the Impact of Nature Preschools on Young Children's Creative Thinking**

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ABSTRACT

Creative thinking is valuable and necessary in society today and in the development of solutions to environmental issues. Fostering creative thinking skills and environmental values should begin early in life. The purpose of this study was to investigate the influence that a nature preschool experience has on the development of creative thinking in young children. The *Thinking Creatively in Action and Movement* (TCAM) instrument was used to assess creative thinking through measuring children's fluency, originality, and imagination scores at four nature preschools and one non-nature preschool. Results indicate that nature preschooler's creative thinking scores increased significantly from pretest to posttest measures. Results further suggest variation in influence on creative thinking across the nature preschool sites.

Keywords: young children, creativity, creative thinking, nature, nature preschools

Creative thinking, which is defined as thinking that is novel and produces ideas of value (Sternberg & Lubart, 1996), is a crucial skill in society today. It plays a key role in everyday cleverness, arts and science advancement, business innovation, social interactions, and public policy (Moran, 2010). Creative thinkers are active learners who can find and solve problems, recognize patterns, combine information in new ways, challenge assumptions, make decisions, and seek new ideas (Healy, 2004). Creative thinking is needed to develop, refine, communicate, and execute ideas; it is needed for being open to new perspectives, demonstrating originality, understanding real-world limits, and viewing failure as an opportunity (Greenhill, 2015). The development of these skills is particularly valuable in early childhood, as they are foundational skills upon which young children learn (Banning & Sullivan, 2011). Furthermore, creative thinking has significant implications for the natural environment. Creative thinking will be integral in resolving climate change, biodiversity loss, resource depletion, and other pressing environmental issues of our time (Csikszentmihalyi & Wolfe, 2014). Individuals who care about and place a high value on the environment may be more likely to act for the environment and invest their time and energy into developing creative solutions to environmental issues. Because early childhood has been shown to be a critical period for developing lifelong environmental values (Ewert, Place, & Sibthorp, 2005; Iozzi, 1989; Samuelsson & Kaga, 2008), the field of environmental education has much to gain from the development of effective approaches to fostering creative thinking and instilling environmental values in children as early as possible.

Even though creative thinking is valuable and necessary for both individuals and society, there is growing concern that early childhood learning settings do not provide young children with opportunities to develop creative thinking (Beghetto, Kaufman, Hegarty, Hammond, & Wilcox-Herzog, 2012). This is often because early childhood educators feel pressured to focus purely on academic skills to meet the expectation that children enter kindergarten with

specific academic knowledge (Beghetto et al., 2012). In fact, a recent study found that relative to students in 1998, kindergarten teachers today are far more likely to expect children to enter kindergarten with academic skills, provide teacher-directed instruction, use workbooks, and administer standardized tests (Bassok, Latham, & Rorem, 2016). Those teachers were also far less likely to utilize learning centers (Bassok et al., 2016). Additionally, early childhood learning environments today often restrict creativity by requiring young children to find a single correct answer, discouraging alternative solutions, taking away outdoor free playtime, and providing constant, adult-directed learning experiences (Gray, 2016). These changes in kindergarten and preschool experiences have profound effects on the creative thinking abilities of young children.

For instance, a recent study had some startling findings regarding creative thinking scores in children. The study found that creative thinking changes with age in the following manner: young children's creative thinking steadily increases until third grade, then it levels off and begins to decrease until about high school, when increases are again observed (Kim, 2011). This aligns with a conventional stage model of creativity that suggests creative thinking levels correlate with a child's ability to understand societal conventions (Runco, 2014). However, the study also found creative thinking scores have been decreasing significantly since 1990 in children across all ages, even when considering conventional stage differences among age groups, with the greatest decrease indicated in kindergarten through third grade (Kim, 2011). The authors suggest this decrease may be due to increased focus on academic success and too many structured activities at the expense of unstructured, free play time (Kim, 2011). This indicates that there is a need to renew efforts to foster creative thinking in young children.

Nature preschool programs may offer a solution to help reverse this trend. Nature preschools are preschools that "use nature themes and daily nature explorations as the central organizing concept of their program," are "equally committed to both high standards of developmentally appropriate early childhood education and the best practices of environmental education," and "support dual aims for children: meeting child development goals and acquiring conservation values" (Finch & Bailie, 2016, p. 92). Nature is an ideal environment for developmentally appropriate learning across all domains, and nature play opportunities at nature preschools allow children to solve problems, be curious, and play creatively (Banning & Sullivan, 2011). Nature play is child-initiated and child-directed play that happens when "children play in and *with* nature" (Erickson & Ernst, 2011). Nature play can provide children with plenty of space, time, variety, and loose parts to invent endless play scenarios that contribute to the development of creative thinking skills that will persist throughout life (Banning & Sullivan, 2011). Nature play is also beneficial in early childhood from an environmental education standpoint because repeated positive experiences in nature foster the development of lifelong environmental values and ethics (Ewert et al., 2005; Iozzi, 1989; Samuelsson & Kaga, 2008).

In response to the need for creative solutions to the environmental issues of our time, research is needed to determine strategies that will best support creative thinking at all ages. This research is essential at the early childhood level, as the insights gained can help educators provide experiences that support the development of creative thinking skills children can draw upon when faced with real-world issues later in life. In light of the potential for nature play to foster creative thinking in young children, the purpose of this study was to explore the influence of nature preschool on the development of creative thinking in young children. The quantitative research methods used in this study sought to answer the following research questions:

- (1) Did nature preschoolers' creative thinking significantly increase from the beginning of the school year to the end? Was a similar growth pattern seen in children who attended a non-nature preschool?
- (2) Was there variation between nature preschool programs in terms of their influence on creative thinking?

This study is significant because it sought to find an empirical link between nature preschool participation and the development of creative thinking. Research that can demonstrate a significant link between a nature preschool experience and creative thinking development can lend strength to a growing body of evidence indicating important life skills, including creative thinking, can be fostered through immersive nature play experiences. Furthermore, research such as this can provide early childhood educators with a deeper rationale for stepping back from academically focused instruction and providing more play-based learning opportunities.

REVIEW OF LITERATURE

Creative Thinking: A Multidimensional Construct

Creative thinking is defined as the thought process associated with developing novel and useful ideas (Sternberg & Lubart, 1996). Creative thinking can refer to any part of the creative thought process including generating, analyzing, refining, or even rejecting ideas (Healy, 2004). Furthermore, creative thinking is a multidimensional construct (Clapham, 2011). The idea that creativity is a multidimensional construct was first presented in Guilford's 1956 Structure of Intellect (SOI) model, which classified mental abilities by "operation performed, content used to perform the operation, and the type of product produced" (Clapham, 2011, p. 459). The SOI model emphasized that intellect is made up of several factors including cognition, memory, divergent thinking (the process of generating multiple responses to a problem), convergent thinking (the process of choosing a single correct response for a problem), and evaluation (Guilford, 1956). Guilford (1956) further suggested divergent thinking was the factor most associated with creative thinking. Recent research supports the idea that creative thinking and divergent thinking are related by indicating divergent thinking ability is a meaningful predictor of future creativity (Kim, 2006; Runco & Acar, 2012).

Divergent thinking can be further broken down into the subdimensions of fluency, flexibility, elaboration, and originality (Clapham, 2011; Guilford, 1956). Fluency is the ability to quickly produce many ideas that are relevant and adhere to specified requirements (Clapham, 2011; Guilford, 1957). This means when problem is at hand, a person who has a high fluency can develop many solutions to solve the problem rapidly. Fluency stresses the number of ideas generated over the quality of the ideas generated (Clapham, 2011; Guilford, 1957). Flexibility is described as the number of categories produced to solve a given problem (Clapham, 2011), or the ability to discard familiar ideas into order to develop new or unfamiliar ideas (Guilford, 1950, 1957). Elaboration refers to the ability to build upon and improve an idea (Clapham, 2011). Originality refers to a person's ability to develop unique ideas that have purpose and meaning in a particular situation (Feist, 2010; Runco & Jaeger, 2012). Originality is particularly important for creative thinking because ideas must be original if they are to be considered creative (Runco & Jaeger, 2012; Sternberg & Lubart, 1996).

Imagination is also a dimension of creative thinking. Imagination was not included in Guilford's SOI model, but imagination was included in early childhood assessments of creativity, such as the Creativity Assessment Packet (Williams, 1980, as cited in Lemons, 2011), the Khatena-Torrance Creative Perceptions Inventory (Khatena & Torrance, 1976, as cited in Lemons, 2011), and the TCAM (Torrance, 1981b). Imagination refers to the ability to develop mental representations of things, concepts, or ideas that are not immediately present to the senses (Markman et al., 2009, as cited in Forgeard & Kaufman, 2016). Imagination allows a person to move beyond the current moment in time or place and plan for the future, create a new world, or consider alternatives (Taylor, 2011). Furthermore, the ability to imagine what it is like to be another animal or person promotes development of empathy, which is a desirable trait in children as well as adults (Torrance, 1981a; R. Wilson, 2014).

Natural Progression of Creativity Development

Maslow (1971) proposed two distinct varieties of creativeness: primary creativeness and secondary creativeness. Primary creativeness arises from the unconscious mind and is "a universal and common kind of thing" (Maslow, 1971, p. 80), while secondary creativeness involves hard work and training to help a person complete a creative endeavor (Maslow, 1971). This is important to understanding the natural progression of creativity development in children because the idea of primary creativeness indicates that all children have the potential to be creative, and secondary creativeness suggests that creative abilities can be developed over time (Maslow, 1971; Runco, 2014).

The four C model of creativity, which divides creativity into categories based on the magnitude of creativity, suggests a path for the development of creativity over time (Kaufman & Beghetto, 2009; Kozbelt, Beghetto, & Runco, 2010). These creative magnitudes are referred to as little-c, mini-c, Pro-c, and Big-C creativity (Kaufman & Beghetto, 2009). Mini-c and little-c creativity are lower magnitude forms of creative expression that can be achieved by anyone (Beghetto et al., 2012). Mini-c creativity refers to transformative learning and includes the process of constructing personal knowledge to understand new concepts (Kaufman & Beghetto, 2009). The theory of personal creativity

suggests mini-c creativity may not be considered creative by others, but for the individual who constructed personal knowledge, it is both novel and significant (Runco, 2003). This indicates that young children who rarely, if ever, produce ideas or products that would be considered creative by the standards of society are indeed creative (Runco, 2003). Little-c is the next level of creativity and involves everyday innovations that would be considered creative by anyone (Kaufman & Beghetto, 2009). Pro-c and Big-C creativity are higher, professional levels of creative accomplishment that can be achieved over time through hard work and commitment (Beghetto et al., 2012; Kaufman & Beghetto, 2009).

The conventional stage model can be used to explain how a child's creative growth typically occurs (Runco, 2014). In this context, conventions are considered normative or typical behaviors in society such as laws, fads, or fashions (Runco, 2014). Children are typically in the pre-conventional stage throughout early childhood as they are unaware of conventions and are therefore unable to conform to them (Runco, 2014). This unconventionality often manifests as creativity. As children approach middle childhood, they enter the conventional stage as they begin to understand societal conventions place a high value on conventions, which can inhibit self-expression and creativity (Runco, 2014). In fact, there is evidence that approximately 50 percent of children experience a "slump" in their creative thinking during the conventional stage (Runco, 2014; Torrance, 1967). Finally, children enter the post-conventional stage during adolescence when they are aware of conventions, but also understand that they can choose which conventions to follow (Runco, 2014). This opens the door for creativity. Evidence suggests children who were strong creative thinkers in early childhood and slumped during the conventional stage tended to regain their creative thinking abilities as they transitioned into the post-conventional stage (Runco, 2014). This emphasizes the importance of fostering creative thinking skills gained early in life because those skills can persist and resurface when children become post-conventional thinkers.

Fostering the Development of Creative Thinking

In the context of creative thinking development in young children, mini-c and little-c creativity are particularly relevant. Mini-c creativity should be the primary emphasis in early childhood education because play is central at this level of creativity (Beghetto et al., 2012). Young children learn about themselves and the world through play, and a notable amount of what young children learn during play cannot be taught (Wilson, 2008). Play provides opportunities for early learning and development across all domains (Wilson, 2008), and the most beneficial play is both self-initiated and child-directed (Banning & Sullivan, 2011). Mini-c creativity can be readily included and fostered in early childhood programs by providing opportunities for self-directed play as children will naturally construct knowledge through such play experiences (Beghetto et al., 2012). Further, when children pretend during their play several creative thought processes occur including divergent thinking, flexibility, problem solving, perspective taking, and more (Russ, 2014). Early childhood education should also include a moderate focus on little-c creativity, which can be developed through the inclusion of domain-specific skills while also providing time for play and exploration in that domain (Beghetto et al., 2012). By focusing efforts on developing mini-c and little-c creativity, educators can encourage the skills needed for lifelong creative thinking abilities (Beghetto et al., 2012).

Furthermore, brain-based learning research from the field of neuroscience also has important implications for fostering creative thinking. This research indicates early experiences that are reinforced will persist into adulthood, and those that are not reinforced will not persist (McCain, Mustard, & Shanker, 2007; Shore, 1997). Thus, a child's experiences have a strong influence on their development. Furthermore, highly creative brains have more complex and highly-connected neural circuits than less creative brains, which contributes to a creative thinker's ability to readily generate ideas (Feist, 2010). This information offers an example of how early childhood experiences that reinforce creative thinking can contribute to the persistence of those pathways later. Thus, children who are consistently exposed to situations that require creative thinking will develop brains that are wired in manners that allow creative thinking to occur more readily. Early childhood educators can foster creative thinking by providing these novel experiences through play opportunities because play is a primary way to stimulate and reinforce neural connections in the brain (McCain et al., 2007).

Educators can also foster creative thinking growth by creating a non-judgmental space for young children to generate novel ideas (Alkhudhair, 2015). Open-ended and child-directed play opportunities provide the setting young children

need to practice generating novel ideas as they engage in activities of personal interest (Banning & Sullivan, 2011). Craft (2008) found that student collaboration and providing opportunities for children to construct their own knowledge can also foster creative thinking in children. Again, play can foster that collaboration and knowledge construction (Banning & Sullivan, 2011). Research also indicates that educators can promote creative thinking development through open-ended questioning, allowing experimentation and mistakes, encouraging imagination and play, demonstrating critical thinking, and accepting unconventional answers (Alkudhair, 2015).

These strategies for fostering creative thinking are strongly aligned with teaching strategies and methods that are widely used in the field of environmental education, particularly in early childhood environmental education. As such, early childhood environmental education has the potential to play an important role in fostering the development of creative thinking in young children. Many qualities of nature make it a developmentally appropriate environment for children to play and learn. Nature is ever changing, engages all of the senses, and allows for full body movement (Banning & Sullivan, 2011). Nature also provides unstructured, child-directed play opportunities, a plethora of loose parts, and experiences that allow young children to develop and learn across domains and meet early learning indicators including imagination, creativity, problem-solving, and flexibility (Banning & Sullivan, 2011; Wilson, 2008). These features of nature suggest that early childhood programs that embrace nature play should help foster the development of creative thinking in young children because there are ample opportunities each day for exposure to constructive learning and new situations that reinforce brain pathways. This idea is supported by a recent study that found creativity development at a preschool program that spent daily time in a natural outdoor classroom was supported by four factors: predictability of learning spaces, amount of time and consistency of time, open-ended materials, and a caring adult (Kiewra & Veselack, 2016).

Nature preschools regularly incorporate nature play into their daily routines in their efforts to integrate best practices in both early childhood education and environmental education (Bailie, 2016). Such regular nature play opportunities make nature preschools an ideal early childhood learning setting to promote and foster creative thinking development for several reasons. Nature preschool programs tend to follow emergent curricula that allows their children to follow their own interests throughout the year (Bailie, 2012). These child-directed learning experiences at nature preschools provide children with time needed to develop creative thinking abilities as they explore, play, and experiment with their natural surroundings (Banning & Sullivan, 2011). Further, children at nature preschools must think creatively to find new ways to use the same nature play area as it changes with the seasons and weather throughout the year. Similarly, seasonal changes provide new and different natural loose parts such as dry leaves, seeds, or snow that require children to think of new creative ways to play in and with nature. Nature play at nature preschools can also promote cooperative play among children (Banning & Sullivan, 2011). This cooperative play can often take the form of creative problem solving as children develop, share, and test multiple ways to solve a problem like moving heavy log or climbing a steep hill (Banning & Sullivan, 2011; Craft, 2008). As such, nature preschools, with their emphasis on nature play, offer ideal settings for fostering creative thinking in young children, thereby reversing the current trend of decreasing creative thinking levels.

METHODOLOGY

Participants

Participants in this study included children ages three to six who attended four nature preschools in Minnesota. In addition, participants included one class of children who attended a non-nature preschool program located on a university campus, administered through the university, and within the same geographic region as the nature preschools. All enrolled preschool children were invited to participate. There were 19 children from nature preschool A, 13 children from nature preschool B, 17 children from nature preschool C, and 26 children from nature preschool D who participated in this study. There were 11 children from the non-nature preschool who also participated in this study.

Design

This study was carried out using a nonequivalent pretest posttest control-group design. This quasi-experimental design was necessary because the participants could not be randomly assigned to treatment or baseline groups (Creswell, 2014). While ideally there would have been multiple non-nature preschool sites included for relatively equal number of participants in the treatment and control group, the study utilized only one baseline site because early childhood educators and parents are often hesitant to allow young children to participate in research, particularly when it is not directly beneficial. Thus, the study proceeded with the unequal group sizes. This difference (n = 75 versus n = 11) prompted an analysis that focused on growth in the nature preschool participants, using the non-nature preschool participants as a baseline group or reference group, as opposed to an actual control group.

Treatment

The treatment for this study was participation at a nature preschool during the 2016-2017 school year. There was a baseline, non-nature preschool group included in this study to serve as a reference or comparison for what typical creative thinking growth looks like over the course of the school year. The university-administered preschool was selected because the program has an experienced and stable teacher, is rooted in developmentally appropriate processes, and is connected to the university's education and early childhood education departments and consequently open to participation in university-affiliated research. This was a mixed-age preschool program where the guiding philosophy stressed that children learn best through child-directed play and that play supports and enhances cognitive, social, emotional and physical development. In order to provide children with opportunities to direct their own play the classroom environment, materials, and curriculum are driven by the interests of the children. These characteristics that the university-administered, non-nature preschool could be considered high-quality and can therefore serve as a baseline showing how children in a high-quality preschool classroom are expected to grow in their creative thinking over the course of the school year. For this reason, and due to being demographically similar to the participating nature preschools, the university-administered preschool seemed appropriate for providing participants for the baseline or reference group. All of the participating preschools were in existence prior to the study, and the preschool programming and operations continued on throughout the study as they would normally proceed in the absence of a study being conducted.

The nature preschools and the non-nature preschool in this study offered several different schedules for families to choose from including half day, all day, partial week, and full week options. In this context, half day means that children attended preschool for a half day in either the morning or afternoon, while all day means the children attended preschool both in the morning and afternoon. In partial week programs children attended preschool either two or three days per week, and in full week programs the children attended preschool four or five days per week. The preschools also had varied amounts of time spent outdoors, learning spaces, and guiding philosophies (see Table 1, next page).

Instrument

Divergent thinking tests are among the most commonly utilized measures of creativity, and numerous divergent thinking tests have been developed in efforts to measure levels of creative thinking in individuals. Divergent thinking tests emphasize searching for as many novel solutions to problems as possible in an effort to measure divergent thinking dimensions and thus extrapolate creative thinking levels (Lemons, 2011). This study utilized a divergent thinking test called *Thinking Creatively in Action and Movement* (TCAM), an established and intact instrument designed for use with three-to-eight year old children who are often better at expressing themselves through movement than verbally (Torrance, 1981a, 1981b). The TCAM accepts both kinesthetic and verbal responses to four activities that measure fluency, originality, and imagination, which are dimensions of creativity relevant to a young child's life and are developmentally appropriate (Torrance, 1981a). In this operational context, fluency is number of ideas generated, originality is production of unique ideas, and imagination is one's ability to take on a new role (Torrance, 1981a). TCAM activities were administered according to a provided protocol and are summarized as follows (Torrance, 1981a):

- “How Many Ways” asks participants to think of different ways to move from one side of the room to the other and is scored for fluency and originality.
- “Can You Move Like?” asks participants to take on six different roles, which are scored for imagination on a Likert scale ranging from “no movement” to “excellent, like the thing.”
- “What Other Ways?” asks participants to think of as many ways as possible to place a paper cup in a waste basket and is scored for fluency and originality.
- “What Can You Do with a Paper Cup?” asks participants to think of as many ways as possible to play with a paper cup and is scored for fluency and originality.

The TCAM has an overall test-retest reliability coefficient of 0.84 and the individual activities have coefficients of 0.71, 0.79, 0.67, and 0.58, respectively (Torrance, 1981a). The TCAM has a published interscorer reliability level greater than 0.90 (Torrance, 1981a). TCAM scores do not indicate a relationship with intelligence, cooperation, race, sex, previous school attendance, and socioeconomic status; the scores are associated with learning experiences expected to produce creative growth, a creativity curriculum, and problem-solving sociodrama (Torrance, 1981a). Reisman, Floyd, and Torrance (1981) found that creative thinking abilities assessed by the TCAM predicted cognitive performance that involve divergent thought.

Table 1
Nature preschool characteristics

Preschool	All or Half Day	Full or Partial Week	Approximate Daily Time Spent Outdoors	Learning Spaces	Guiding Philosophy
Nature preschool A	All day	Partial	4+ hours	Indoor classroom, outdoor classroom, nature playscape, and access to a minimally-managed, 30-acre forest	Help children build community, create a lifelong love of play, foster a sense of self, and develop a connection with nature
Nature preschool B	All day	Full and partial	4 hours	Indoor classroom, nature playscape, and access to maintained hiking trail and unmaintained, forested public natural areas	Provide opportunities for nature play, self-regulation, and early learning
Nature preschool C	Half day	Partial	2 hours	Indoor classroom, barnyard with farm animals, nature playscape, and trails leading to several different natural habitats	Foster child-directed learning, considers the outdoor learning space a second educator, and encourages learning through nature play and exploration
Nature preschool D	All day	Partial	3+ hours	Indoor classroom, nature playscape, and access to nature center and public forested parkland	Develop connections to nature and whole child growth through education, play, and exploration
Non-nature preschool (baseline)	All day	Partial	Varies; typically less than 30-60 minutes	Classroom and fenced outdoor playground with plastic play structures and open space	Provide high-quality, nurturing care and learning opportunities

Data Collection Procedure

Prior to administration of the pretest, IRB approval was obtained and consent forms were given to guardians of children at the five participating preschools. Only children whose guardians consented to their participation were given the option to participate in the TCAM pretest and posttest. Researchers asked these children if they would like to participate before beginning the pretests and posttests and proceeded with data collection only if the child was willing to participate. If the child chose to stop in the middle of a pretest or posttest, it was noted and the child was allowed to stop and return to the group and activities underway.

Data was collected using results from the TCAM pretest and posttest. The pretest was administered by two researchers in September 2016, and posttests were administered by two researchers over a three-week period in April and May 2017. Because of the multiple administrators in this study at hand, an inter-rater reliability was assessed using an Intraclass Correlation Coefficient (ICC) to evaluate the degree that raters provided consistency in their rating of fluency, originality, and imagination across subjects (McGraw & Wong, 1996). For fluency and imagination, the resulting ICC was in the excellent range, ICC = 0.99 and ICC = 0.88, respectively (Cicchetti, 1994), indicating that coders had a high degree of agreement and suggesting that fluency and imagination were rated similarly across coders. The high ICC suggests that a minimal amount of measurement error was introduced by independent raters, and therefore statistical power for subsequent analyses is not substantially reduced. For originality, the ICC was 0.66, which is in the range considered good (Cicchetti, 1994). Fluency, originality, and imagination ratings were therefore deemed to be suitable for use in the present study.

All tests were scored per TCAM's scoring procedures by the same researcher for consistency. Tables for converting raw scores into standard scores are included in the TCAM scoring guide for ages three to six (Torrance, 1981a) and were used in this study; by doing so, the age of participant was able to be accounted for, which controlled for participant age.

RESULTS

Increase in Nature Preschoolers' Creative Thinking

A paired-samples *t* test was conducted to evaluate whether young children who participated in nature preschool had a significant increase in creative thinking from the beginning of the school year to the end of the school year. In this study, the data from the treatment and baseline groups were analyzed through two separate paired-samples *t* tests, due to the very unequal group sizes ($n = 11$ and $n = 75$, respectively). Differences in ages are accounted for in these results, as the standard scores, which incorporate the children's ages, were used in the analysis. Tests were run for each of the dimensions of creative thinking: fluency, originality, and imagination (see Table 2 for the Means and Standard Deviations for nature and non-nature preschool groups for these three dimensions).

The results for the nature preschool treatment group (see Table 2) indicated posttest means for fluency, originality, and imagination were significantly higher than pretest means for these three dimensions, $t(74) = 4.49$, $p < 0.001$; $t(74) = 4.33$, $p < 0.001$; and $t(74) = 4.72$, $p < 0.001$, respectively. These results suggest that there was a significant increase in nature preschoolers' fluency, originality, and imagination from beginning to end of the preschool year. In contrast, the results for the non-nature preschool baseline group (see Table 2) indicated posttest means were not significantly higher than pretest means on these three dimensions of fluency, originality, and imagination, $t(10) = 1.31$, $p = 0.22$; $t(9) = 2.06$, $p = 0.70$; and $t(9) = 2.14$, $p = 0.06$, respectively. These results suggest that there was not a significant change from pretest to posttest for fluency, originality, or imagination in the non-nature preschool baseline group.

Table 2

Paired-samples t test results for treatment and baseline fluency, originality, and imagination standard scores

	Fluency		
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Treatment (nature preschools)	89.89 (17.76)	104.76 (28.35)	t (74) = 4.49, p = < 0.001*
Baseline (non-nature preschool)	97.55 (14.64)	106.55 (22.88)	t (10) = 1.31, p = 0.22
	Originality		
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Treatment (nature preschools)	96.13 (20.16)	113.61 (36.58)	t (74) = 4.33, p = <0.001*
Baseline (non-nature preschool)	105.20 (14.13)	126.00 (30.59)	t (9) = 2.06, p = 0.07
	Imagination		
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Treatment (nature preschools)	89.85 (17.68)	99.99 (18.42)	t (74) = 4.72, p = < 0.001*
Baseline (non-nature preschool)	92.30 (16.52)	103.00 (12.03)	t (9) = 2.14, p = 0.06

Note. Baseline: n = 11 for fluency and n = 10 for originality and imagination; Treatment: n = 75 for fluency, originality, and imagination

Note. * indicates statistical significance

To investigate if the significant growth from pretest to posttest in the nature preschool participants remained when controlling for gender and prior participation, a general linear model with gender and prior participation as covariates and time (pretest to posttest) as the main effect was used. For fluency, originality, and imagination, the results suggest the increases from pretest to posttest remained significant when controlling for both gender and prior participation. The results further suggest the treatment did not vary based on gender and prior participation, and the treatment seemed to have a positive impact on the fluency, originality, and imagination results for both boys and girls regardless of whether they had prior participation or not.

For fluency, the results indicated that there was no significant interaction between the main effect of time (pretest to posttest) and gender ($p = 0.11$), and there was no significant interaction between main effect of time and prior participation ($p = 0.88$). The increase from pretest to posttest in fluency standard scores remained significant when controlling for both gender and prior participation, $F(1, 72) = 11.55$, $p < 0.001$. These results suggest the treatment did not vary based on gender and prior participation; the treatment seemed to have a positive impact on the fluency of both boys and girls, and also regardless of whether they had participated prior to this study or not.

For originality, the results indicated that there was no significant interaction between the main effect of time (pretest to posttest) and gender ($p = 0.09$), and there was no significant interaction between main effect of time and prior participation ($p = 0.79$). The increase from pretest to posttest in originality standard scores remained significant

when controlling for both gender and prior participation, $F(1, 72) = 9.171$, $p < 0.01$. Similar to the results for fluency, these results for originality suggest the treatment did not vary based on gender and prior participation; the treatment seemed to have a positive impact on the originality of both boys and girls, and also regardless of whether they had participation prior to this study or not.

For imagination, the results indicated that there was no significant interaction between the main effect of time (pretest to posttest) and gender ($p = 0.56$), and there was no significant interaction between main effect of time and prior participation ($p = 0.84$). The increase from pretest to posttest in imagination standard scores remained significant when controlling for both gender and prior participation, $F(1, 72) = 7.31$, $p < 0.01$. Similar to the findings for both fluency and originality, these results for imagination further suggest the treatment did not vary based on gender and prior participation; the treatment seemed to have a positive impact on the imagination of both boys and girls, and also regardless of whether they had participation prior to this study or not.

Variations in Nature Preschools' Influence on Creative Thinking

Paired-samples t tests were used to analyze the data to investigate if there was variation among nature preschool programs in terms of their influence on creative thinking. For these analyses, the data from each nature preschool site was evaluated separately (See Table 3). The results for nature preschool A indicate there was significant growth for the dimensions of fluency and originality. The results for nature preschool B indicate significant growth for the dimensions of fluency and imagination. The results for nature preschool C indicate significant growth in the dimension of imagination. The results for nature preschool D indicate significant growth across the dimensions of fluency, originality, and imagination. Collectively, these results suggest that variations in nature preschool implementation, setting, and/or approach seem to be influencing their effectiveness on fostering creative thinking in their preschool-aged participants.

Table 3

Paired-samples t test results for nature preschool A, B, C, and D fluency, originality, and imagination standard scores

Nature Preschool A			
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Fluency	90.42 (16.03)	108.26 (29.68)	$t(18) = 2.14$, $p = 0.05^*$
Originality	95.11 (11.92)	122.11 (37.66)	$t(18) = 2.89$, $p = 0.01^*$
Imagination	93.05 (17.58)	96.32 (15.81)	$t(18) = 0.72$, $p = 0.48$
Nature Preschool B			
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Fluency	89.92 (17.41)	108.85 (28.00)	$t(12) = 3.73$, $p < 0.01^*$
Originality	89.08 (30.89)	106.46 (54.76)	$t(12) = 1.62$, $p = 0.13$
Imagination	90.00 (21.11)	104.23 (19.00)	$t(12) = 2.36$, $p = 0.04^*$

Nature Preschool C			
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Fluency	89.59 (21.14)	95.65 (18.01)	t (16) = 1.38, p = 0.19
Originality	98.41 (20.46)	105.00 (20.79)	t (16) = 1.17, p = 0.26
Imagination	83.59 (16.50)	91.82 (18.81)	t (16) = 2.24, p = 0.04*
Nature Preschool D			
	Pretest Mean (SD)	Posttest Mean (SD)	Significance
Fluency	91.19 (17.63)	106.12 (32.93)	t (25) = 2.45, p = 0.02*
Originality	98.92 (18.35)	116.62 (32.90)	t (25) = 2.62, p = 0.02*
Imagination	91.54 (16.65)	105.88 (18.00)	t (25) = 4.22, p = < 0.001*

Note. Nature preschool A: n = 19; nature preschool B: n = 13; nature preschool C: n = 17; nature preschool D: n = 26
Note. * indicates statistical significance

DISCUSSION

The results of this study must be considered in the context of the limitations and threats to the validity associated with this study. One limitation of this study was the use of multiple test administrators or coders for the TCAM instrument in both pretesting and posttesting. The use of multiple coders could have led to inconsistencies in data collection if the individual test administrators coded differently than the other test administrators. This was addressed through an inter-rater reliability analysis to confirm that coding across administrators was suitable for use in this study. Fluency and imagination ratings show a high degree of agreement, and the originality rating shows a good degree of agreement (Cicchetti, 1994), so the ratings were deemed suitable for use. However, this threat is not entirely eliminated.

A second limitation of this study is that TCAM assessments were administered both indoors and outdoors. Since the nature preschool sites conduct part of the school day indoors and part of the school day outdoors, it was necessary to allow for indoor and outdoor testing as the test administrators were intentional not to interfere with the normal flow of the school day. Nevertheless, the variation in settings may have introduced variation in child responses as different distractions and visual prompts may have influenced the child. Similarly, the fact that the weather varied greatly from sunshine to snow to rain throughout the administration of the pretests and posttests that occurred outdoors introduced another validity threat. Such differences could have influenced the amount of time a child could focus on TCAM activities. For instance, if it was warm and sunny, the children appeared to focus for longer than when it was colder or wet. Once again, due to the nature of the study and certain parts of the school day taking place outdoors, it was necessary to administer TCAMs in all weather.

Another limitation of this study was the temperaments and shyness of some children who participated in this study. Young children are quite unpredictable and can be shy one day and confident the next day. They can also be easily

distracted or uninterested in participating in the TCAM activities at any time. And some children are simply more out-going than others. Thus, the validity of a child's score and consequently the findings overall should be considered with this in mind. Attempts to address this were made through spending time with the preschoolers prior to administration of the instrument to familiarize children with the researchers and through spending a bit of time with children individually prior to beginning the assessment to increase the children's level of comfort with the researchers. Additionally, if a child was very shy or unwilling to complete the TCAM assessment for any reason, it was noted and the data was not utilized in the final analyses, as the scores may not have reflected the child's actual creative thinking levels.

Additionally, there is a limitation presented by the potential subjectivity of some responses. The scoring guide provides lists of likely responses for activities one, three, and four and a point value is associated with each response. However, if the response was written slightly differently, it is possible that the response could be scored differently than the scoring guide anticipated. This was addressed by having just one of the three test administrators score the TCAMs, which allowed for consistent scoring.

With these limitations in mind, as well as the potential limitation of variations in group sizes across the sites, the results of this study show a significant increase in the creative thinking levels of children who attended a nature preschool across the creative thinking dimensions of fluency, originality, and imagination. In contrast, children who attended the university-administered, non-nature preschool did not show a significant increase in creative thinking for the dimensions of fluency, originality, and imagination. A potential concern regarding the results of this study is that nature preschoolers' families may spend more time outdoors in general, due to their voluntary selection of a nature preschool for their children, and this may have been adding to the influence the nature preschools. However, if differences in family time in nature or familial disposition toward nature engagement was influencing on results, it would be expected that nature preschool children would have started with higher creative thinking scores, from the prior exposure to time in nature. This, however, was not the case in this study, as the baseline group had higher pretest creative thinking scores than children in the nature preschools. This suggests that differences in posttests creative thinking scores can likely be attributed to the nature preschool attendance, as opposed to family nature engagement.

Based on the characteristics of nature preschools, perhaps it is not surprising that the results of this study suggest significant growth in creative thinking. Nature preschools strive to provide children with extended daily periods of nature play. This time allows young children to experience the constantly-changing outdoors by playing in and with nature while engaging all of their senses and encountering new situations (Banning & Sullivan, 2011). New situations may require children to solve new problems, find new ways of doing routine activities, or try something brand new in their play. Each of these tasks requires a child to think creatively as they figure out the best way to solve the problem, adjust their routine, or test out a new activity (Healy, 2004). Because opportunities to think creatively arise so often in nature play, they regularly reinforce brain pathways required for creative thinking, which likely contributes to those pathways becoming better established and more permanent (Feist, 2010; McCain et al., 2007; Shore, 1997).

Not only do regular nature play experiences wire the brain to think creatively, but they provide countless opportunities for young children to learn through constructivism. The theory of constructivism suggests that people have existing schemas or ideas about the world in their minds, and when new information is acquired it is either added to an existing schema via assimilation or a current schema is reconstructed to align with new information through accommodation (Piaget, 1952). Each time a person restructures information obtained during nature play to fit an existing schema they are thinking creatively (Runco, 2003). Thus, the plethora of new information provided by the ever-changing nature of the outdoors may also be offering children with the chance to develop mini-c creativity as the child makes novel and personally meaningful interpretations of an experience to understand it better (Beghetto et al., 2012) and develop little-c or everyday creativity as they invent new information (Runco, 2003). Furthermore, the variety of open-ended loose parts children choose to interact with in nature introduce creative thinking opportunities. When loose parts are open-ended, the child must assign roles to them. For instance, a rock could be a rock or a frog or a shovel or a shelter. Each time a child invents a new role for that rock to enhance their play, the child must think creatively to assign the rock a novel identity that is useful for their play. Emphasis on mini-

c and little-c creativity and practice generating and implementing new ideas may foster creative thinking skills in nature preschoolers.

The results of this study further indicate variation among the nature preschool programs in terms of their influence on creative thinking. Understanding how sites vary and how those variations impact creative thinking is important in pinpointing the underlying factors at nature preschools that contribute to creative thinking growth. This understanding is necessary for knowing best how to foster creative thinking at nature preschools, particularly for nature preschools for whom this is an important intended outcome. Differences in each nature preschool that participated in this study may account for the variation in growth across the dimensions of fluency, originality, and imagination indicated in the results. This study did not attempt to control for the aspects of the participating nature preschools that make them different, as this study was exploratory in nature. Thus, it is important to note that the discussion that follows regarding variations in nature preschools and how that may have influenced creative thinking is conjecture as well as grounds for further research.

One possible reason nature preschools A, B, and D saw significant growth in fluency is that the children in these three schools attended nature preschool all day, and thus had 1 to 2 more hours of daily outdoor nature play. More time playing in nature may provide more opportunities for children to become fully engaged in their play and come up with new ways to use play spaces or loose parts (Banning & Sullivan, 2011). This extra practice and extra time to become engaged in play may further reinforce brain pathways associated with the development of new ideas (McCain et al., 2007; Shore, 1997). Thus, it is possible length of day may contribute to the development of fluency in nature preschoolers.

It also is possible that length of day partially influenced the significant increase in originality at nature preschool A and D as these are both all day programs. As with fluency, more time playing in nature could account for increases in originality because more time playing in nature allows children more time to come up with unique ways of playing with or using the natural environment and loose parts (Banning & Sullivan, 2011). Furthermore, the encouragement of original or unconventional ideas helps foster the development of creative thinking (Alkhudhair, 2015). Thus, it could potentially be extrapolated that children who have more opportunities to develop original ideas at all day nature preschool programs would have received more encouragement from teachers regarding their unique ideas, which fostered originality in those children. However, if the only factor influencing originality were length of day, then it would be expected nature preschool B would also see a significant increase in originality over the course of the school year. As such, while length of day may play a role, another unknown factor that links nature preschool A and D may be the reason behind the increase in originality within these programs.

Similarly, it is possible that length of day partially influenced the significant increase in imagination at nature preschool B and D as they are both all day programs. However, nature preschool A would have also been expected to see a significant increase in imagination if length of day was the only factor, while nature preschool C, which had a significant imagination increase, would not be expected to increase. Future research might seek to investigate the role of time, aiming toward an understanding of how duration of preschool participation influences creative thinking, as that would provide helpful guidance to sites who desire to have a positive influence on creative thinking.

As described previously, imagination helps children begin to develop empathy for others (Torrance, 1981a). This idea may help explain why nature preschool C saw a significant increase in imagination. One key feature of nature preschool C is that the children have daily interactions with a wide variety of farm animals. Allowing children to care for animals helps foster empathy as they learn to put themselves in the shoes of animals and imagine what it is like to be those animals (Wilson, 2014), and thus there may be relationships among this interaction with animals, the development of empathy, and the development of imagination. Nature preschools A, B, and D do offer some opportunities to care for animals, but nature preschool C provides frequent and sustained opportunities to do so. Once again, this cannot entirely account for the variation across programs as nature preschool B and D also saw growth in imagination, but it may partially explain this variation in imagination scores. Further research is needed in investigating the role of interaction with and caring for live animals and how this influences creative thinking in general and specifically in imagination.

Additionally, another important consideration would be variations in the teachers across these sites, as well as variations in guiding philosophy and primary aims. As this study was not designed to uncover specific mechanisms that influenced the results, here too one can only speculate as to the role variations in teaching style and philosophy may have played. With the recognition that variation in effectiveness exists, coupled with the overall positive influence suggested by the collective results, it would be helpful for continued research that aims to extend this current study focused on impact toward understanding the mechanisms at play.

IMPLICATIONS

This study has important implications for the field of environmental education. By demonstrating that nature preschools seem to be supporting the development of creative thinking this study provides environmental educators with a strategy (nature preschools and/or extended periods of nature play) with which they can encourage this skill from a young age. This is significant for the field because there are numerous environmental issues that require creative solutions (Csikszentmihalyi & Wolfe, 2014). From the early childhood environmental education standpoint, the results of this study provide further empirical evidence suggesting that nature preschools provide developmental benefits for young children who participate in them. Nature play is an important factor in promoting these benefits, as it is widely accepted in environmental education as a means of fostering holistic developmental growth (Banning & Sullivan, 2011) and instilling lifelong environmental values in young children (Ewert et al., 2005; Iozzi, 1989; Samuelsson & Kaga, 2008). Each new piece of evidence that nature preschools and nature play are beneficial for young children is important for the field of environmental education because it may help convince more families to participate in nature play, and thereby promote the goals of environmental education.

Early childhood practitioners in non-nature preschools can use these results as evidence as to why it is necessary and beneficial to the children in their programs to incorporate elements of nature preschools such as nature play and natural loose parts into their non-nature preschool classrooms. Early childhood educators sometimes find that they are expected to provide early childhood instruction that is not age appropriate in order to prepare children for higher grade levels by increasing teacher-directed academic instruction and decreasing play opportunities (Gray, 2016). As such, the results of this study add to the body of literature demonstrating that nature preschools and nature play can help promote early learning by helping young children meet early childhood learning indicators of progress through developmentally appropriate experiences that will help them become ready to learn across a range of domains when they enter elementary school.

Ideally, the results of this study may also be used by advocates of nature preschools, environmental education, and holistic early childhood learning to encourage administrators of non-nature preschool programs to incorporate nature play into these programs. A systematic review of literature on the benefits of children engaging with nature indicates that nature experiences, particularly when those experiences include play, benefit children in several ways (Gill, 2014). The review found well-supported evidence that time in nature is associated with adult pro-environmental attitudes, increased physical activity, motor development, and improved mental health and emotional regulation (Gill, 2014). Further, the review found that there is at least some evidence that engagement with nature can also promote social skills, self-control, well-being, self-confidence, and language and communication development in children (Gill, 2014). Each of these benefits offer advocates more evidence supporting the importance of nature play in early childhood. The present study's results which indicate that nature preschools have a positive influence on creative thinking development builds upon previous research and, when considered with the literature a whole, may encourage administrators in the early childhood field to adapt their programs to include nature play.

RECOMMENDATIONS

This study explored the influence that nature preschools have on creative thinking in young children. The results suggest positive influence. However due to the small sample size and the lack of random assignment to treatment and control groups, further research confirming these findings would be useful. The study also found that variation exists across nature preschool programs in relation to which dimensions of creative thinking were positively influenced. Because of the decline of creative thinking among children and because of the importance creative

thinking has in the context of both environmental issues as well as key skills and habits needed for today's world, future research is needed to help pinpoint the elements of nature preschool that influence the development of creative thinking. Beyond the influence of the amount of time, the role of unstructured play specifically in nature within nature preschools could be further studied to see if this unstructured play accounts for the growth in creative thinking. For example, a study comparing the growth of creative thinking between programs rooted in unstructured play in nature versus unstructured play in a classroom could begin to answer this question; if results were to indicate greater growth through unstructured nature play, it would lend weight to the idea that unstructured play in nature contributed to this study's results. Furthermore, a recent study found that features of two outdoor preschool classrooms, including time, a routine of going outdoors, open-ended materials, and a supportive adult, boosted creativity in participating children (Kiewra & Veselack, 2016). Future research could seek to determine if and how variations in this set of factors contributes to variation in effectiveness in supporting the development of fluency, originality, and imagination.

Future research should also seek to determine the role of the nature preschool teacher in the development of creative thinking. Different qualities of teachers and how teachers behave during unstructured nature play time may lead to different outcomes. For instance, one nature preschool teacher may choose to interact with children more often than another during nature play for any number of reasons. The number and length of these interactions may contribute to varied creative thinking growth. A study that investigates the qualities and behaviors of nature preschool teachers during nature play may help determine if teachers play a significant role in the development of creative thinking during nature play in addition to any effects that nature play itself may have on creative thinking development.

CONCLUSIONS

Overall, the findings from this study suggest that nature preschool experiences positively influence creative thinking in young children. The results indicate significant growth in the creative thinking levels of nature preschoolers over the course of the school year, as compared to the lack of significant growth in the creative thinking levels of non-nature preschoolers. These results were not influenced by gender or prior participation. The results also indicate variations among nature preschool programs in terms of their influence on creative thinking. Each program saw an increase at least one measured dimension of creative thinking measured by the TCAM (fluency, originality, or imagination), but which aspects increased differed across programs. These results have important implications for the field of environmental education, early childhood environmental education, and early childhood education as this study helps demonstrate that nature preschools and nature play can play a significant role in the development of valuable skills in young children and toward the development of citizens who are prepared to creatively solve environmental problems.

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Sensuous and Languaged Learning: Children’s Embodied and Playful Connections to Nature

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ABSTRACT

This paper reports on a study of day care children, ages 2 years 6 months to almost 5 years old, who visited a naturalized area near their day care once a week, over several months. The focus of this paper is on the embodied learning and expression of children’s learning, along with their use of oral language. The children engaged in some structured activities, as well as free play. Often, after play, adults had children discuss what they had observed or learned in the garden. Constructivist grounded theory was used for this study, with the researcher and research assistant making notes while children played, while they talked, and jotting down memos at the end of each day. Initial observations revealed that children not only explored the naturalized area through their senses, but they embodied their “feelings” of and about the world, and used their bodies to express and playfully imagine their worlds. Although language allows for greater focus and analysis of experiences, the role of non-languaged explorations and understandings is also important, and has, perhaps, been undervalued. More research is required on children’s interactions and creative play in natural or naturalized areas, with monitoring of children’s embodied explorations included. More research is also required on the role of children’s early and sustained experiences in natural areas for developing pro-environmental attitudes and action.

Keywords: Early childhood, environment, embodied learning, play, nature

Summer day (Researcher notes end of day): *A group of 3 and 4-year-old children ran out the east door of the institution in which their day care was located. Immediately on escaping the building, many of the children ran to the dense underbrush that crowded up against the corrugated concrete east wall. They ducked down under and squeezed between branches, rubbing against the concrete as they negotiated their way to a set of concrete steps, obscured by the dense underbrush. Some of the children were able to pull themselves to the top landing of the three steps, getting onto their chests, then scabbling up to their bellies, before standing on the top. Others clambered up similarly, but on the lower second step. One child carefully pushed through the bushes, and climbed to the bottom step. Then, the children jumped to the ground on the other side of the steps – some from the top, some from the second, and one walked back down the steps, struggled through the underbrush to the wall, and caught up to her peers at the northeast corner of the building. We adults watched from the shade of the maple trees where the underbrush had been mowed out to favour lawn grass.*

“Look Cathy¹!” one of the children called to a day care teacher. “I found moss!”

“I did too. Moss!” Many voices joined in. Cathy affirmed their observation, and explained to me that they had looked at moss the week before, on a different outing. “Where might you find moss?” she called out.

¹ Cathy is one of the day-care teachers. All names and locations are pseudonyms.

“In shady places!” numerous voices responded.

The children rounded the corner of the building, where a grassy slope led down to a soccer pitch. One of the boys set off running, down the hill, across the soccer pitch, screaming with joy as his peers chased him. The children were spread out in a long line, running as fast as their short legs could take them, with a few of the girls sedately remaining with the adults. We suddenly realized the children were headed directly to the garden, on the other side of a road, and were unlikely to stop until they got there. “STOP!” shouted one of the teachers, leaping into a flat out run. She caught the children before the road. Here, she reminded them of appropriate protocol for crossing a road. Fortunately, a car came along, so the children could practice looking both ways, and crossing when it was safe.

When the children arrived at the garden, they scurried en masse to the boulder field – about two meters wide, with a shallow slope, between the asphalt path leading to the west door of the building and the garden. The children stepped cautiously from boulder to boulder, noting to one another which boulders were unstable, sometimes slipping a bit, but, with care, finding their way through. They moved on from individually going through the boulder field to playing games of follow the leader, where they would run through the little forest, and then up – as fast as they could (but not running) – through the boulders. They bounced across the soft ground in this forest, emerging onto a crusher dust path, where they scuffed their feet.

End of day memo: *The children reveal their experiences of this world in their bodies.*

When I remember my childhood experiences, many of them in the outdoors in wilderness, my memories are embodied. I think of lying in my sleeping bag, and feeling itchy – on my back from sunburn and on my legs from mosquito bites; I counted 32 bites on one leg before I fell asleep. I think of the musty-sweet odour emanating from my skin after a day in the sun and wind, or the fresh smell of sheets right off the clothes line in the fall. Or, in the winter, coming indoors after playing in the snow, with a smile frozen on my cold chapped cheeks, and having to get my mother to test the water temperature before putting my hands in it because, as the cold let go of my hands, I could not tell if the water was too hot or freezing cold. And the ache as my fingers warmed up! Always, after a day outdoors, I would have a heightened sense of my body, lively, oxygen rich. I love being outdoors, and that love is based largely on sensations; feeling good or feeling pain (a moderate amount), I knew I was alive. I wondered about the dominant narrative now that has led to a tendency to protect children from unpleasant experiences, keeping them in climate controlled, secure indoor spaces. I wondered how children sensually explore their outdoor worlds. The story above about children on their way to a naturalized play area, revealed their embodied experiences, how they put themselves into situations to feel, to sense, their world. The focus of this paper is on the sensuous and embodied learning the children expressed through playing in a naturalized area. The physical affordances of natural and naturalized areas are very different than the affordances of play grounds, playing fields and other managed places. The themes that emerged from this study which focused on children’s sensuous and embodied learning were children’s: close sensory observation of the world; language in learning; and emotion in play. Every story included several of these themes, so the intersection of these themes takes up the largest portion of the discussion section of this paper.

WHY MORE NATURE FOR CHILDREN

The most important argument for children being in natural or naturalized areas is for them to come to recognize the importance of nature, and that they are part of nature. Pramling Samuelsson and Kaga (2009), in their summary of the UNESCO Early Childhood Education for a Sustainable Society conference held in Paris, stated: “There was a strong consensus that educating for sustainability should begin very early in life. It is in the early childhood period that children develop their basic values, attitudes, skills, behaviours, and habits, which may be long lasting” (p. 12). Studies of adults have found that early experiences in the outdoors (Gurholt, 2014), and the kinds of experiences they engage in there (appreciative, such as bird watching, rather than, for example, operating motorized vehicles (Thapa, 2010)), could lead to adults recognizing that humans must take better care of the planet.

A second argument is for physical health: children who explore the natural world, outdoors, develop better physical motor skills, and both large muscle and coordination abilities (Fjortoft, 2001; Söderström, Boldemann, Sahlin, Mårtensson, Raustorp, & Blennow, 2013). The children are, overall, healthier and less likely to suffer from long term illnesses than their indoor peers.

A third reason is that children develop better academically from being in the natural world. This is perhaps due to increases in their ability to focus, with research indicating that time in natural or naturalized areas reduces the effects of ADD/ADHD – mitigating the necessity for medication (Faber Taylor & Kuo, 2009; Kuo & Faber Taylor, 2004); research on adults demonstrated similarly that time in nature restored a person's ability to focus (Berto, 2005; Hansmann, Hug, & Seeland, 2007; Kaplan, 1995; Tennessen & Cimprich, 1995). Learning affordances (Gibson, 2000) are plentiful in natural areas. A learning affordance is something – an object, an event, a relationship – that can be observed, and that provokes children to learn. Teachers can support children's learning of different concepts by building on the affordances children find in natural settings (Gustavsson & Pramling, 2014; Torquati & Ernst, 2013; Ward, 2013).

A fourth reason is that natural and naturalized areas offer opportunities for children to develop creatively. They are more likely to have time, space, and "loose parts" for creating their own worlds, and for sustaining their stories (Melhuus, 2012).

Finally, children who are allowed more time for free exploration in natural and naturalized areas are better able to assess risks when they are older. The risks are smaller when they are young, so learning to assess these low level risks then applies to the riskier behavior available to older people (Deci & Flaste, 1996; Dweck, 2006; Ryan & Deci, 2000; Sandseter, 2009).

Having natural and naturalized areas easily available to children, to their families, to their classrooms, should therefore be important to a society.

One aspect of children in the outdoors that has not been examined is the ways in which children embody their sensory experiences in natural areas, while they are still in early stages of language acquisition. The focus of this paper is on the children's exploration and expression of the world through their bodies, the sensuous experiences they have in a natural/naturalized place.

An examination of the research literature reveals the following terms for outdoor spaces: green, natural, naturalized, nature. The meanings of these terms vary depending on the authors' context. In this paper, "green" is any area with plants, including natural and naturalized areas, as well as sports fields, and suburban yard and park spaces – the term includes some areas with little biodiversity. I define a "natural" area as one which exhibits great biodiversity, much of it as it was before interruption by human settlers; a "naturalized" area as one which has been disrupted from its original biodiversity, and now, as much as possible, returned to this original biodiversity.

STUDY DESIGN

PARTICIPANTS

This study is part of a larger study, examining what children choose to do in a naturalized area, and how they talked about the area based on organized activities and their free play. This study reports on the observations of children from a nearby day-care playing in the naturalized space, and focuses on the kinds of sensuous activities in which the children engaged, and how they expressed this kind of non-verbal learning. The teachers from the day-care and the researcher planned some activities for the children, but much of the time, the children were invited to engage in spontaneous play. There were from two up to to four day-care teachers, sometimes an educational assistant, one researcher, and for some of the time, a research assistant, with the eleven to thirty children whenever they were in the Prairie Habitat Garden.

The children ranged in age from two years six months to five years old. All the children engaged in the activities in the garden; about 70% of the parents signed permission for their children to be observed while at play in the garden, and only observations of these children were retained. Children were put into groups based on permission for the study; each day, one group comprised only children in the study, and two groups comprised a mix of children, those in the study and those not. Notes were kept on all three groups by the researcher and research assistant. Notes kept on mixed groups were destroyed; only the researcher knew for which group the notes would be kept. As part of the ethics agreement, no photos were taken. The children are to remain anonymous.

CONSTRUCTIVIST GROUNDED THEORY

The study used constructivist grounded theory (Bryant & Charmaz, 2007; Kenny & Fourie, 2014, 2015; Seldén, 2005). Grounded theory draws on the data to support the development and/or modification of theory. Along with Bryant and Charmaz (constructivist grounded theorists), I acknowledge that the researcher is inevitably value laden and biased, which interrupts the potential for completely open interpretation towards theory building. Following the recommendations of Bryant and Charmaz, I took care to develop my awareness of my biases, through the support of the research assistant, so as, as best we could, to keep our minds open to potentialities, as well as looking for “the negative case” (which was open, not binary), so that I would be able to monitor my interpretations. The research assistant and I discussed first impressions of collected data each day, and wrote summary memos. This facilitated reflection on our different perspectives of the children’s experiences. Finally, to try to remain as open to alternate interpretations as possible, penultimate versions of the papers were shared with day-care teachers for their reflection and input.

However, researcher bias is what led to exploring the role of embodied sensations of the experiences. If I, the researcher, had not had profound embodied memories of my own childhood experiences, it is likely that I would not have noticed that the children engaged in “feeling” on the first day as they headed off to the garden. However, to ensure my biases did not affect further interpretation, it was important to systematically search the data and discuss it with the research assistant, as well as later to take the interpretations to the day-care teachers for their opinions.

The research assistant had met with the researcher (myself) daily for two months before the study began. As part of the research assistant’s work with the garden, she read about how children learn in natural spaces; as well, she read several papers about constructivist grounded theory, the method we had decided would be appropriate. When the study began, the two of us kept notes, made memos, and discussed these the next day. The research assistant picked up on note taking quickly, and was very perceptive, often noticing things I did not.

Research data included planning notes for what to do, notes made on observations at the time of the children’s activity (named “notes in the moment”), notes made during conversations with the children (also named “notes in the moment”), notes made immediately after activities of what was remembered and seemed significant (named “notes end of day”). At times, I have put material in regular font, within square brackets, to indicate that I am commenting on the notes after the fact, to add more explanation. Usually the researcher and the research assistant took notes each day. Notes from the groups of children whose parents had given permission were transcribed. While transcribing the notes from hand written to electronic form, the researcher and research assistant made “memos” when something interesting appeared. For example, the research assistant noted that it was girls who were not running, and tended to hang around the picnic table on the mowed lawn grass beside the garden. We discussed the memos early the next day, and we decided which to pursue in greater depth to perhaps make themes. In the case of girls being less active, follow up observations revealed that some of the girls were more sedate, and less likely to engage in active play in the garden, but the majority of the girls were involved in active play in the garden. At the end of the study, the memos and follow-ups were examined more closely, and sorted into themes. Themes were then classified together into categories. The themes and categories were then shared with the day-care teachers for their input.

This paper focuses on one of the categories that emerged from the larger study, the category that addresses the role of sensory activities, the sensuous feelings and expressions, that children demonstrate regarding and within

their early experiences in learning in a naturalized area. Children's learning and expression are discussed regarding the interactions amongst learning, embodiment, and language.

GARDEN SETTING

The setting of the study was in a naturalized area, once only lawn grass and a few elm trees, but now planted, as much as possible, to species native to the northern North American prairies. The garden is bound by asphalt paths on three sides, and a building on the fourth side.

On the north end of the garden is a boulder field, separating the garden from the asphalt path that leads out of the building. The north side of the garden, immediately south of the boulder field, is shaded and moist, and has been planted to woodland plants. The ground here is softer and moister. A path of red crusher dust runs through the garden from the north to the south end. Heading south along the path, one reaches a sunnier part of the garden, where short- and long -grass prairie plants have been planted. Some of the shrubs have gotten out of control – without the appropriate animal grazers and fires, prairie plants can be invasive in their own habitat. Still, there is a variety of interesting indigenous plants that flower abundantly in their season, and that stimulate different senses. The garden itself is about 0.074 hectares (0.20 acres) in size.

As well as native plants, the garden has had some cultural features built in. There is a Medicine Wheel, and an Earth Turtle², representing First Nations' cultures. There is a constructed post with signs noting people who have donated to the Faculty of Education, and there is an interpretive sign about the garden. As well as First Nations cultural features, there are ecological supports: there is an indigenous bee house, commercially built, which is situated near the Earth Turtle; there are bird feeders, with sunflower or niger seed, and some with suet; the garden is planted entirely to indigenous plants (keeping out invasive weeds, such as quack grass, is a struggle).

Many species of birds and Richardson's ground squirrels were expected to be attracted to the garden. Interestingly, the ground squirrels are much more prolific in the mowed area across the asphalt path. As well as these species, mice and garter snakes have made homes here, and rabbits, hares, and foxes visit. Quite a variety of invertebrates also live here, likely in far greater diversity than in the lawn across the asphalt path.

THE DAY-CARE

The day-care is located on the grounds of a post-secondary institution and contained within the Faculty of Education, but autonomous and serving the larger University. The day-care has a fenced green play yard, with sand, swings, water hoses. As well, the day-care is about 500 meters from a natural space designated a park by the local community; the day-care teachers take the children to this park often. Since the Prairie Habitat Garden has been built, just on the other side of the building from the day-care, the children also access this outdoor space. To get to the garden, the children either walked through the building or around the outside, always accompanied by adults. The children ranged in age from two and a half to five years old. Most of the children attended day-care full time, during the time their parents worked at the post-secondary institution. Countries of origin were diverse. The children already spent much time outdoors. There was a large notice on the door, stating that parents should dress children appropriately for the weather, since the children go outside EVERY day. As well, the day-care teachers had much experience and expertise in taking the children beyond the play yard. A common word for the children was "outing" as in "Are we going on an outing?" The children reported, with excitement, to their teachers when they found something in the garden that connected to other day-care learning experiences. An example of this was when

² An Earth Turtle is a feature made of soil and rocks, and represents some Eastern Tribal stories of the Woman Who Fell from the Sky. The woman landed in the ocean, and, when offered by the turtle, she climbed onto its back. Other animals then brought up soil from the ocean bottom, adding size to the turtle. This has resulted in Eastern First Nations' groups naming North America "Turtle Island". A Medicine Wheel, in this case a series of three concentric circles and divided into four quadrants, demonstrates how different aspects of the world are integrated into one complete whole – a circle. Across the northern North American plains, stone circles have been found, and the Medicine Wheel is one interpretation of their meaning.

the children discovered raspberries in the garden, and connected these to a story one of their teachers had just read to them that morning at story time.

The outings to the Prairie Habitat Garden were an added outing; the children were excited to go on another outing, and they indicated they enjoyed the garden as another special outdoor place to play.

GARDEN ACTIVITIES

The children in the day-care were divided into two groups; one group visited the garden on Tuesday mornings, and one group visited on Thursday mornings, both for an hour or so. We tried to ensure the kinds of activities were similar for each group, because the children interacted a lot within the day-care, and talked about what they had done. If the weather were cold, garden time began with a physically active organized game. On warmer days or after warm-up on cold days, children explored the garden, engaging in free play, and talk time. We also wanted to implement a quiet time, and did this by inviting children to try to feed the birds by them sitting still with sunflower seeds in their hands. Often, after activities in the garden, the children were called together for “circle time” during which I, the researcher, would ask them about their experiences. Visits to the garden were not the only outdoor and in-nature activities the children were involved in, but were the only activities reported on in this study. They played outside nearly every day for significant periods of time, and they went on other outings with their teachers. The garden was an extra, a special place the children could visit that was, in some ways, their garden.

The study was eight weeks in length with weekly observations.

STORIES

As noted, my memories of being outdoors in my childhood involve sensations, both pleasant and painful. The painful sensations did not put me off going outdoors. They are some of my most powerful memories, and were, in Dewey’s (1938) terms regarding experiential education, educative rather than mis-educative. Educative experiences lead to learners going on in their learning; mis-educative experiences shut down further exploration. Negative reactions from influential adults about incidents, and severe or prolonged pain might well have made events mis-educative. For me, sensations that other parents might not want their children to experience became fixed in my memories and a foundation for my love for the natural world. I had experienced these feelings; I had enjoyed the day; itchy mosquito bites were not just an unfortunate side-effect (unpleasant), but a part of the memory of the excitement and activity of the day. Thus, I was drawn to the children’s sensory experiences of the garden.

The following notes include “notes in the moment”, while the researcher and research assistant were observing the children at play. There are also “notes end of day”, which were additions the researcher and research assistant made from their memories of the events, after the events. It is difficult to keep up to what the children are doing, and it is difficult to be sensitive to all the different aspects of the children’s activities. The notes also include “memos” made as the researcher and research assistant read over and transcribed into digital form the notes after the children had gone back to the day-care; memos are different than end of day notes in that they are based on the notes, result and develop from our discussions, and focus on emerging patterns. Memos lead to the creation of themes, and the researcher and assistant could then examine the theme in greater detail. Later, themes were classified into categories.

In the italicized transcripts of our in the moment and end of the day notes, I have inserted explanations in square brackets and not-italicized text. These additions were not in the original notes, but have been inserted to clarify what the notes meant.

Fall day (Researcher’s notes in the moment): *The children run down the asphalt path on the hill, and leap into the leaves piled at the bottom. They crunch them and stomp on them. On the crusher dust path, the children scuff their feet; they make dust. In the softer ground in the forested area, the children bounce as they run. They head through the trees, circle back to the boulder field. Now they are negotiating their ways around and over the rocks. No longer one big group, they have separated. They seem to want to step from the top of one rock to the top of another. They are cautious. Should we tell them to be careful? The teachers*

are letting them explore. The children are being careful. Ishmael³ is on a tippy boulder. He calls out to Wyatt behind him to be careful because this stone is tippy. Now Rodney calls to those behind him to follow him because he has discovered a new path. About three children follow him. Maria ignores him. When she gets out of the boulder field and on to the asphalt path, she runs to Cathy [a day-care teacher], takes her by the hand and leads her through the boulders, saying "I found a new path through the boulders."

(Memo: The children do not comment on the textures of leaves, crusher dust, bouncy ground, boulders, to other children or to their teachers. Not that we hear, but we observe them experiencing these things during the entire visit.)

The textural exploration of the ground and materials at their feet – asphalt, crunchy leaves, crusher dust, soft earth – was interesting from an educator’s perspective. Vygotsky (1934/1986) argued that learners need to put words to their observations to use those observations for “spring boards” for later learning. However, embodied knowledge contributes to physical environmental responses. Knowing that rocks are hard, regardless of words, affects a child’s later negotiations through the boulders. These children seemed to understand the boulders to be hard; they did not want to fall. Not wanting to fall made them move cautiously, but did not prevent them from negotiating the area. Neither the day-care teachers nor researcher and research assistant observed a child fall amongst the boulders. (Just because it has not happened does not mean it will not happen.) The day-care teachers had had sufficient experience with the children to know which children and when the children needed to be advised to be cautious. Lacking the experience with young children, I (the researcher) yearned to warn the children. However, the children knew to be careful. All of them worked their ways cautiously amongst the boulders. Sometimes only experience will teach them what kind of “careful” to be.

An interesting aspect of the above description was that the children invented the word “tippy” to describe boulders that were unstable. The instability of the boulders, they would use words to describe. The hardness of the boulders, they did not.

Many activities that I planned for the children involved them exploring the garden’s sensory learning affordances. A learning affordance is anything (event, relationship, object) that children are drawn to that a teacher can use to support further learning (Gibson, 2000; Torquati & Ernst, 2013; Ward, 2013). Until I noticed the children exploring the textures under their feet, I had not thought of this affordance – textures of ground. However, I did plan for them to explore other textures that the garden offered. One of the first activities involved a game of follow the leader (a cool-day warm-up activity) with children in small groups with an adult leader. Each leader had children engaging in sensory activities, such as stopping after hopping to smell the flowers and leaves, hesitating after running to listen or touch. Then each teacher invited a child to lead the group. Every child in every group had the opportunity to lead. The children generally focused their leadership on taking their peers quickly through physically challenging areas. I was unsure if the children had picked up on any of the textures, sounds, etc. of the garden. I had noticed them scuffing their feet, but they did not lead their peers to scuff their feet. Children responded to their sensations in the garden, but they did not seem to communicate this to other children.

Fall day, Circle time in the garden (Researcher’s notes end of day): *I invited the children to be quiet and to listen. What did they hear? Their immediate answers were “cars” and “trucks”. Tuning my ears, I realized that this was so. I have become inured to the sounds of traffic. I listened more carefully, because I wanted them to hear the birds. It was hard to hear them with the sounds of the traffic. I asked the children to listen for bird songs. I listened carefully, and, as soon as I heard one, I lifted my index finger. “There! Did you hear that?” The problem with learning to hear bird songs is that we alert our friends to them just as the song finishes. “Listen again. Quietly. ... There, did you hear that?” lifting my index finger again. When the geese flew over, the day-care teacher pointed up to them. The geese were honking and the children paid attention to them – they heard them. The first bird they noticed “in” the garden was one far above the garden.*

³ All names are pseudonyms. No photographs were taken, because of the need to protect the children’s anonymity.

(Memo: Bird calls are subtle in urban areas, but they are present; it took about four times of focused listening before the children began spontaneously to notice the bird calls.)

As Gustavsson and Pramling (2014) noted about variation theory, there is far too much happening in any given moment for a human to attend to it all. In the case of the bird calls, the children stopped to listen, but heard, at first, only the loudest noises. It does take teaching to tune in to the less obvious sounds of the natural world. The teaching, in this case, involved using language. Perhaps I could have had the children focus on the sounds of the birds by merely lifting my finger each time I heard a bird call, but the words explaining what to listen for made the lesson more efficient and perhaps more effective. I wonder how else I could support the children tuning in to the sounds around them?

Experiences are complex; language focuses humans on aspects of an experience; putting language – words, sentences – to these experiences sequences the experience. But the complexity of the experience cannot be ordered. There is too much going on at one time for the fullness to be communicated. On the other hand, learning to focus on aspects of the moment, or the place, can draw things out of the background and help to make meaning from complexity.

Fall day, Circle time in the garden (Researcher's notes end of day): *To get the children to explore the garden, I suggested they go find a berry to bring back to our meeting place. The children could not find any! The teachers and I attended to each child, pointing to berries. Pirita saw the rose hips, and then pointed excitedly to several more. Hasan still could not see them. I had to pick several rose hips for him.*

Some children brought the first berry they found back to the meeting place. Hasan searched the garden to be sure to find an unusual berry – a choke cherry. Most of the children brought back rose hips. Back at the meeting place, I showed them how to peel the skin off the rose hips to find the hairy seeds underneath.

Language can help humans to focus their experiences. Words are signifiers of things, but also make things significant. I cannot imagine how I might share what I learn without using language – but sharing that information with others makes that aspect of the experience seem more important. Observing the children's sensual play, however, and remembering my own childhood experiences, revealed the role of embodied experiences for learning. Not everything needs to have words put to it; indeed, not everything can have words put to it. As a child, I had eaten rose hips, because my mother had told me they were edible. I soon learned, without her guidance, that the seeds on the inside had an unpleasant texture in my mouth. I then modified the eating of rose hips to nibbling the skin off the outside. I learned that the hips are sweetest after a frost. I did not put words to this learning. Until now. Interestingly, the day-care teachers told the children not to eat the rose hip seeds, or they would get "do you remember? Yes, you will get itchy bum! From the seeds coming out after you eat them!" I do not remember that experience from childhood. I wonder why?

Fall day, Activity time (Researcher's in the moment notes): *I notice Anne [one of the day-care teachers] has gathered a group of children with her, and they are sitting in a circle!! They have a collection of leaves. The leaves are stunning shades of bright orange, yellow, red, and one is a deep green along the veins but bright orange away from the veins. [I wondered and recorded in my notes:] Where did she find all this beauty? She is asking the children about the colours, and the children practice colour words. From their chorus answers, they know their colours.*

Anne, the day-care teacher, had used an affordance in the garden – the leaves – to reinforce the children's colour vocabulary. I had put exclamation marks in my in the moment notes because I had invited the children at this time to explore the garden, whereas Anne had the children organized into a structured activity. The children were co-operating, and thus, I assume they were enjoying the activity. Perhaps this circle of learning had been set up when some of the children noticed the vibrancy of the leaves, and Anne picked up on this to support further learning for all the children in her group. This would be consistent with Gustavsson and Pramling's (2014) discussion of sustained shared conversations, which are supposed to emerge from children's observations and their comments or questions to teachers. It is a moment when teachers are invited to participate in the children's worlds, and gives opportunity

for enhancing understanding and focus. *Gustavsson and Pramling* gave examples of teachers and children playing and learning in natural areas. During free inquiry activities, children will notice and comment on something, and that is the cue for the teacher to support them in focusing on scientific classification. For example, one teacher in *Gustavsson and Pramling's* study invited the children to count the number of body parts on a spider and on an ant. Similarly, the leaves offered an affordance, which Anne used, and she used the conversation to develop vocabulary. Anne had engaged in sustained shared conversations with the children.

I did not stay long enough to see the rest of this lesson, but the potential for developing greater understanding through examining the shapes, matching these with colours, and continuing to explore the sensory aspects of the leaves was great. The children could have explored, with or perhaps without guidance, the textures of the leaves, or the relationship between leaf colours and shapes. These could have been opportunities for further sustained shared conversations, for developing vocabularies that help children to know their worlds. I only thought of these opportunities after the moment. I hadn't even noticed the affordance of leaf colours as an opportunity for developing the shared language of colours. The day-care teacher had supported the children in learning more from the affordances in the garden through sustained shared conversation.

Summer day, Activity time (Research assistant's notes in the moment): *Robbie and Peter are discussing the Forest of Doom. I ask them what this is. They showed me where it is. I asked them why they called it the Forest of Doom. They lead me through the rose bushes. It is prickly in here! Even they are having trouble getting through. They point to a sign on the fence. They know it is a caution sign. They ask me what it means. I say I don't know. They say they think it is a warning about poisonous snakes. There is a squiggly line on it that could be a snake ???*

Summer day (Researcher's notes end of day): *After Meaghan [research assistant] mentioned that the children were talking about the Forest of Doom, I mentioned this at circle time. I had thought all the children were sharing this story, but as soon as I mentioned the Forest of Doom, a number of children wanted to know where it was. Robbie and Peter were then the experts and the stories of the poisonous snake spread quickly. Then, they led the children to and into the Forest of Doom.*

(Memo: *Most of the children seemed to want to be afraid. They jumped at the opportunity to search for this poisonous snake!*)

This observation increased our understanding of children's play: the children wanted an emotional challenge. The "Forest of Doom", and the purported presence of poisonous⁴ snakes added to the allure of this place. Some research (Deci & Flaste, 1996; Dweck, 2006; Ryan & Deci, 2000, Sandseter, 2009) has pointed out that children who have opportunities to take risks in their early years are better able to assess risk as they get older. Usually, the risks that young children are exposed to, with adults being close by to monitor them, are less likely to cause fatalities. These children took risks with the places they chose to move through, and these risks were physical (the boulder field, and the rose bushes), and emotional (the poisonous snake).

Summer day (Researcher's notes in the moment): *Sofia has pulled me into the forest (not the FofD). She wants me to tell her – and the group of three girls who are together, if this plant is poison ivy. Mabel explained that Adam's brother had been burned by poison ivy (now Adam arrives and affirms this is so). Adam says he is not sure, but he thinks this plant is poison ivy. The plant is a small shrub, but looks nothing like poison ivy. The children are still cautious in the forested area.*

(Memo: *The children became very alert to plants that might be poison ivy, ceased exploration of that part of the garden, and sought out adults if they thought they had found some poison ivy. They did not get adults involved in their exploration of the Forest of Doom because of the poisonous snake. What is the difference between the two dangers?)*

⁴ There are no poisonous snakes in this part of the province.

I assured the children we had not planted any poison ivy in the garden. Perhaps telling them this was a mistake; the children took up challenges such as the boulder field, and they seemed to enjoy the sensation of fear in the example of the poisonous snake. A learning side effect of the children worrying about poison ivy could have been supporting them in attending to minute differences in plants. This was an affordance that I did not take advantage of. I could have talked to them about what poison ivy looked like and asked them to find a plant they thought matched this description. Small groups of five children per adult would have been able to notice and name a number of plant characteristics. Sustained shared thinking (Gustavsson & Pramling, 2014) could have been used to enhance the children's learning. In the above example of the different fall leaf colours, the day-care teacher had engaged in sustained shared thinking about colours. To support children in learning to attend carefully to differences in plants, I could have some laminated pictures of poison ivy, and of several other plants that might be confused with it. Children who worried about poison ivy would be given the laminated pictures of different plants, so they could try to determine which ones might be poison ivy. Plant identification – paying attention of details and patterns – could be further supported then by the colours of the leaves in the fall.

An intriguing aspect of contrasting the children's engagement with the Forest of Doom, and their engagement with the poison ivy is the way the children assessed the risk. The reported information, delivered from a peer about poison ivy, seemed to be more influential than the interpretation of information of a wiggly line meaning "snake" on a caution sign. Both situations evoked emotions in the children, but one fearful situation was to be embraced while the other was to be avoided. Perhaps it was the embodiment of the poison ivy. The child's brother had actually been burned, had felt the pain, of the poison ivy. None of the children had been bitten by a poisonous snake.

Children's sense of what is real became an interesting topic for discussion between researcher and research assistant. Children engage in creative play, and story this play, and this seems to support them in controlling and interpreting their roles in the world around (not just in their imaginations) (Paley, 1991, 1999, 2010). Although their play becomes so real to the children that an adult viewer might believe the children are entirely within their created worlds, the children seem to differentiate amongst multiple layers of their stories. Their sensory experiences and their language affected their actions, affected the way their time in the garden became embodied.

Summer day, Circle time (Researcher's notes end of day): *During the debrief, I asked the children what they had noticed in the garden. Suzy said (she sounded mischievous) that she had seen a turtle. Jayden said "I saw an elephant." At this Suzy responded (she sounded indignant): "I saw a real turtle." And she added, "It was made of dirt and stones." Immediately, Ishmael said: "I saw a mosquito, made of stones, flying by me. There it goes!" and he turned his body, pointing at the mosquito, made of stones, flying by.*

The children's imaginary beings were made real in their interactions – a mosquito, so light and flying, but made of hard, dense stones; the little boy's whole body, indicating where his mosquito was such that we all looked to see it go by; a turtle, with the speaker seeming to know her audience would imbue it with different bodily characteristics (heavy, shelled, moving slowly) than the one she had experienced (a hill, with rocks outlining turtle parts, and plants growing on it). There were layers of imagination in their stories. When a boy said that he saw an elephant, the turtle girl had to let him know that her "truth" was more real than his – there was NO elephant in the garden. But then, another boy developed on the idea of the stones, and melded this to a living breathing creature from the garden, one present throughout the summer: a mosquito. His mosquito, however, had special heavy qualities, building on what his peer had said in her description of the turtle. I could imagine this mosquito in a way that was very different than if he had just pointed to a mosquito. And, as he used his whole body to indicate where it was, we all responded, following him, briefly, into his imaginary world. The children sense the world, by, for example, responding differently to bouncy forest ground versus shale path. The children express their worlds, communicating via their bodies, leading, pointing, revealing how they have sensed the world. Does this demonstrate that mind and body are inseparable, and inseparable from the world?

The world is filled with information, flooding our senses. To be able to survive, all living things must learn to pay attention to significant details. Significant details might hit a living thing, hard, letting that thing know to pay attention. Or, for humans (and likely many other species), significant details are pointed out by nearby adults (Gustavsson & Pramling, 2014). Children can be invited to attend to specific details (usually through language), but

perhaps the adults around them should support the children in their learning and inquiry by appealing to all their senses. A tendency for most human cultures is to focus on what is seen, more than what is heard, felt, smelled. A tendency in Western Modern Culture is to focus on things, objects, rather than on relationships.

Cold fall day, Circle time (Researcher's notes end of day): *It was windy during debrief, but the sun was shining. I asked the children what they had heard in the garden. Chantal said she had heard the clouds, pointing to one that was scudding across the sky. (This was too good!) I asked her what it sounded like. She made a musical sound. Maria said she also heard a cloud. She also made a musical sound. Elijah interrupted, saying he had heard a different sound, and he made a sound like thunder. There are times when I would love to be in their worlds.*

The world is complex, and children do need to learn to attend to important details. However, they notice much that adults have shifted to the background. We can help the children to attend to sounds, sights, smells, feelings, and even tastes that they might not otherwise notice. But we can also learn from them. Children can remind us of the complexity that our bodies have learned, without language, to respond to the sensuous nature of the world around us. Language is important; adults do signify, through language, important factors from the chaos of the world that children must learn. However, much of children's learning they do without language, by responding to the sensuous nature of the world around them.

DISCUSSION

The themes that emerged above are the roles of: close sensory observation of the world; language in children's learning; and emotion in children's play. Multiple themes emerged in each story, and they tended to be intertwined, so were not separated in the "Stories" section above, nor do they separate well in the discussion below; hence the last theme is intersecting themes.

CLOSE SENSORY OBSERVATION OF THE WORLD

For children, their bodies are sensory organs; the textures of the ground reverberate through their bodies. Close observation, while attuned to how interactions in the world can be embodied, will support understanding the importance of children experiencing the natural world for learning what it "feels" like. These unlanguage embodied experiences are individual, sometimes not shared verbally with others. It was interesting to see what felt experiences caused the children to use language to explain, and which they did not. For example, they did not warn one another than the rocks were hard, although this was something that could be a concern; they did use language to explain that a boulder was unstable. Vygotsky (1934/1986) argued that learners need to put words to their observations to use those observations for "spring boards" for later learning. However, embodied knowledge contributes to physical environmental responses. For some of the sensuous aspects of the garden, the children learned directly from the garden, rather than from other humans.

Children feel their worlds, but they also hear, and see them. However, in the story about hearing bird calls, the children did not hear the subtle songs until the teacher had used language to point them out. This brings us to the next theme, regarding use of language for learning.

LANGUAGE IN CHILDREN'S LEARNING

Children also learn by attending to adults and peers, to what they signify through language, to extract information from the chaos of the world around them. Interestingly, however, children will create words when they notice something that needs a word. For example, in this study, the word "tippy" was invented by a child to caution his peers about unstable boulders. In this way, learning is social and language, with children making sense of the world with others.

Taking this up in terms of variation theory: every experience has multiple aspects. Gustavsson and Pramling (2014) noted, for example, that a child, to learn what is red, must also learn what is not red. That will support the child in

interpreting colour the same way as the culture does. However, the object might also be shaped as a triangle, made of plastic, taste sweet, or (as one of my friends suggested) worship a particular form of god. Language will support children in sharing their learning, and in appropriating the ideas of the culture. Much will be left out, however, because every phenomenon is complex. Meanwhile, there is much that children embody, aspects of the world that children pick up on through their bodies (all their senses) that they respond to without using words. For example, the children understood to move their bodies differently on the soft ground than on the hard asphalt path. They knew to move carefully through the boulder field.

EMOTION IN CHILDREN'S PLAY

The children managed to create a sense of fear in one part of the garden – there was a poisonous snake there. However, the other children wanted to explore this part of the garden, to search for this snake. The snake did not have the same degree of fear associated with it that, hearing from a peer whose brother had been badly burned by poison ivy, finding poison ivy did. Hearing the story of a brother burned, and that there might be poison ivy, the children seemed more fearful than adventurous, in that part of the garden. Perhaps who spoke, what information was communicated, and the body language associated with the message, gave the poison ivy story a different kind of fear than the poisonous snake story. Likely, the children picked up on the playfulness around the story of the poisonous snake, and the serious concern about the poison ivy. This indicates that young children engage in sophisticated intersubjective communication.

INTERSECTING THEMES

Adult humans tend to associate specific observations with specific senses, and language tends to support isolated aspects of experiences, and sequence these aspects. However, all senses are intricately implicated in all our experiences. Learning to sense the world should be encouraged, facilitated, and perhaps further developed, especially if teachers and other adults understand that every sensation, every experience, involves the whole body. When I consider the in-classroom activities I did with young children to teach them vocabulary associated with (for example) taste – “touch this to your tongue here”, etc. – those activities were limited to what I provided, rather than being open to the generous affordances of a natural world. The experiences described in this research happened in a naturalized area, and in community with other humans, and were shaped by the experiences and knowing of others. However, there were also individual and unshared learnings, as children adjusted their bodies and sensations to, for example, the texture of the ground beneath their feet.

The naturalized garden offered learning affordances that the day-care play yard did not, such as greater variety in species, kinds of soil, and greater difficulty for retreating indoors if it began to rain. The garden, unlike the play yard, offered up its constructed areas as surprises, whereas the natural features were explored largely without spoken wonder. The different textures of the ground, the shapes of leaves, and tastes of berries, the odours of the plants, the bird calls, were all things that emerged from the complexity of this ecosystem over time. The adults helped the children tune in to some of these aspects, but we adults were able to learn from the children as well. Some of adult learning is actually re-learning, for example remembering the magic of the world, and how to explore the world sensuously. Importantly, though, before this study, I did not realize how much of the world I know that I have never put into words, such as how to respond to textures of the ground, etc.

Abrams (1996) argued that the use of language separated humans from their sensuous contact with the natural world. Indeed, experiences are complex and holistic, involving the whole body. Language, according to Vygotsky (1934/1986), allows humans to focus on aspects of the world, and to recall that aspect to their minds later, as well as to share those aspects. Can language, requiring signifying and sequencing, embrace the complexity and holism of experiences? Vygotsky prioritized the role of language in learning, arguing that when a person put words to a phenomenon, that phenomenon could then be analyzed and could be a “spring board” for later learning. He argued that without putting words to events, further learning would be limited. Does the theorizing of experience (through putting words/concepts to it) take us away from the experience (Abrams), or does language (communication) deepen experience (Vygotsky)? Perhaps we can have both?

In this research, occasionally activities brought the children to focus on specific aspects of the natural world. The children then were able to pick out those aspects, as per Vygotsky's theories – putting language to their experiences so as to build on them later. However, from observing the children at play, and in conversations with them, it seemed the children were learning and applying some of their learning without “wording” their experiences. The children sought out different textures, experienced them without discussing them, and then modified their behaviour based on their individual explorations. This was obvious as children ran on the asphalt path, shuffled along the crusher dust path, and bounced on the soft earth in the forest. In conversations (language) about their observations, they noted seeing and hearing clouds, and gave rather playful descriptions of the sounds. At the same time as using language, however, they embodied their creative descriptions of, for example, a mosquito made of stones.

Personally, I cannot imagine communicating about an experience to someone else without putting words to it. On the other hand, I have had visceral experiences, which I remember and react to because of their visceral, rather than verbal, nature. This research indicates that children learn much without putting language to experiences. They learn, but can they build on their learning; can they do more than react spontaneously in the future? Without language, it is difficult to ask these children what they learned, and how they might apply it. Dewey wrote that educative experiences are ones that lead to growth; embodied and unworded experiences do lead to growth, but is the growth limited? The way to investigate this is not obvious, but might lie in more thorough and systematic follow up studies.

FINAL WONDERS

There are wonders that remain. Will children who are exposed early and often to natural or naturalized areas, experiencing the magic and playfulness potential in these areas, value natural areas when they become adults? The research that has been done has been retrospective, involving adults. These adults note that their childhood interactions in nature affected their love for and involvement with natural areas now. However, adults who spend time in natural areas are more likely to look back fondly on childhood experiences in nature. Cutter McKenzie, Edwards, Moore, and Boyd (2014) argued that children need more than play time in natural areas; that they need to be taught about sustainability issues as well. I tend to concur, since this is more likely to give children language to think against the dominant discourse which encourages humans to see themselves as separate and able to control /manage the natural world. Language itself, in communicating cultural values, can interrupt children in seeing themselves as part of the natural world. There is definitely need for more research on the kinds of activities and language to use with children to support them in seeing themselves in relationship with the world, rather than dominating it.

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Developing a Nature-Based Four-Year-Old Kindergarten Program: OAK Learning Center at Bay Beach Wildlife Sanctuary in Green Bay, WI (USA)

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ABSTRACT

The challenges and successes of planning, implementing, and evaluating a nature-based four-year-old kindergarten program are shared as well as a description of the first years of the program that is designed to enhance the students' academic, physical, social, and emotional development. In addition, a description of how the partnership among a wildlife sanctuary, city, public school district, and university to create this program is provided. "Purposeful play" and ideas from European forest kindergartens are guiding philosophies for much of what we do. Forty students (twenty each in morning and afternoon sessions) have been enrolled for each of the past five academic years. They are taught by a licensed teacher and an experienced naturalist. The enacted curriculum meshes the kindergarten readiness requirements from the public school district with the natural resources from the sanctuary. There has been a waiting list of students each year wanting to enroll in the program. Plans are currently underway to double the size of the program, and parents have been asking the school district to develop a nature-based track through the K-8 curriculum.

Keywords: Early childhood, community partnership, nature-based kindergarten, public school

"There's no way that we can help children to learn to love and preserve this planet, if we don't give them direct experiences with the miracles and blessings of nature." – Anita Olds

Students in schools are expected to learn many things – e.g., subject matter concepts and ideas, how to get along with others, soft skills such as being punctual, and elements that will build character. For many years and in many settings, this learning was thought to be best learned indoors under the watchful eye of a qualified teacher. All students were expected to learn the same things at the same rate at the same time. However, as more is learned about how individuals grow and develop, questions have arisen about the assumptions related to learning that many educators have held dear for decades. What are the optimal conditions for learning? What roles do student misconceptions play in learning? How can free discovery play a role in learning? Should students go outside to learn? If so, how should their outdoor time be spent? Recent published research and the forest kindergartens of Europe were studied to address these questions and others like them to inform the planning and development of our program.

The Problem

In his widely-read book, *Last Child in the Woods* (2008), Richard Louv describes the impact of nature-deficit disorder on children – the increasing divide between youngsters and the natural world. He explores the environmental, social, psychological, and spiritual implications of the growing number of children who spend little time outdoors. Studying nature in its own setting at its own pace is something fewer and fewer children do. This is leading to a reduced understanding of our natural world. Instead of spending time outdoors, more children spend their free

time in front of a screen – be it video game, tablet, movies, or countless cable TV channels. These fast-moving, action packed forms of entertainment are more appealing to many than the slower, more peaceful pace of nature. However, the impact of all this screen time is not well understood with respect to academic, physical, emotional, and social development. There does seem to be a connection between the sedentary lifestyle that watching a screen supports and childhood obesity. The percentage of American preschool children who are overweight more than tripled between 1971 and 2009, exploding from 5.8% in 1971 to 18.4% in 2009 (Ogden, Carroll, Kit, & Flegal, 2014; Anderson & Whitaker, 2009). Six out of ten of these preschoolers will continue to be overweight or obese at age 12 (NICHD, 2006).

It has been shown that exposure to natural environments improves children's cognitive development by improving their awareness, reasoning and observational skills (Pyle, 2002). Early experiences with the natural world have been positively linked with the development of imagination and the sense of wonder (Cobb, 1977; Louv, 1991). Wonder is an important motivator for lifelong learning (Wilson, 1997). When children play in natural environments, their play is more diverse with imaginative and creative play that fosters language and collaborative skills (Taylor, Wiley, Kuo, & Sullivan, 1998; Fjortoft, 2001; White, 2014). Children who play regularly in natural environments show more advanced motor fitness, including coordination, balance and agility, and they are sick less often (Fjortoft & Sageie, 2000). Nature helps children develop powers of observation and creativity and instills a sense of peace and being at one with the world (Crain, 2001). Natural environments stimulate social interaction between children (Bixler, Floyd, & Hammutt, 2002). Outdoor environments are important to children's development of their personal identity (Broadhead & Burt, 2002). Nature buffers the impact of life's stresses on children and helps them deal with adversity. The greater the amount of nature exposure, the greater the benefits (Wells & Evans, 2003). For example, children with symptoms of Attention Deficit Hyperactivity Disorder (ADHD) are better able to concentrate after contact with nature (Taylor, Kuo, & Sullivan, 2001).

Thus, there is ample evidence that being outside, exploring natural areas, and interacting with plants, animals, and abiotic elements (e.g., rocks, soil, wind, rain, etc.) can benefit children in multiple ways. Yet these experiences are being replaced by more appealing indoor activities, or the push for more academics to be added to the kindergarten experience, in particular preparing students to read (Sparks, 2014). What can be done to get more children outdoors and help them and their families realize that there is much to be learned while having a good time?

Lessons from Europe

One way to address the issues described in the previous section is for children to attend a *forest kindergarten* (waldkindergarten in Germany). This type of early childhood education, typically for youngsters aged 3-6, is held almost exclusively outdoors. Children are encouraged to play, explore, and learn in all kinds of weather in a forest or other natural environment. Adults organize lessons not through highly structured activities, but through assisting students in their learning, using their natural curiosities and exploration as the foundation. The emphasis is on play with toys fashioned from natural objects, such as sticks, small rocks, hardened mud, grasses, etc. Common activities include playing imaginative games, role playing, building structures, counting objects, looking for patterns, and memory games, all with natural materials found in the local environment. Even though many differences exist in the methods between forest kindergartens and school-based kindergartens, the ultimate goal of educating young children remains the same.

Forest kindergartens are most common in Scandinavia, Germany, and the United Kingdom. The work of a variety of theorists, including Jean-Jacques Rousseau, John Heinrich Pestalozzi, Friedrich Froebel, John Dewey, Maria Montessori, Jean Piaget, and Lev Vygotsky, have influenced the creation of seven pedagogical principles of practice that guide the forest kindergarten approach to education (as described by Williams-Siegfredsen, 2012):

1. A holistic approach to children's learning and development
2. Each child is unique and competent
3. Children are active and interactive learners
4. Children need real-life, first-hand experiences

5. Children thrive in child-centered environments
6. Children need time to experiment and develop independent thinking
7. Learning comes from social interactions.

Among the theorists listed above, Froebel is widely credited with establishing the first kindergarten in Germany in 1837. His background in forestry and his strong belief that child-led, nature-based experiences should be the core of early childhood education continues to influence programs today in many countries. Many positive outcomes, both academic and in other domains, are attributed to this approach.

Underpinning the Danish forest school approach is the research indicating that using the outdoor environment and allowing children to be outdoors all year round is beneficial. It not only develops children's physical, cognitive, linguistic, social and emotional competencies, it also keeps them healthy. The research is showing that children who spend a significant amount of time outdoors each day have better social skills, are more attentive, have fewer infections, have fewer conflicts, have better brain function, have better language development and learn more vital life skills than those spending more time indoors. (Williams-Sieghfredsen, 2012, p. 13)

In 1993, the forest school concept was transported to England from Denmark following an exchange visit by staff at Bridgewater College in Somerset, and approximately 50 forest schools have been established across Great Britain since (Maynard, 2007). Fostering self-esteem, developing self-confidence, creating independence, learning about the environment, and taking risks have been foregrounded in these programs. Of particular importance is for students to meet both physical and emotional risks and challenges head-on – climbing a tree, balancing on a log, jumping into a pond, etc. It is critical that children learn how to assess risks and take challenges to not only spur on their development, but because these are crucial life skills. The adult's role is to support and guide the students in how to assess challenges and risks for themselves. The setting is made as safe as reasonably possible, in order to facilitate risk-taking. Trust among students and between an individual student and teacher is central to many components of a forest school (Constable, 2014; Knight, 2013).

Translating the European Ideas to Our Program

The nature-based approach to early childhood education has grown rapidly in the United States in the past five years. According to North American Association for Environmental Education (2017a), there were at least 250 nature preschools and forest kindergartens operating in 43 states in 2017 compared to fewer than 50 in 2012. The OAK (Outdoor Adventures for Kids) Learning Center at the Bay Beach Wildlife Sanctuary in Green Bay, WI admitted its first classes of students during the 2013-14 academic year. Much of the planning for this program was informed by the ideas from Europe that were just described. Thus, the OAK Learning Center is part of a swiftly growing network of like-minded organizations and individuals. This network is a valuable resource in the advancement of this program when considering the benefits of environmental education for learners, including "improving academic performance, enhancing critical thinking skills, and developing personal growth, life-building skills, confidence, autonomy, and leadership" (North American Association for Environmental Education, 2017b, p.2).

OAK Learning Center students are chosen for this program using the same procedures that govern the enrollment of all 29 four-year-old kindergartens in the Green Bay Area Public School District. It was the first nature-based four-year-old kindergarten (4K) program in Wisconsin connected with a public school district, and it remains the only nature-based 4K program in the Green Bay school district. A handful of other nature-based 4K programs exist within the state, but all are either private schools, Montessori schools, or charter schools. Our goal was to offer a tuition-free program.



Figure 1. Students practicing their balance on a downed tree under the supervision of two adults

As in many states, four-year-old kindergarten is not mandated, but many school districts are offering it, which creates a shortage of classroom space. A statewide model has been developed whereby a public school district can partner with another organization (such as a non-profit) which has classroom space, allowing the district to offer 4K without having to build additional classrooms. The state educational reimbursement per student is split between the school district and the 4K site. The non-profit organization uses this funding to hire instructional staff (in this case a certified teacher and an experienced naturalist) and purchase educational materials. Lessons are team taught by the teacher and naturalist, which allows access to two different areas of expertise (early childhood and environmental education) in the curriculum. The school district furnishes the classroom and equips the staff with other needed materials, in addition to providing professional development opportunities, evaluation of the teaching staff, etc. Since the funding comes from the State, tuition is not charged to families, making it affordable to everyone, which was a core consideration in the formation of this program. During the planning years, visits to other nature-based preschools included discussions of the barriers for participation by some families. Tuition was one of the barriers, and the commitment was made to find a model that would not require a family to pay tuition thereby opening this opportunity to many families who live in the economically strained neighborhoods near the sanctuary.

In addition to the Green Bay school district and the wildlife sanctuary, the city of Green Bay is a partner (since the sanctuary is a city park) along with the local university (the University of Wisconsin-Green Bay). The teacher and naturalist are actually city employees, and the University provides expertise and experience with environmental education programming along with field placements for early childhood pre-service teachers and interns. The development of this partnership during the 2012-13 academic year has been a strength of this program, with each partner using the OAK Learning Center to fulfill both philosophical goals and pragmatic programmatic needs. Many meetings occurred prior to the enrollment of any students to ensure that the needs of each partner were being met

and that the goals of the program were consistent with the overarching goals of each partner. The following table summarizes the important goals and needs that have been addressed.

Table 1: What goal or need has the OAK Learning Center helped each partner meet?		
Partner	Philosophical Goal	Pragmatic Need
Green Bay Area Public School District	A customized learning track for each student is offered. The OAK program is the beginning of an environmental education track.	More 4K sites are needed for an increasing enrollment.
Bay Beach Wildlife Sanctuary	Environmental education is part of its mission. This program provides an opportunity for young children to begin early in developing an appreciation for and understanding of nature.	One objective is to increase enrollment in the sanctuary's programming.
University of Wisconsin-Green Bay	Establishing more collaborations with community organizations is a priority of the new administration of the campus	The OAK program provides a field placement for pre-service teachers and a site for research studies concerning early childhood development.
City of Green Bay	The OAK program adds one more reason (a strong education system) why a family might choose Green Bay as a place to live.	The program provides an employment opportunity for a teacher and naturalist.

Many of the specific components of a forest kindergarten described in the previous section have been incorporated into the OAK Learning Center. A building exists at the sanctuary where students seek shelter during extreme weather conditions. This building also has restroom facilities, an area for snack time, and office space for the teacher and naturalist to perform administrative duties. Children are expected to be dressed for the weather when they arrive for their class. A motto regularly shared with parents is, "there is no such thing as bad weather, only bad clothing," which comes from the European programs. The guiding philosophy for the curriculum is *purposeful play* that pays attention to the students' academic, physical, social, and emotional development. Purposeful play has a meaning behind it; the student has a reason for why he or she is doing what she or he is doing. For example, when a student is building a structure out of sticks, she might say that she is building a home for an animal, and, as she is doing so, she is learning engineering principles. When a student is balancing on a log as part of a story he is telling to his friends, he is acting out what an animal might be doing, while also learning how far he can lean one way or the other before losing his balance. Subsequently, he might learn that by lowering his center of gravity while balancing on a log, he can lean out further before losing his balance. Careful observation of these student behaviors on the part of the teacher and naturalist informs future lessons and allows the instructors to gauge the developmental readiness of the students for more advanced activities.

There are 20 children enrolled in a three-hour morning section with another 20 students attending an afternoon session. As with other 4K programs in the school district, parents/guardians must provide transportation for drop-off and pick-up, so the program is limited to those students from families with this resource. Innovative ways to provide transportation to families who need it are continually being explored so that this barrier to participation can be removed. However, student enrollment mirrors the demographics of the northeast side of the city where the sanctuary is located, with respect to race/ethnicity, socioeconomic background, and single-parent households.



Figure 2. At the OAK Learning Center, there is no bad weather, only bad clothing.

Each class is taught by a certified early childhood teacher and an experienced naturalist who are hired through the city. Appropriate teaching strategies and assessment practices are created and implemented by the teacher while the naturalist provides many ideas and experiences for the students to interact with the big ideas and concepts related to the environment. This instructional approach is based on ideas from the past few decades when it became evident that many teachers were uncomfortable with taking their students outdoors due to their lack of knowledge about the environment (Hanna, 1992; Kellner, 1975). When planning lessons, the teacher is responsible for making sure the district curriculum and assessment standards are being met, and the lessons are taught in a developmentally appropriate manner. The naturalist makes certain the content of what is being taught is accurate and is a valuable resource for both the teacher and students as they explore the natural areas of the sanctuary during lessons.

Children are immersed in the natural world to learn *in-nature* versus learning *with-nature* (Warden, 2012). The program does more than just add nature to a playground, use a natural playscape, have students make observations out the classroom window, or read a nature-based story, which are all examples of learning “with-nature.” Digging in the earth, looking for bugs, balancing on logs, jumping in puddles, singing songs, building fires, catching fish, planting a garden, observing wildlife on a nature walk, and rolling in the mud help ensure the “in-nature” learning experience.



Figure 3. The outdoor exploration space includes hollow logs, rocks, and a storage shed in a fenced area.

Measures of Success

Has this program been successful during its first few years? The following are several measures that would indicate it has been.

Academic performance. The PALS (Phonological Awareness Literacy Screening) assessment, developed at the University of Virginia, is administered twice per year in this program. According to the teacher, almost all of the students have been at or above the expected level of performance. Informal conversations with kindergarten teachers have yielded no concerns about the kindergarten readiness of OAK Learning Center graduates. Parents have also commented that their OAK graduate has met or exceeded the academic expectations of kindergarten and subsequent grades.

Waiting list. The OAK Learning Center is a “choice” program. Parents can choose to send their child to this program or have their child enroll in their “home school.” Each year, this program has always been the first 4K program in the school district to fill enrollment, and by May 1, a waiting list has grown to more than a dozen students for the following fall. Students are placed on the waiting list using a lottery system from all applications, and the rank order from the lottery determines the order in which students are enrolled, if spaces open. Each year the district fields calls from parents of two-year-olds wanting to know how to get their child’s name on the registration list for two years in the future. However, this option does not exist in the school district. (One year a mother who was only six months pregnant called to inquire about registration of her unborn child.)

Parent survey responses. At the end of each academic year, a graduation ceremony is held for the students. Parents, family members, and all stakeholders in the program are invited. We have taken this opportunity to administer a parent survey consisting of three items:

1. What are the strengths of this program? What does this program do well?
2. What needs to be improved or changed? Should something be eliminated? If so, what?
3. Overall, what is your evaluation of this 4K program?

For each year, the responses have been overwhelmingly positive (greater than 90% of all responses to item three are positive), with some parents not being able to come up with anything to write as a response to the second question. Recurring positive comments have included the hope that younger siblings will be able to attend the program, the amazement of the breadth and depth of knowledge learned during the year, the increased appreciation the student has for the natural world, and the monitoring the student does of family activity, such as making sure that recycling is occurring and that no one litters.

Interviews with parents and students. During an interview with a university reporter, one student exclaimed, “We were learning, and we didn’t even know it!” Informal conversations with groups of parents have also yielded equally enthusiastic feedback. “My child is learning so much. He comes home nightly to explain to us why something happens the way it does.” “I am learning a lot about nature just by talking to my child.” Many parents responded that they wished their child could stay in the program for five-year-old kindergarten or all of elementary school. Because of the success of this program, the school district is reorganizing one of its elementary schools as a science, technology, engineering, and mathematics (STEM) school with an environmental focus.

Interviews with other stakeholders. After the first year, representatives from each of the partners were interviewed. Once again, positive comments dramatically outweighed the occasional suggestion for improvement. “This program has been an invaluable addition to the array of early childhood programs offered in the area.” “Using the OAK Learning Center as a field placement site for teacher candidates has allowed these pre-service teachers to experience a unique approach to teaching and learning from what they see in a regular classroom.” In fact, the program has been so successful that fund raising efforts are underway by the friends group of the sanctuary to expand the facilities at the site, allowing for the program to at least double in enrollment.

Anecdotal evidence. Although we do not have any statistically rigorous data to support these statements, some parents have claimed that their child lost weight during the program. The teacher and naturalist observed an increase in student stamina on hikes during the school year. The parent of a child with special needs noticed her daughter’s flexibility, balance, and stamina improve as a result of the physical activities at the program.

Conclusion

This program has been deemed successful from multiple perspectives, as have other nature-based preschools. OAK Learning Center students develop not only academically by learning numbers, letters, shapes, colors, etc., but also physically, socially, and emotionally. When observing lessons, it is highly evident that the students are having fun while learning. They are balancing on logs and taking long nature hikes. They are working together to complete complex tasks. They are developing deep and lasting connections to nature. When older students come to the sanctuary for a field trip, the OAK students can sometimes be seen explaining to them how to properly treat animals (e.g., don’t chase geese) and respect the environment (e.g., pick up your litter). They are becoming true ambassadors for the natural world. All of these outcomes were made possible through the creation of a nature-based early childhood program built from a partnership of organizations and using the lessons learned from other successful programs. We hope that our program can help inform others as well.

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Editor's Note: Dr. Carla Gull is our new Book and Resource Review Editor. She teaches beginning college classes online with the University of Phoenix, hosts the podcast *Loose Parts Nature Play*, leads nature programming in her local area, facilitates professional development in early childhood, and shares insights on *Loose Parts Play* on social media. Her passion for children's literature stems from searching for the perfect book to share with children. If you have ideas or would like to contribute book or resource reviews, please contact Dr. Gull at Carla.Gull@phoenix.edu.

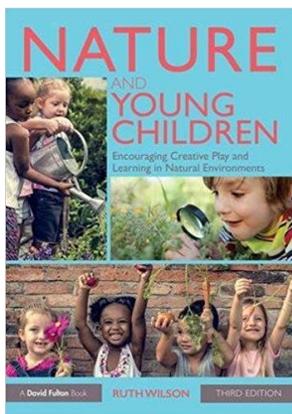
Connecting to Nature with Ruth Wilson

Carla Gull

Book and Resource Review Editor

Have you encountered Ruth Wilson or her work yet? With over 30 years in the education field and a PhD, she has a long trail of involvement in early childhood environmental education. Currently, she writes books, consults, and is the research library curator for the Children & Nature Network.

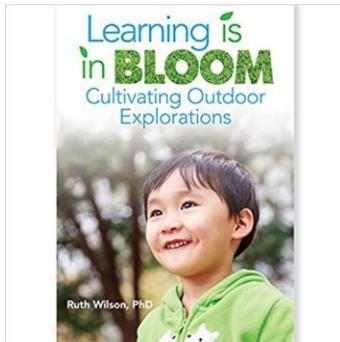
Nature and Young Children: Encouraging Creative Play and Learning Natural Environments (3rd Edition). (2018).



Wilson's updated book on *Nature and Young Children* takes the wonderful premise of her original work while also tackling additional topics relevant for today, such as sustainability, inclusion, and encouraging pro-environmental behaviors in developmentally appropriate ways. As the curator of Children & Nature Network's Research Library, she is on the forefront of recent academic research on children and nature and weaves it seamlessly into foundational principles connecting young children to the natural world. The book is full of current research, presented in a very readable manner. Wilson focuses on nature play, natural outdoor playspaces, bringing the outdoors in, the role of the adult, holistic child development, integrated teaching and learning and fostering pro-environmental attitudes and behaviors. This

foundational work provides a research-backed framework for children developing a relationship with nature.

Learning is in Bloom: Cultivating Outdoor Explorations. (2016).



Learning is in Bloom concentrates on connecting children to the rhythm of nature, connecting through play, exploration and experimentation, indoor/outdoor connections, and connecting through language, literacy, and the arts. Embedded in the rich content of each section, find easy to implement activities to connect to nature, such as nature names, animal yoga, practical math ideas, animal homes, and so many more. Wilson explains the foundational aspects of children's connection to nature, their rights, guidelines and resources, current resources in this quest, and our own call to action in a very doable way. Curricular ties to math, science,

literacy, and movement, as well as ways of bringing nature inside, make this an applicable read. Practical and easy-to-implement activities, along with extension ideas, help the reader put these principles in action right now. Find a glossary, resources, and a children's book list at the end.

Fostering a Sense of Wonder during the Early Childhood Years. (1993).

**Fostering A Sense
of Wonder
During the
Early Childhood Years**



At just around 200 pages, this online booklet is full of information on connecting children and nature, focusing on the sense of wonder in ourselves as educators and in the children we work with. I have turned to this free online publication many times in preparing for presentations. I find myself highlighting so much because it is that good. Wilson embeds specific nature activities within the theoretical framework of connecting children to nature.

I especially like the evaluation, *Fostering a Love of Nature Index*, at the end. Taking time to reflect deeply on where we are in these principles and where we want to be can be powerful for our practice. Educator resources, book lists, and supply companies (though somewhat outdated now) give us information we need at our fingertips. Find it online at: [http://epa.ohio.gov/oeef/oeepublications#151808568-](http://epa.ohio.gov/oeef/oeepublications#151808568-fostering-a-sense-of-wonder-during-the-early-childhood-years)

[fostering-a-sense-of-wonder-during-the-early-childhood-years](http://epa.ohio.gov/oeef/oeepublications#151808568-fostering-a-sense-of-wonder-during-the-early-childhood-years)

Selected articles and webinars:

Connecting Young Children and Nature: How to Educate and Enchant. (*Gryphon House* webinar, 2016).

It is delightful to listen to the author as she shares examples and ideas for enchantment when connecting children to nature. Wilson brings us into the wonder of nature. Nature in its simplicity offers basic materials to learn and grow while developing creativity. Wilson also presents a list of attention-focusing questions to use with children. Knowing and feeling are essential aspects of this critical time outside. Listen to Ruth Wilson's webinar at <https://www.gryphonhouse.com/our-authors/author-detail/ruth-wilson-phd>.

Becoming Whole: Developing an Ecological Sense of Identity. (*Wonder*, 2011)

Wilson focuses on factors that impact a child's ecological identity as a child, such as putting into context one's self within the natural environment. As part of this development, biophilia describes how our affinity for nature goes beyond basic physical needs to a need for the intellectual and aesthetic satisfaction nature brings. This article focuses on developmentally appropriate ways of shaping of natural connections and identity in early childhood. It also lists eight key points we can do as educators to encourage this connection to nature. This resource is available at

http://ccie-media.s3.amazonaws.com/nacc/wonder_may11.pdf

Aesthetics and a Sense of Wonder. (*Exchange*, 2010).

At two and a half pages, this short read focuses on wonder—wonder as an emotion, wonder as a way of knowing, and living with wonder. Children have a heightened sense of wonder. As educators, we can help cultivate this natural curiosity and delight. Access this article at

<https://www.ccie.com/library/5019324.pdf>

Why Children Play Under the Bushes. (Early Childhood News, 2004).

Children's nature play is explored, looking at loose parts, well-designed playgrounds, a 'playgarden' alternative (what we might call a natural playscape in today's terms), guidelines for choosing plants, outdoor learning centers, and a checklist for evaluating outdoor playspaces. Wilson also shares play zone guidelines with ideas of what might be in our outdoor spaces for optimal child development. Read this wonderful article at

http://www.earlychildhoodnews.com/earlychildhood/article_view.aspx?ArticleID=412

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