

Beyond Traditional School Readiness: How Nature Preschools Help Prepare Children for Academic Success

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ABSTRACT

Increasing demands of accountability and academic readiness across U.S. preschools are often accompanied by decreased play and time outdoors during the school day. The nature preschool movement, grounded in a desire to foster connection to the natural world while also supporting important developmental processes and school readiness, counteracts this trend by simultaneously emphasizing outdoor play and preparing children for success in kindergarten and beyond. This study utilized the *Penn Interactive Peer Play Scale* and *Preschool Learning Behaviors Scale* to quantitatively explore the influence of nature preschools on peer play interactions and learning behavior, both of which contribute to young children's academic readiness. Results indicated that nature preschools may be having a significant positive influence on peer play behaviors in both the preschool and home setting, as well as on all dimensions of learning behaviors. Implications for further research and practice are discussed.

Keywords: nature play, nature preschool, peer play behaviors, learning behaviors, school readiness

Early childhood is a critical time period for developing a sense of respect and an ethic of care for the natural environment (Iozzi, 1989). Positive interactions with and in nature also are integral to the health and development of young children (Dankiw et al., 2020). Within this growing body of literature; however, there has been little empirical work regarding the effect of time in nature on the development of young children in terms of preparing them for successful entry into kindergarten, nor in terms of their readiness for academic learning. In light of the strong emphasis in the U.S. on academics and accountability at the preschool level, coupled with a decline in time for play and outdoor exploration, there is a need for additional research grounding the nature-play approach.

One area of particular importance is school readiness, specifically in the transition from preschool to kindergarten. This transition is heavily reliant on a variety of aspects of development that move beyond basic academic skills to also include aspects of social-emotional learning (SEL), approaches to learning, and development of physical and motor skills, all of which combined are predictive of later academic and social success (Claessens et al., 2009; Ladd & Price, 1987; NAEYC, 1996; Snow, 2006). It seems likely that the use of the local outdoor environment and the emphasis on unstructured play that characterizes nature preschools may have a positive influence on children's school readiness when school readiness is defined more broadly through a lens of holistic development, with a focus on a child's readiness to learn, interact, and engage in positive learning behaviors.

REVIEW OF LITERATURE

Defining School Readiness

In the U.S., ensuring young children are ready for successful school experiences is a national and state educational priority. The National Education Goals Panel (NEGP) indicated five dimensions of learning and development for young children that have shaped and continue to guide thinking regarding school readiness: cognition and general knowledge; language development; approaches to learning; social and emotional development; and physical well-being and motor development (NEGP, 1995). In 2002, the Good Start, Grow Smart initiative encouraged states to develop early learning guidelines for language and early literacy development that were aligned with state education standards for public schools (U.S. White House, 2002). Since then, early learning standards, also referred to as early learning guidelines, have been developed for all U.S. states and territories, and the majority of these early learning standards have been aligned with standards for early grades (Barnett et al., 2012).

Early learning standards help prepare and support children as they transition between learning environments, providing the continuity needed for successful transition to and performance in Kindergarten and the elementary years (IOM & NRC, 2015). Not only do these standards provide teachers with guidance for instruction that supports young children in meeting these expectations, early learning standards also shape expectations for educator competencies and quality standards for programs and schools, as well as policies needed to support those standards and expectations (IOM & NRC, 2015). However, some early childhood educators continue to express concern that early learning standards are not comprehensive and do not fully represent the diversity of development and learning in the early years. Additionally, there is concern that the aim of ensuring that children in the aggregate meet the standards comes at the expense of supporting children's individual learning and growth along developmental trajectories (Kagan & Scott-Little, 2004). Similar to concerns regarding learning standards in the elementary grades, there are also concerns regarding the potential narrowing of curriculum and instruction to focus on the literacy and language guidelines emphasized in the 2002 initiative.

In spite of these concerns, the National Association for the Education of Young Children (NAEYC) maintains that early learning standards can contribute to comprehensive and high quality early learning and care as long as they emphasize significant, developmentally appropriate content and outcomes, develop through informed and inclusive processes, are implemented and assessed in ethical and developmentally appropriate ways, and are accompanied by strong supports for programs and families (NAEYC-NAECS/SDE, 2002). Head Start, an early childhood program that is publicly funded under the U.S. Department of Health and Human Services, also continues to use early learning outcomes as one measure of program success. These outcomes include the same five domains outlined in 1995 by the NEGP, signifying an ongoing theoretical consensus about the importance of all five dimensions of learning and development (Head Start: Early Childhood Learning and Knowledge Center, 2020). However, many programs continue to focus a disproportionate amount of time on the cognition and general knowledge domain, with an emphasis on acquisition of academic skills and knowledge (Jones & Boufard, 2012; Katz, 2015; Shoshani & Aviv, 2012).

One explanation for this gap between research and practice lies in the link between funding and progress indicators, many of which are content-knowledge and academic in nature. Although enrollment numbers in the U.S. have held relatively steady for the last ten years with approximately one-third of four-year-olds enrolled in publicly funded preschool programs, the push for an increase in state-funded prekindergarten programs continues to grow, bringing with it numerous implications for both students and teachers (Kagan & Kauerz, 2007; Friedman-Krauss et al., 2018; Takanishi & Kauerz, 2008; The National Institute for Early Education Research, 2018). In state-funded early childhood programs, funding is directly linked to demonstrating proficiency in early learning standards as well as improved data reporting (U.S. Department of Education, 2015). Other types of funding through external organizations and grants also tend to require some form of data reporting. This focus on data may narrow the scope of teaching because curriculum alignment tends to skew towards those academic subjects that are tested or reported, rather than the development and learning across all domains (Pedulla, 2003).

However, as practitioners know, the transition from preschool to kindergarten is ripe with numerous changes, not all of which can be recorded through academic assessment. These changes include shifts in teacher relationships, increased behavioral and social expectations, and the increased importance of social-emotional learning skills (Rimm-Kaufman & Pianata, 2000). Furthermore, all domains of children's learning are important and interrelated. Recent neurobiological understandings of early brain development suggest it is critical for early encounters to provide a wide range of experiences that provoke, stimulate, and support children's innate intellectual dispositions (Katz, 2015). These include learning opportunities for preschool-aged children that involve more than academic skills and also further self-regulation, initiative, and sustained synchronous interaction with others (Blair, 2002). Other findings have underscored the importance of social and emotional development with respect to the implications these skills have on school readiness, particularly in the context of positive learning behaviors (Duckworth et al., 2007; Shoshani & Slone, 2017). Thus, learning opportunities for preschool-aged children should offer opportunities to develop self-regulation, initiative, and peer interaction in addition to academic skills (Blair, 2002).

While these findings are notable, educators also need functional examples and solutions for program implementation. A pervasive achievement gap, increasing national and state mandates for a school readiness focus in early childhood education, and increasing standards-based education at an early age have combined to increase the need for practical, evidence-based practices for early childhood educators. Consequently, it is increasingly relevant to examine the impact of existing, integrated frameworks of early childhood education that may influence children's school readiness.

Nature preschools emphasize the importance of young children's direct experiences with nature as a catalyst for connecting with the natural environment in ways that promote physical, social, and cognitive development. This exploration often occurs through unstructured nature play which contributes to childhood development in a myriad of ways including increased creativity (Wojciehowski & Ernst, 2018), development of scientific reasoning and discovery skills (Carter, 2016; McClain & Vandermaas-Peeler, 2016), awareness of self in relation to the external environment (McClain & Vandermaas-Peeler, 2016), and increased resilience and self-regulation (Ernst et al., 2018). One recent study showed that in regard to kindergarten readiness, children in a nature-based preschool program were as prepared as those in a high quality, traditional preschool program (Cordiano, 2019).

However, additional empirical research is needed to link the impact of nature preschools on school readiness. As previously outlined, most educators, including nature preschool administrators and teachers, continue to feel the pressures of using data to demonstrate their students' academic readiness. This pressure for data further underscores the necessity of empirical research that demonstrates the myriad of benefits of nature preschools. Within the current context of increasing standardization and focus on academic content, children consequently have fewer opportunities for play and connection with nature (Louv, 2008). Thus, in light of the importance of these factors in preparing young children for school, this study aims to illuminate the impact of nature preschools on two key components: peer play interactions (a component of social-emotional learning) and learning behaviors (a component of approaches to learning).

Peer Play

Peer play interactions are a component of social-emotional learning. For young children, competence in social-emotional learning has been shown to prepare them for cognitively demanding tasks (Perry et al., 2011), support school readiness or "readiness to learn" (Denham, 2006), and predict early childhood academic success (Denham et al., 2012). Children who have developed social learning demonstrate sensitivity to the needs of their peers, while also meeting their own social interaction goals (Howes & James, 2002). During early childhood, play is a primary mechanism for the development of social skills and peer relationships (Gallagher, 1993; Ginsburg, 2007). Thus, peer play behaviors often function as an indicator of social competence and, as noted above, are a critical factor in children's school readiness.

A meta-analysis of the impact of play indicated its ability to help children develop interpersonal skills and increase problem-solving capacity (Fisher, 1992). Through the repeated social interactions that occur during peer play,

children have the opportunity to develop a variety of skills and competencies that contribute to their ability to build and maintain future peer interactions and relate to the world around them (Coplan & Arbreaux, 2009; Fisher, 1992; Frost & Sunderlin, 1985). In fact, the United Nations High Commission for Human Rights deemed play so important that it is recognized as an inextricable right of every child (Office of the United Nations High Commissioner for Human Rights, 1989). Thus, this ability to successfully relate with peers is not only an essential and developmentally salient competency that influences both academic and social success in kindergarten and beyond (Cicchetti 1990; Eggum-Wilkins et al., 2014; Ladd, 1990; Ladd & Price, 1987; Ladd et al., 1988; Rimm-Kaufman & Pianata, 2000), but it is also a critical piece of the early childhood experience.

Higher levels of peer play skills at both the beginning and end of the year are associated with positive learning outcomes (Bulotsky-Shearer et al., 2012) and increases in peer play skills throughout the school year predict higher levels of kindergarten competence (Eggum-Wilkins et al., 2014). Conversely, poor peer relations indicate potential problems with school adjustment (Ladd et al., 1996), development of language skills (Cohen & Mendez, 2009), and lower literacy and math skills (Bulotsky-Shearer et al., 2012). Within this context, it appears as though emphasizing social-emotional learning, specifically peer play relations, in early childhood provides a critical foundation for the mastery of a range of skills that are important to academic achievement, as well as long term well-being and mental health (Campbell et al., 2016; Denham & Brown, 2010).

Promoting Positive Peer Play Behaviors

Although these skills are highly indicative of future success, many children enter school without well-developed social and emotional skills (Rimm-Kaufman et al., 2000). Isolated interventions, such as social-emotional learning curriculum, have shown limited success and often pit academic skills against social-emotional learning (Jones & Bouffard, 2012). Conversely, ongoing integration of social-emotional learning, when supported throughout all aspects of the child's day, may help to create the developmental framework needed to enhance young children's school readiness (Jones & Bouffard, 2012; Denham, 2006). Carter offered one example of this integration through her proposed nature-based social-emotional approach to support young children's development (2016). She argued that blending the components of environmental education, early childhood education, and social emotional development supports education that is good for both the child and the earth. Open-ended play in green spaces, like that seen in nature preschools, diversifies the range of opportunities for children to both formally and informally engage in a variety of learning opportunities (Dyment & Bell, 2008). As children wonder, wander, and play, they engage in many scientific processes that use overlapping skills with those needed for social and emotional learning (Carter, 2016; Gerde et al., 2013).

Chawla and colleagues noted that through nature play, children typically have the freedom to choose from a variety of play activities in which cooperation and social interaction are heavily embedded and thus this play may facilitate more supportive peer relationships (2014). In a review on the impacts of green school grounds on children's well-being, Bell and Dyment showed that time spent on natural school grounds impacts social health through the cooperative and creative play that often occurs in nature. They also identified additional physical and mental health benefits, specifically reduced stress and increased self-confidence (2008). More recent studies have also correlated young children's exposure to green space with greater socio-emotional competencies (Scott et al., 2018).

Additional research supports the positive impact of nature preschools on individual components that may impact positive peer play such as creativity (Wojciehowski & Ernst, 2018) and development of empathy (Lithoxidou et al., 2017). Given the existing evidence, it seems likely that children in nature preschools will exhibit positive peer play behaviors, thus indicating one aspect of the beneficial impact of these early childhood experiences on school readiness.

Learning Behaviors

The term learning behaviors refers to an overarching set of actions, behaviors, and dispositions that describe how a child engages in or responds to a learning situation (Dominguez et al., 2010). Rather than focusing on what students learn, these skills better describe how a child learns. These behaviors are considered keystone "learning-to-learn"

skills that tend to transfer to future learning contexts and support successful schooling and thus are foundational to school readiness (Barnett et al., 1996; McDermott, 1984). Subdomains, including task persistence, motivation, initiative, attentiveness, and openness to new challenge, have been shown to contribute uniquely to school achievement (Leigh, 1996). Research suggests that focusing on learning behaviors during early childhood may be especially beneficial, as preschool-aged children's behaviors are both malleable and formative at this time (Barnett et al., 1996; McDermott et al., 2002). Furthermore, in contrast to other possible influences on academic outcomes, such as motivation, learning behaviors include observable behaviors and responses, and thus are considered to be more "teachable" within the classroom context (Schaeffer & McDermott, 1999).

Learning behaviors typically increase over the school year and this change can be predicted by both children's individual behavioral adjustment (child-level variance) as well as differences in classroom quality (classroom-level variance) (Dominguez et al., 2010). These measured variances support the generally-held belief that learning behaviors can be shaped through various interventions. Helping children develop optimum levels of learning behaviors may help them succeed, and even stand out, academically (Schaeffer & McDermott, 1999). In contrast, children with poorer learning behaviors at the start of preschool have shown signs of greater maladjustment and absenteeism by the end of first grade (McDermott et al., 2016).

Promoting Positive Learning Behaviors

At the classroom level, process features such as behavior management and productive use of time predict some of the variance in children's learning behaviors over time (Dominguez et al., 2010; Mashburn et al., 2008). Although a 2010 study indicated that classroom-level differences accounted for 27% of the variance in learning behaviors, a follow-up study examined the impact of variation in classroom organization, emotional support, and instructional support and found only classroom organization to have a significant impact of learning behavior (Dominguez et al.). Furthermore, the effect size was small, which suggests the need for further studies that examine other potential factors of classroom quality that may impact learning behaviors.

When examined through the lens of child-level variance, shyness in particular appears to negatively influence baseline learning behavior scores (Dominguez et al., 2010). Because early childhood learning is often social and interactive, and shy children frequently have fewer close relationships with teachers and less social imitative with peers (Rydell et al., 2005), these findings suggest that shyer students may struggle to acquire some of the skills necessary for academic readiness. While this is just one illustration of the influence child-level variance may have on learning behaviors, it is a poignant example in the context of this study. In nature preschools, where children regularly interact with one another through creative play, children may be able overcome some of these social barriers, increase their social interactions, and develop self-confidence (Ginsburg, 2007), thus creating a "safer" space to develop positive learning behaviors. Play also comes naturally to most children and allows them to create their own world, or special place of play, where they can "explore and demystify some of the scary and unknown aspects of world" (Nitecki & Chung, 2016, p. 25).

Nature preschools "employ a child-led, play-based approach to teaching that adapts to children's interests, abilities, cultures, and environments" (Natural Start Alliance, 2019, p.11). Rather than separating "play" from "learning", nature preschools rely heavily on the notion that these two activities are deeply connected and are thus interwoven throughout the educational experience (Natural Start Alliance, 2019). This adaptable and interwoven framework for teaching and learning may help to address concerns about the limited efficacy of singular lessons and interventions. Similar to recommendations for integrating SEL into the curriculum rather than teaching it as isolated lessons, research suggests the early education would be most effective at helping children develop positive learning behaviors by integrating and scaffolding these skills within the ordinary curricula (Fantuzzo et al., 2011; McDermott et al., 2018). Emphasis should be placed on generalizable skills that children can use throughout transitional learning (McDermott et al., 2018). Nature preschool curricula typically emphasize key skills related to learning behaviors such as task persistence and exposure to new challenges and appropriate risk (Banning & Sullivan, 2011; Natural Start Alliance, 2019). Children are encouraged to learn through experience and interaction in a developmentally appropriate manner, which may further encourage development of learning behaviors.

Existing research suggests that exposure to exciting, creative, and novel learning experiences may also help children develop positive learning behaviors (Hyson, 2004). Nature offers a dynamic space for engagement and allows children to develop physical, emotional, and cognitive skills (Gerde et al., 2013). This dynamic aspect of nature-based play offers a plethora of opportunities for development of positive learning behaviors as children typically learn from trial and error, problem solving, critical thinking, and taking risks (Bundy et al., 2009; O'Brien, 2009). The variety of meaningful experiences helps children constantly construct new meanings with new information, which in turn helps them develop essential cognitive processing skills (Hurwitz, 2002). Thus, these benefits of novelty and exploration, which are central to nature preschools, suggest that children enrolled in such programs will display positive learning behaviors.

Interaction Between Peer Play and Learning Behaviors

Research has identified positive peer play as an important facet of positive classroom learning behaviors (Canella, 1993; Coolahan et al., 2000; Fantuzzo et al., 1998). Children who demonstrated positive play behaviors showed higher levels of classroom competence motivation, positive attitudes towards learning, and attention and persistence within the classroom. Conversely, when children showed higher levels of play disconnection, they also demonstrated indication of inattentiveness, lower competence motivation, and a more passive attitude towards learning (Coolahan et al., 2000). Additional research reveals that problem behaviors in the classroom negatively influence both positive peer play (Fantuzzo et al., 2003; Fantuzzo et al., 2005) as well as learning behaviors (Fantuzzo et al., 2005). One explanation for this relationship offers evidence suggesting that preschoolers who exhibit problem behaviors often miss out on social learning experiences, which in turn negatively impacts learning outcomes (Bulotsky-Shearer et al., 2012).

These findings suggest that by nurturing children's natural desire for connection with others (through nurturing peer play) then lifelong learning behaviors can be cultivated. This relationship warrants additional study as it may offer further support for the importance of incorporating play in early childhood education as a method of supporting positive learning behaviors and school readiness. Thus, because of the suggested correlation between peer social competence and learning behaviors, and because they speak to school readiness in a broader and arguably more meaningful way, the proposed study focuses on these two constructs.

METHODOLOGY

Research Purpose

This exploratory study investigated the hypothesis that nature preschools have a positive influence on young children's peer play interactions and learning behaviors. Specifically, the following research questions were addressed in this study:

- 1) Do nature preschoolers' learning behaviors and peer play behaviors significantly change from the beginning to the end of the school year, when controlling for age, gender, prior participation, and duration of participation?
- 2) If there is growth in nature preschoolers' learning behaviors and peer play behaviors, is that growth different from growth seen in non-nature preschoolers?
- 3) Is there a significant relationship between learning behaviors and peer play behaviors?

Design

The following exploratory study occurred during the 2018-2019 academic year using a pretest-posttest non-equivalent comparison group design. Four nature preschools in northern Minnesota, U.S. served as the treatment group and two non-nature preschools in northern Minnesota, U.S. served as the comparison group. The four nature (treatment) preschools applied a child-directed play philosophy and were led by caring and responsive teachers. Regardless of weather, the majority of the day was spent outdoors in nature play (defined for this study as child-initiated play that take place in and with nature). For children in the full day program, this schedule allowed for approximately four to five hours of daily nature play whereas the half-day children engaged in nature play for two

to three hours. Outdoor play occurred in a variety of nature settings including “wild” (unmaintained) natural space, minimally managed space, and natural playscapes designed specifically for nature play. The natural playscapes included “structures” such as stepping stones or stumps, digging areas, and a collection of loose natural parts for building and creating. Indoor spaces were used minimally for approximately one-half to two hours. This time was devoted primarily to free play; although, teachers typically led loosely structured, playful learning experiences for approximately 30 minutes each day. These four nature preschools had a combined total of 84 participants and the mean age of participants was four years and one month.

For this study design, two non-nature preschools served as a comparison or baseline group, rather than a true control group, due to fewer participants and the lack of random assignment. The comparison schools were selected based on willingness to participate as well as a similar geographic location, tuition structure, and demographic makeup in relation to the treatment schools. One of the non-nature preschools was affiliated with a local parochial elementary school while the other was affiliated with the local university. Experienced teachers demonstrated caring and responsive teaching and care-giving. Both schools emphasized a child-directed play philosophy in order to support children’s cognitive, social, emotional and physical development. The majority of play occurred indoors (four to five hours) with an additional one to two hours of outdoor playtime in a maintained outdoor space with typical playground equipment. Children also experienced approximately one hour of teacher-led learning. Similar to the nature preschools, there was little ethnic and racial diversity across the non-nature preschools. The majority of participants in both groups were Caucasian. Additionally, because both nature and non-nature preschools had similar tuition requirements, it was assumed that all participants were relatively similar in terms of economic background. The comparison group was comprised of a total of 24 participants, with a mean age of three years and ten months.

Based on these defining characteristics, participants across the preschools shared similar demographics and experienced developmentally-appropriate programs led by caring and responsive teachers. Child-centered, play-based pedagogy and practice aimed to support holistic development of children in all programs. The proportion of time spent outdoors and the location of outdoor play time, both key attributes of nature play, served as the main differentiation between the nature and non-nature preschools. Therefore, these components allowed for exploration of the potential influence of nature play on learning behaviors and peer play behaviors.

Instruments

There were two instruments used in this research study. The *Penn Interactive Peer Play Scale* (McWayne et al., 2007) is a 32-item teacher and parent rating scale, with versions for preschool children and kindergarten children. The parent version assesses play in the home and neighborhood; whereas, the teacher version assesses play at school. Three dimensions comprise the instrument:

- *Play interaction* (8 items, Chronbach’s alpha = .90): Assesses children’s play strengths, including comforting and helping other children, showing creativity in play, and encouraging and welcoming others in play;
- *Play disruption* (11 items, Chronbach’s alpha = .91): Assesses aggressive and antisocial behaviors that interfere with ongoing peer play interactions (a lower score on this dimension or a decrease over time is considered desirable); and
- *Play disconnection* (11 items, Chronbach’s alpha = .87): Assesses withdrawn behavior and nonparticipation in peer play (lower scores or decreases in this dimension are desirable).

Teachers and parents are asked to indicate the frequency of observable behaviors, with response options of “never,” “seldom,” “often,” or “always.” See McWayne, et al. (2007) for information on content and construct validity information, as well as for additional information on uses, administration, scoring, and interpretation.

The *Preschool Learning Behaviors Scale* (McDermott et al., 1996) assesses learning behaviors through teachers’ reporting the frequency of specific, observable behaviors that occur during preschool activities. Teachers may

choose “doesn’t apply,” “sometime applies,” or “most often applies.” Based on if the item has positive or negative wording, responses are scored zero, one, or two points. The assessment produces an overall score from the sum of 24 items (Cronbach’s alpha = .88); see McDermott, et al., 2013 for divergent and convergent validity information. The assessment also yields scores for three dimensions:

- *Competence motivation* (11 items, reliability = .85): Assesses children’s interest in and approach to learning-related activities;
- *Attention/persistence* (9 items, Chronbach’s alpha = .83): Assesses children’s skill in focusing and maintain attention; and
- *Attitudes* (7 items, Chronbach’s alpha = .75): Assesses children’s propensity to cooperate, accept help, and handle frustration.

Procedures

Institutional Review Board approval was obtained, and consent forms were distributed to guardians of the children enrolled in the six participating preschools. All children were invited to participate, and children with parental consent for participation were included in the data collection. Pre-test data was collected October 2018, as the instruments require data to be collected after teachers are sufficiently familiar with the children’s behaviors and interactions in order to rate and describe the specific, observable behaviors that comprise the items on the scales. Teachers completed both the Penn Interactive Peer Play Scale and the Preschool Learning Behaviors Scale for each child for whom parental consent was granted. Parents completed only the Penn Interactive Peer Play Scale, as the Preschool Learning Behaviors Scale is designed for use in classroom settings. These same instruments were administered as posttests in May 2019. Each assessment takes approximately 10-15 minutes per child to complete.

RESULTS

General linear modelling (tests of within-subjects effects) was used to investigate the first research question, which focused on change in nature preschoolers’ peer play and learning behaviors, when controlling for age, gender, prior participation, and duration of participation (part time or full time). Results suggest significant growth in the play interaction dimension of peer play, as well as a significant reduction of play disruption behaviors and play disconnection behaviors, for both school (teacher rating) and home/neighborhood (parent rating) settings. In addition, there was significant growth in learning behaviors (total score), as well as in the three learning behavior dimensions of competence motivation, attention/persistence, and attitudes. For all of these constructs, the partial eta-squared values suggested a large treatment effect size ($>.14$, per Levine & Hullet, 2002). See Table 1 for adjusted pretest and posttest means (controlling for age, gender, prior participation, and duration of participation), as well as the statistical results from the inferential tests of within-subjects effects.

To address the second research question, general linear modelling (tests of within-subjects effects) was used to investigate change in non-nature preschoolers’ learning and peer play behaviors, when controlling for age, gender, prior participation, and duration of participation (part time or full time). These analyses were oriented toward interpreting the results of the nature preschool participants, as the non-nature preschool results reflect what might be expected in terms of change from participation in high quality preschool and through developmental maturation. The only construct where significant change occurred among the non-nature preschool participants was play disconnection in the home/neighborhood setting (parent rating). Thus, the statistically significant change in learning behaviors and peer play behaviors among the nature preschool participants is not only statistically significant, but likely also practically significant, as similar growth was not seen in the comparison group of non-nature preschoolers (with the exception of the play disconnection dimension of peer play behaviors for the parent rating/home and neighborhood setting). See Table 2 for the statistical results from these analyses.

Table 1

Statistical Results for Nature Preschool Participants' Peer Play Behaviors and Learning Behaviors

	Adj. Pretest M (SE) ^a	Adj. Posttest M (SE) ^a	F (1,80)	p ^b	Partial η ²
Peer Play Behaviors					
Play Interaction (Teacher)	23.44(.31)	28.79 (.33)	169.73	<.001**	.68
Play Interaction (Parent)	25.77 (.30)	27.17 (.29)	15.03	<.001**	.16
Play Disruption (Teacher)	28.11 (.67)	20.24 (.48)	157.56	<.001**	.67
Play Disruption (Parent)	29.82 (.45)	27.93 (.57)	16.00	<.001**	.17
Play Disconnection (Teacher)	19.40 (.53)	12.64 (.33)	157.28	<.001**	.67
Play Disconnection (Parent)	17.75 (.37)	16.04 (.36)	18.15	<.001**	.19
Learning Behaviors					
Competence Motivation	16.73 (.45)	20.27 (.31)	59.65	<.001**	.43
Attention/Persistence	13.18 (.37)	16.62 (.29)	63.16	<.001**	.44
Attitudes	11.11 (.28)	12.71 (.22)	29.76	<.001**	.27
Learning Behaviors Total	36.53 (.83)	43.96 (.67)	64.22	<.001**	.45

^a Adjusted for the covariates of age, gender, prior participation, and duration of participation (part or full time)

^b* denotes significance at .05, ** denotes significance at .01

Table 2

Statistical Results for Non-Nature Preschool Participants' Peer Play Behaviors and Learning Behaviors

	Adj. Pretest M (SE) ^a	Adj. Posttest M (SE) ^a	F (1,20)	p ^b	Partial η ²
Peer Play Behaviors					
Play Interaction (Teacher)	24.88 (1.38)	26.81 (.91)	3.39	.09	.23
Play Interaction (Parent)	25.33 (.75)	26.20 (.77)	1.28	.29	.11
Play Disruption (Teacher)	25.19 (1.69)	23.88 (1.37)	.71	.42	.06
Play Disruption (Parent)	28.47 (1.20)	27.53 (1.26)	.85	.38	.08
Play Disconnection (Teacher)	15.88 (1.47)	14.75 (.89)	.95	.35	.08
Play Disconnection (Parent)	18.27 (1.27)	16.27 (.90)	5.84	.04*	.37
Learning Behaviors					
Competence Motivation	19.53 (.83)	2.06 (1.01)	.76	.40	.06
Attention/Persistence	15.94 (.78)	16.47 (.78)	.42	.53	.03
Attitudes	11.77 (.39)	12.24 (.57)	.67	.43	.05
Learning Behavior Total	41.77 (1.51)	43.41 (1.88)	1.35	.27	.10

^a Adjusted for the covariates of age, gender, prior participation, and duration of participation (part or full time)

^b* denotes significance at .05, ** denotes significance at .01

To further explore if the change in learning behaviors and peer play behaviors in the nature preschools was different from what might be expected through developmental maturation and/or participation in a high quality, non-nature preschool programming, univariate analyses of covariance (ANCOVAs) were conducted to investigate the difference between the nature preschool and non-nature preschool participants' posttest levels of each of the dimensions of learning and peer play behaviors, when controlling for pretest level, age, gender, and prior participation. Unadjusted pretest and posttest means, as well as the adjusted posttest means and the results from the ANCOVAs are reported in Table 3. The results of the ANCOVAs suggest nature preschoolers had significantly higher posttest levels of competence motivation and play interactions in the preschool setting and significantly lower posttest levels of play disruption and play disconnection in the preschool setting than the non-nature preschoolers, when adjusting for pretest levels as well as age, gender, prior participation, and part v. full-time participation. Collectively, the results from the within-subjects tests as well as these ANCOVAs suggest nature preschools may be having a significant positive influence on all dimensions of learning behaviors and peer play behaviors in both the preschool and home setting, with strongest evidence for influencing the competence motivation dimension of learning behaviors, as well

as the three peer play dimensions (increasing play interactions and decreasing play disruptions and disconnections) in the preschool setting.

Table 3
Comparison of Change in Peer Play Behaviors and Learning Behaviors for Nature and Non-Nature Preschool Participants

	Nature Adjusted Posttest M (SE) ^a	Non-Nature Adjusted Posttest M (SE) ^a	F (df) ^b	p ^c	Partial η ²
Peer Play Behaviors					
Play Interaction (T) ^d	28.82 (.32)	26.13 (.63)	(1, 101) = 14.20	<.001**	.12
Play Interaction (P) ^e	27.15 (.28)	26.92 (.58)	(1,97) = .13	.72	<.01
Play Disruption (T) ^f	20.06 (.48)	25.22 (.95)	(1,101) = 23.32	.001**	.19
Play Disruption (P) ^f	27.85 (.45)	28.45 (.94)	(1, 97) = .33	.57	< .01
Play Disconnection (T) ^f	12.44 (.32)	15.17 (.65)	(1,100) = 13.54	<.001**	.12
Play Disconnection (P) ^f	16.06 (.33)	16.03 (.69)	(1,97) = .002	.97	<.001
Learning Behaviors					
Competence Motivation	20.41 (.33)	18.66 (.65)	(1,103) = 5.66	.02*	.05
Attention/Persistence	16.66 (.30)	16.13 (.59)	(1,103) = .69	.41	.01
Attitudes	12.74 (.22)	12.22 (.42)	(1,103) = 4.77	.27	.01
Learning Behaviors Total	44.16 (.68)	41.76 (1.34)	(1,103) = 2.50	.12	.02

^a Adjusted for the covariates of pretest, age, gender, prior participation, and duration of participation (part or full time)

^b F value for between subjects factor of treatment v. control

^c * Denotes significance at .05, ** denotes significance at .01

^d T = Teacher Report

^e P = Parent Report

^f Lower values are more desirable than higher values

To address the third research question regarding if there are significant relationships among the dimensions of learning behaviors and the dimensions of peer play behaviors, Pearson correlational analyses were conducted with posttest levels of each dimension of the two constructs. See Table 4 for the results of these correlational analyses. The results suggest significant relationships between competence motivation dimension of learning behaviors and the play interaction dimension ($r = .24, p = .01$) and the play disconnection dimension ($r = -.25, p < .01$) of peer play behaviors in the preschool setting. There was also a significant relationship between the attitudes dimension of learning behaviors and the play disruption dimension of peer play behaviors in the preschool setting ($r = -.22, p = .03$). These results suggest that higher levels of competence motivation are associated with higher levels of play interaction and lower levels of play disconnection. Similarly, higher levels of (more positive) learning-related attitudes are associated with lower levels of play disruption behaviors.

DISCUSSION

Successful transition from preschool to kindergarten relies on a variety of skills that contribute to “school readiness” (Head Start: Early Childhood Learning and Knowledge Center, 2020; NAEYC, 1996). Although many programs emphasize the academic components, a growing body of research suggests that skills such as social-emotional learning and learning behaviors also greatly impact a child’s successful transition as well as future academic performance (Campbell et al., 2016; Denham & Brown, 2010; Shaeffer & McDermott, 1999). Young children’s development is also positively impacted by positive experiences with and in nature (Dankiw et al., 2020; O’Brien, 2009; Scott et al., 2018). This study sought to offer empirical evidence regarding the effect of time in nature on the development of children in terms of two components of school readiness: peer play interactions and learning behaviors.

Table 4

Results of the Correlational Analyses of the Posttest Levels of Peer Play Behaviors and Learning Behaviors

	1	2	3	4	5	6	7	8
1. Comp Motivation	—							
2. Attn Persistence	.76, <.001**	—						
3. Attitudes	.60, <.001**	.83, <.001**	—					
4. Play Intxn (T ^a)	.24, .01**	.11, .26	-.07, .47	—				
5. Play Intxn (P ^b)	-.01, .91	-.05, .60	.02, .86	.15, .14	—			
6. Play Disruption (T)	-.01, .88	-.16, .10	-.22, .03*	-.32, <.001**	.06, .57	—		
7. Play Disruption (P)	-.01, .97	.01, .94	-.05, .64	-.14, .18	-.31, <.01**	.42, <.001**	—	
8. Play Disconn (T)	-.25, <.01**	-.01, .31	-.04, .70	-.48, <.001**	-.23, .03	-.30, <.01**	.15, .13	—
9. Play Disconn (P)	-.11, .27	.11, .25	.13, .18	.22, .03	-.53, <.001	.09, .37	.48, <.001**	.36, <.001**

Note. Pearson Correlation Values and Two-Tailed Significance Level

^a T = Teacher Report

^b P = Parent Report

* Denotes significance at .05, ** denotes significance at .01

The results of this study suggest the potential for nature preschools to positively impact peer play interactions as well as learning behaviors. The significant change in both constructs over the course of the school year cannot be explained by maturation alone, as these same changes were not seen in the non-nature group of preschoolers (with the exception of the play disconnection dimension of peer play behaviors for the parent rating of the home/neighborhood setting). This variance may suggest that play in nature could be more conducive to supporting desirable play interactions as well as reducing non-desirable play behaviors (disruption and disconnection). Based on the characteristics of nature-play, where children routinely engage in open-ended, creative, social play it is not surprising that children develop desirable play interactions. As children choose from a variety of outdoor play activities, they engage in many cognitive processes that use skills that overlap with those needed for social and emotional learning (Carter, 2016; Chawla, 2014; Gerde et al., 2013).

Additionally, the natural setting may be more conducive than the indoor setting in regard to developing competence motivation learning behaviors. Studies have shown that classroom quality impacts students' learning behaviors; however, a study of the variation in classroom organization, emotional support, and instructional support identified that only classroom organization accounted for a small portion of the variance (Dominguez et al., 2010). Classroom quality consists of two components: *structural features* such as teacher training and teacher-student ratios and *process features* which include use of developmentally appropriate activities, effective use of the instructional day, and teacher sensitivity (Dominguez et al., 2010). In the current study, many of the common structural and process features of the classroom were similar. Participants in both the treatment and control groups learned through child-centered, play-based, and developmentally appropriate programs led by caring and responsive teachers. All children spent the majority of time in play; however, the main difference between groups resided in the location of that play.

These findings suggest that play location may be an overlooked aspect of classroom quality that contributes to the development of both peer play and learning behaviors. Regular experiences in nature typically involve exploration of diverse and ever-changing landscapes and thus may encourage children to engage in a large variety of both formal and informal learning behaviors (Dyment & Bell, 2008). This diversity may contribute to a wider array of learning and play opportunities than those found in a more traditional preschool (Coridano et al., 2019; Danks, 2010). Studies examining the quality of outdoor environments have shown that children playing in environments with lower quality or fewer natural components are often associated with repetitive play and less constructive and imaginative play (DeBord et al., 2005; Hesteness et al., 2007). In contrast, the loose parts and natural elements characteristic of natural playscapes have shown to help children develop their ability to problem solve, cooperate, and make observations (Ku et al., 2013).

Additionally, the component of freedom of choice, or autonomy, may offer insight as to why the location of play matters. Although one could argue that all play offers some aspects of freedom, research suggests that play in nature offers more free-choice than play that is confined by artificial, man-made boundaries (i.e. blacktop, manufactured play equipment) (Chawla et al., 2014). Play in a dynamic, outdoor environment may help to create a learning environment that allows for child-driven risk taking and learning through trial and error (Bundy et al., 2009). When children have a sense of choice and autonomy over their decisions, whether in play or in the classroom, they typically demonstrate greater motivation, adjustment, and long-term interest in subjects (Krapp, 2005; Ryan et al., 1985). The freedom to explore, make mistakes, and learn, which is cultivated through nature preschools, perhaps allows children to create a safe space where they can develop their natural instincts free of artificial boundaries and constraints.

The results of this study suggest that higher levels of learning-related attitudes (more positive) are associated with lower levels of play disruption behaviors. Likewise, higher levels of competence motivation are associated with higher levels of play interaction and lower levels of play disconnection. These results suggest a relationship; while not a causal one, there exists the possibility that developing positive play interactions may also have a positive impact on learning behaviors. Thus, this study's findings of a correlation between positive play and positive learning behaviors warrants further study, as better understanding this relationship continues to strengthen our collective understanding of the importance of play.

Implications for Practice and Policy

These findings suggest that nature preschools positively impact two components of school readiness, peer play interactions and learning behaviors, and thus offer early childhood educators a programmatic example (nature preschools) through which they can help prepare children for the transition to kindergarten. These findings are significant because a successful transition to kindergarten has long term effects on students' motivation and engagement in school (Denham et al., 2012).

Furthermore, the findings offer evidence for the importance of ample unstructured time spent playing outside. As researchers and practitioners continue to voice concerns that the shift towards accountability comes at the expense of other valuable experiences such as developing a love for learning, outdoor activity, collaborative problem solving and social emotional learning (Koretz, 2017; Ritchie et al., 2007), it is increasingly important to demonstrate the efficacy of these other "non-academic" components of school. This study offers such support as it demonstrates the value of unstructured play experiences in helping children transition to kindergarten. Combined with existing research highlighting the importance of nature play, the current study results may help to encourage increased support of nature play and nature preschools from families, educators, and administrators.

Limitations

Interpretation of the results of this study must be considered with an understanding of limitations and threats to validity. It is important to recognize that the sample size of the nature preschool participants was larger relative to the sample size for the non-nature preschool participants, which decreased the internal validity of the study.

Additionally, external validity is limited, as the participants in this study were primarily Caucasian and from a higher socio-economic background. The small sample size and homogenous makeup of the study participants make it necessary to use caution when speculating about correlations, impacts, and influence. Accordingly, further research should aim to reduce these limitations by utilizing a larger sample size and a more equivalent control group in order to more fully assert nature preschools' influence on children's peer play and learning behaviors. Another important direction for further research includes working towards deeper understanding of what aspects of the nature preschool experience are most influential in achieving these positive outcomes relating to peer play and learning behaviors.

Conclusions

Even with these limitations and a need for further research in mind, the results of this study offer promising evidence for the impact of nature preschools. Richard Louv suggests that, "Playtime – especially unstructured, imaginative, exploratory play – is increasingly recognized as an essential component of wholesome child development" (2008, p. 48). The findings from this study offer additional support that the unstructured outdoor playtime that occurs in nature preschools may also help children develop critical school readiness skills. These findings help expand our understanding of the complexity of skills that contribute to school readiness and offer further support for the importance of time in outdoor free play and learning during early childhood.

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