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ISSN 2331-0464 (online), Volume 6, Number 3, Summer 2019

TABLE OF CONTENTS

RESEARCH

Literature Review

Program Development

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Physical Activity and Parental Attitudes and Beliefs of Children Attending a Nature Preschool

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ABSTRACT

Children who spend more time outdoors are more physically active and have fewer behavioral problems than those who spend less time outdoors. No studies to date have evaluated physical activity and behavioral outcomes in an exclusively outdoor nature preschool setting. The aim of this study was to examine differences in objectively measured physical activity and child behavior in children attending a nature preschool compared to waitlisted controls. This cross-sectional pilot study was conducted in Seattle, Washington, in 2016. Children were 3-5 years of age (n=33) at the time of enrollment; parents or primary caregivers completed assessments. Children in the intervention group were enrolled at the nature preschool. The comparison group included children that were either waitlisted at the nature preschool, or were participating in a 2-hour nature-based outdoor enrichment class at the same location once per week. All children wore Actigraph accelerometers to measure moderate-to-vigorous physical activity (MVPA; primary outcome) for 5 days; parents completed the Strengths and Difficulties Questionnaire to assess child behavior (secondary outcome). Children in the control group engaged in 16 more minutes/day of MVPA compared to children attending the nature preschool (113 minutes, SD=24; 97 minutes, SD=16, respectively). No differences were found in MVPA during preschool hours (9 am to 1 pm). Parents of children attending the nature preschool reported wanting their children to engage in more active outdoor playtime compared to controls (206 minutes, SD=136; 150 minutes, SD=87, respectively). Actual self-reported active outdoor playtime was also higher for nature preschool participants compared to controls (233 minutes, SD=61; 67 minutes, SD=52, respectively). Parents of nature preschool participants were more comfortable with lower temperatures (21 degrees F, SD=12) for their children to play outdoors than control families (30 degrees F, SD=19). In summary, both children attending more traditional childcare environments and nature preschools had high levels of MVPA and parents of children in nature preschools were more tolerant of colder conditions for outdoor play.

Keywords: physical activity, early childhood, outdoor preschool, nature preschool, forest preschool

There is increasing evidence of value, and interest in, the benefits of nature contact for human health and well-being (Brussoni et al., 2015; Frumkin et al., 2017; Herrington & Brussoni, 2015; McCurdy, Winterbottom, Mehta, & Roberts, 2010; Tremblay et al., 2015a). Outdoor play for children, particularly in natural environments, is associated with increased physical activity, and other developmental, social/emotional, and health benefits (Gray et al., 2015; D. R. Lubans, Morgan, Cliff, Barnett, & Okely, 2010; D. Lubans et al., 2016; Stephenson, 2003; Taylor, Kuo, & Sullivan, 2002). Nonetheless, total daily outdoor time for children has decreased compared to previous generations (Bassett, John, Conger, Fitzhugh, & Coe, 2015; Gray et al., 2015; Tremblay et al., 2015a). Thus, nature preschools offer a

potential solution to increasing outdoor time, and optimizing physical and behavioral health in early childhood (Kenny, 2013; Larimore, 2016; Sobel, 2015; Sobel, 2014).

In addition, children who spend more time outdoors have been found to be more physically active than those who spent less time outdoors (Hinkley, Crawford, Salmon, Okely, & Hesketh, 2008). Specifically, more time outside is associated with higher moderate-to-vigorous physical activity (MVPA), and fewer minutes of sedentary time (Larouche, Garriguet, Gunnell, Goldfield, & Tremblay, 2016; Tremblay et al., 2015a). Natural settings provide more challenging physical environment (trails, hills, slippery surfaces, etc.) and opportunities for functional play,(Pellegrini & Smith, 1998) which may support motor development by facilitating gross motor activities during a critical development period for these skills (Fjørtoft, 2001, 2004; Little & Wyver, 2008). Spending time outdoors has also been associated with improved Vitamin D levels (Absoud, Cummins, Lim, Wassmer, & Shaw, 2011) necessary for healthy bone development, and prevention of the onset of myopia (Xiong et al., 2017). In addition to physical health benefits, nature contact and outdoor play may promote children's social and emotional development (Burdette & Whitaker, 2005; Burdette, Whitaker, & Daniels, 2004; Heerwagen & Orians, 2002; Kellert, 2012) problem-solving abilities (Kellert, 2012), and creativity (Burdette & Whitaker, 2005; Kellert, 2012; Louv, 2008; Taylor, Wiley, Kuo, & Sullivan, 1998).

While there is increasing evidence about the benefits of children's outdoor time, opportunities for young children to play outdoors may be limited. The American Academy of Pediatrics recommends that preschool-age children get 60-90 minutes of outdoor time each day (American Academy of Pediatrics & American Public Health Association, 2011). According to a study of a nationally representative US sample, only 51% of preschool age children play outdoors with their parents on a daily basis (Tandon, Zhou, & Christakis, 2012). A recent study of Washington State's child care programs found that most centers provide substantially less than this amount of daily outdoor time for young children (Tandon, Saelens, & Christakis, 2015).

One strategy to increase preschoolers' time in and exposure to natural environments is to enroll them in nature preschools. Nature preschools take various forms, ranging from a including nature as a central programming theme and requiring staff have training in both early childhood and environmental education, to what are traditionally called "forest schools" which are generally 70-100% conducted outdoors (Larimore, 2016). Nature preschools have been popular many European countries for decades; in 2014 there were an estimated 1,000 nature preschools in Germany alone (D. Sobel, 2015). Public interest in nature preschools across the US is accelerating rapidly, and programmatic development is following in suit. A 2017 survey of early childhood educators conducted by four national childhood education associations reported approximately 250 nature preschools in in the US, an increase of 66% compared to 2016. Nearly 10,000 children attend these programs annually, and 80% of the programs have a waitlist (North American Association for Environmental Education, n.d.).

As interest in nature preschools increases in the US, there is a need to better understand the implications and potential benefits of this model of early childhood education. The aim of this study was to measure physical activity, child behavior, and to describe and compare parents' perception and practices related to outdoor play between children currently enrolled at a nature preschool to those in other more traditional childcare programs.

Methods

Study Population

This cross-sectional observational study included 33 children aged 3-5 years from the greater Seattle area recruited in 2016. Enrollment included children already attending a nature-based, exclusively outdoor preschool (n=20) and a comparison group (n=13). The comparison group consisted of children from families that were either waitlisted at the nature preschool or were participating in a 2-hour nature-based, outdoor enrichment class provided by the same nature preschool once per week. Of the n=13 participants in the comparison group, n=10 attended a traditional indoor preschool, and n=3 received indoor care at home. All participants were recruited by letter (parent letter and study flyers), by phone (participant initiated), or in person (at the preschool or enrichment class). Participants were excluded from participation if they: (1) were foster children (due to the complicated nature of legal guardianship and informed consent), or (2) if parents/guardians were unable to consent in English. Parents of participants

provided written informed consent; children provided verbal assent. The study protocol was approved by the Seattle Children's Hospital Institutional Review Board.

Setting

The nature preschool occurs exclusively outdoors in a forested park in Seattle, Washington. In alignment with the philosophies of many forest preschools (Kenny, 2013; Larimore, 2016; Sobel, 2015; Warden, 2015), teachers function as guides for learning and do not follow a set curriculum. Instead, teachers focus on free-play and child-initiated exploration and interests; teachers complement with curriculum as needed. Most children attend 5 days per week from 9 am to 1 pm; 2-day and 3-day per week options are available on a limited basis. No full-day options are available. The physical environment consists of dedicated classroom areas that are directly in forested areas. Children use logs and tree stumps to sit; portable canopies are used during inclement weather. While much of the day is spent hiking and exploring the surrounding forest, tables and play stations (e.g., areas for microscopes, coloring, etc.) are present in the classroom areas. No traditional play structures or pre-fabricated playgrounds are utilized.

For control children who enrolled, the 2-hour nature-based outdoor enrichment class was offered once weekly by the same nature preschool the intervention group children attended. All classes included both a caregiver and their child, in addition to a teacher to lead the group. For these classes, the nature preschool prioritizes science-based exploration through outdoor play in a forested park. Classes include circle time, station time (learning stations that emphasize sensory and fine motor skills, creativity, and numerical and literacy skills), short stories, and hikes.

Sociodemographics

Child age (years/months), gender (female/male), race, and ethnicity were determined based on parent report. Socioeconomic status was approximated by parent-reported total annual household income (see Table 1 below).

Table 1
Participant characteristics by preschool type

Category	**Nature Preschool n=20**	**Controls n=13**
Female, *N (%)*	9 (45%)	4 (33%)
Age, *months (SD)*	54 (6)	47 (8)
Race and ethnicity, *N (%)*		
White	13 (65%)	9 (75%)
Asian	1 (5%)	2 (17%)
Hispanic, Mexican, or Latina/Latino	1 (5%)	0 (0%)
Mixed race (≥1 race selected)	5 (25%)	1 (8%)
Parental age, *years (SD)*	38 (4)	39 (4)
Highest Parent Education, *N (%)*		
Completed College	5 (25%)	3 (25%)
Completed Graduate	15 (75%)	9 (75%)
Household Annual Income, *N (%)*		
$29,000 or less	0 (0%)	1 (8%)
$30,000-$49,000	0 (0%)	1 (8%)
$50,000-$69,000	0 (0%)	0 (0%)

$70,000-$89,000	2 (10%)	2 (17%)
$90,000 or more	18 (90%)	8 (67%)

Note: Percentages may not add up to 100% based on rounded estimates.

Measurements

Physical Activity. Physical activity was objectively measured using a GT3X+ Actigraph accelerometer (*ActiGraph,* n.d.; Puyau, Adolph, Vohra, & Butte, 2002); all participants wore the accelerometers between April and June of 2016 for a minimum of 5 days (one weekend included in wear period). A 5-day consecutive wear time has been shown to accurately estimate objectively measured physical activity data in preschool-aged children (Addy, Trilk, Dowda, Byun, & Pate, 2014; Pate, O'Neill, & Mitchell, 2010). Children wore the devices on their right hip attached to an elastic belt. Accelerometers were initialized at 40 hertz to begin sampling and storing activity counts starting at 0100 Pacific Standard Time on the first day of wear. To take into account the impact of weather conditions on physical activity, we categorized weather for each day of accelerometer wear time by National Oceanic and Atmospheric Administration thresholds for precipitation: no rain, and greater than or equal to trace rain (a small amount of precipitation below the rain gauge measuring limit of 0.01 inch) (National Oceanic and Atmospheric Administration, n.d.). Each 'intervention' child was matched with a 'control' child by date to ensure that accelerometer data were present for both groups under any given weather condition. We used a 1:N matching strategy; participants were included in the analysis if they had greater than or equal to one match in the comparison group.

Data Processing and Cut Points. Physical activity counts were downloaded in 15 second epochs using a common method established by Pate and colleagues (Pate, Almeida, McIver, Pfeiffer, & Dowda, 2006). Participants with 3+ valid days of accelerometer data were included if ≥8 hours of wear time were detected; any time period greater than 20 minutes with consecutive zeros was considered non-wear. Accelerometer activity level data were downloaded and analyzed using ActiLife (*ActiGraph ActiLife*, n.d.). Accelerometer data were scored using MeterPlus software (*MeterPlus*, n.d.); time filters were created to reflect on/off times. Physical activity cut points were determined using previously published guidelines: sedentary: 0 - 799 counts per minute (CPM); light: 800 - 1679 CPM; moderate-to-vigorous: 1680 - 3368+ CPM (Pate et al., 2006). In addition, we examined characteristics of sedentary bouts during wear time - sustained periods of inactivity which were defined as being a minimum of 10 minutes in length, and ≤199 activity counts per epoch for the entirely of the bout (1 epoch of ≥200 activity counts would reset the clock for bout time) (Healy et al., 2008; Saunders et al., 2013).

Child Behavior and Parental Beliefs. ***Strengths and Difficulties Questionnaire (SDQ).*** The SDQ was used as a brief behavioral screening tool for each participant (Goodman, 1997; Mellor, 2004). The SDQ is a 25-item parent-reported psychological assessment of children to evaluate psychological attributes in 5 domains (5 items in each domain; score range in each domain: 0-10): emotional problems, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. We used a modified informant-related version of the SDQ that was developed for preschool-aged children. Parents were asked to rate their child on a scale of 0 to 2 for each question (0=not true; 1=somewhat true; 2=certainly true). A general difficulties score was also calculated using SDQ pre-specified instructions (sum of all domain scores except prosocial behavior; overall score range: 0-40) (*Strengths and Difficulties Questionnaire: Scoring Website.*, n.d.).

Parent Supervision Attributes Profile Questionnaire (PSAPQ). The PSAPQ was to assess potential differences in parental value systems that may play a role in whether parents feel comfortable with their child attending a nature preschool. The PSAPQ is a 29-item self-report questionnaire, to assess beliefs/behaviors about parent supervision (Morrongiello & Corbett, 2006). Participants were asked to rate their child on a scale of 1 to 5 for each question (1=never; 2=some of the time; 3=half of the time; 4=most of the time; 5=all of the time; score range in each domain: 0-5). Mean scores were calculated in 4 domains: protectiveness (9 items), supervision beliefs (9 items), risk tolerance (8 items), and belief that fate controls child's health (3 items).

Author-developed questionnaires. In addition, parents were asked to complete two additional questionnaires about: 1) perceived level of importance of activities thought to prepare their child for kindergarten (1=least important; 3=somewhat important; 5=most important) (Jayasuriya, Williams, Edwards, & Tandon, 2016), and 2) limits of comfort with inclement weather conditions (type, frequency [minutes/hours], duration, and temperature [Fahrenheit; F]) for their child's active outdoor playtime activities.

Statistical Analysis

Descriptive statistics were generated for participants using means (SD) for continuous variables and frequencies (percentages) for categorical variables, with results stratified by preschool type. Results are presented as point estimates with 95% confidence intervals, with no inferential statistical testing given the small sample sizes. Physical activity data were analyzed for the entire wear time and were additionally categorized as follows: 1) weekend/weekday, and 2) preschool hours (9 am – 1 pm); all units of physical activity are reported as minutes per day. For the weather analysis, the unit of the analysis was the day, with General Estimating Equations (GEE) models used to account for within-person correlation; GEE model specifications included an exchangeable working correlation matrix and a robust standard variance estimator. All analyses were performed using Stata version 14.1 (or later) and R (R Core Team, 2017; Stata Corp, 2015).

Results

Of the 33 participants included in our analysis, nature preschool participants were more likely to be female, older, and live in households with higher annual incomes. The overall study sample was highly educated; 75% of responding parents had completed some form of graduate school in both groups. Although children attending nature preschool were more likely to be mixed race (25% vs. 8% in controls), both preschool types were predominantly white (65% vs. 75% in nature preschool and controls, respectively). Annual household income was higher in children attending nature preschool; 90% of nature preschool families and 67% of control families reported earning $90,000 or more annually (Table 1).

Control preschoolers engaged in nearly 16 more minutes/day of MVPA on average compared to nature preschool preschoolers (113 minutes, SD=24; 97 minutes, SD=16, respectively). No differences in MVPA were found during preschool hours (9 am to 1 pm) between children attending the nature preschool and those in the control group. Similar differences by preschool type were seen when comparing weekends and weekdays (see Table 2). While the frequency of sedentary bouts did not differ between groups, average sedentary bout length was 3 minutes lower in nature preschool preschoolers (13 minutes, SD=5) than in children in the control group (16 minutes, SD=3) (see Table 2).

Parents reported both the ideal amount of active outdoor playtime they would like their children to have at school, in addition to the actual amount of active outdoor playtime their children receive at school. Parents of children attending the nature preschool reported wanting their children to engage in more active outdoor playtime (206 minutes, SD=136) compared to controls (150 minutes, SD=87). Actual active outdoor playtime was also higher for nature preschool participants (233 minutes, SD=61) compared to controls (67 minutes, SD=52). Thus, children attending the nature preschool have: 1) more active outdoor playtime at school than their control counterparts, and 2) parents that want them to have more total time spent in active outdoor play at school on a daily basis. No differences in total accelerometer wear time were observed between groups (see Table 2).

The PSAPQ scores in each domain appeared similar between children in different preschool types; no differences were found between groups for SDQ scores (see Table 3). No differences were found between groups for self-reported importance of activities to prepare a child for kindergarten; outside play time ranked highly in both groups (4.5, SD=0.95; 4.8, SD=0.39 in nature preschool and controls, respectively) (see Table 4). Parents of nature preschool participants were more comfortable with all inclement weather conditions; high temperature preferences were similar between groups but nature preschool parents were more comfortable with lower temperatures (21 degrees F, SD=12) for their children to play outdoors than control families (30 degrees F, SD=19) (see Table 5). No differences in physical activity or sedentary activity time were found between groups by weather condition.

Table 2
Objectively measured physical activity and parent-reported preferences for physical activity of participant by preschool type

Category	Nature Preschool n=20	Controls n=13	Difference (95% CI)
Objectively measured physical activity (Actigraph accelerometer), *minutes per day (SD)*[1]			
General physical activity			
Sedentary	467 (60)	453 (51)	14.4 (-29.1, 58.0)
Light	91.6 (13)	102 (10)	-10.1 (-19.2, -1.0)
MVPA	97.4 (16)	113 (24)	-15.5 (-31.9, 0.87)
Total Wear Time	656 (59)	667 (59)	-11.1 (-57.9, 35.6)
Weekday physical activity			
Sedentary	468 (66)	461 (54)	6.9 (-40.1, 54.0)
Light	93.5 (18)	101 (15)	-7.3 (-20.1, 5.4)
MVPA	97.1 (21)	112 (30)	-14.9 (-36.3, 6.5)
Weekend physical activity			
Sedentary	486 (65)	453 (51)	33.0 (-14.8, 80.9)
Light	88.7 (14)	103 (15)	-14.2 (-25.9, -2.4)
MVPA	95.8 (16)	113 (22)	-17.7 (-33.8, -1.5)
General physical activity (9 am to 1 pm)			
Sedentary	153 (19)	166 (13)	-13.5 (63.3, 54.2)
Light	31.8 (11)	32.7 (5)	-0.9 (-2.1, 0.64)
MVPA	33.2 (15)	34.7 (7)	-1.5 (-2.8, 1.2)
Sedentary bouts (9am to 1pm)[2]			
Bout, *total number*	6.3 (3)	6.4 (4)	-0.05 (-2.9, 2.8)
Bouts, *number per day*	1.9 (1)	2.0 (1)	-0.11 (-0.94, 0.73)
Bouts, *total length*	88.9 (47)	100 (59)	-11.3 (-54.4, 31.7)
Bout, *average length*	12.8 (5)	16.1 (3)	-3.3 (-6.7, 0.13)
Parent-reported preferences for physical activity, *minutes per day (SD)*[3]			
Outdoor time preferences			
Ideal active outdoor playtime at school	206 (136)	150 (87)	55.5 [-32.0, 143.0]
Actual active outdoor playtime at school	233 (61)	67.3 (52)	165.2 [117.6, 212.9]
On a typical school day…			
Time spent outdoors: from waking to school	12.0 (27)	5 (10)	7.0 [-8.3, 22.3]
Time spent outdoors: after school until bed	105 (63)	76.3 (55)	28.8 [-17.8, 75.3]
Time spent outdoors as a family	68.3 (52)	51.3 (51)	17.0 [-24.0, 58.0]
On a typical non-school day…			
Time spent outdoors	188 (71)	166 (79)	21.5 [-42.5, 85.5]
Time spent outside active as a family	121 (75)	128 (81)	-7.4 [-73.6, 58.8]

Percentages may not add up to 100% based on rounded estimates.
Abbreviations: standard deviation, SD; moderate-to-vigorous physical activity, MVPA; confidence interval, CI.

[1]Objectively measured using ActiGraph accelerometer device.
[2] Sedentary bout defined as a minimum of 10 minutes in length, and ≤199 activity counts per epoch for the entirely of the bout (1 epoch of ≥200 activity counts would reset the clock for bout time).
[3] Parent-reported outdoor time preferences for child.

Table 3
Parent-reported Parent Supervision Attributes Profile Questionnaire and Strengths and Difficulties Questionnaire by preschool type[1]

	Nature Preschool n=19	**Controls n=12**	**Difference (95% CI)**
Parent Supervision Attributes Profile Questionnaire, *score (SD)*[2]			
Protectiveness	3.26 (0.52)	3.27 (0.58)	0.01 (-0.45, 0.45)
Supervision Beliefs	2.85 (0.45)	2.94 (0.6)	-0.09 (-0.53, 0.35)
Risk Tolerance	3.98 (0.4)	3.94 (0.49)	0.04 (-0.33, 0.4)
Belief that Fate Controls Child's Health	2.21 (0.59)	2.11 (0.92)	0.1 (-0.56, 0.76)
Strengths and Difficulties Questionnaire, *score (SD)*[3]			
Overall Score[4]	6.55 (4.35)	7.51 (4.23)	-0.95 (-4.39, 2.49)
Emotional problems	1.20 (1.67)	1.00 (0.95)	0.2 (-0.82, 1.22)
Conduct problems	1.63 (1.54)	1.83 (1.59)	-0.23 (-1.49, 1.03)
Hyperactivity/inattention	2.74 (2.27)	3.58 (2.27)	-0.88 (-2.71, 0.94)
Peer relationship problems	1.05 (0.94)	1.08 (1.24)	-0.03 (-0.95, 0.88)
Prosocial behavior	8.15 (1.57)	7.83 (1.59)	0.32 (-0.95, 1.59)

Abbreviations: standard deviation, SD; confidence interval, CI.
[1] All self-reported by parents
[2] Scores calculated as a mean for each domain on a scale of 1 (never) to 5 (all of time time); score range in each domain: 1-5. Higher is more protective (protectiveness) and values closer supervision (supervision beliefs); higher greater tolerance for risk (risk tolerance); higher is stronger belief that fate impacts future events (belief that faith controls child's health).
[3] Individual domain scores calculated as a sum for each domain on a scale of 0 (not true) to 2 (certainly true); score range in emotional problems, conduct problems, hyperactivity/inattention, peer relationship problems: 0-10 (lower is better); score range for prosocial behavior: 0-10 (higher is better);
[4] Overall score calculated by summing individual scores of all domains except prosocial behavior (scored separately). Overall score range: 0-40 (lower is better).

Table 4
Parent-reported importance of activities to prepare child for kindergarten by preschool type[1]

	Nature Preschool n=20	**Controls** n=12	**Difference (95% CI)**
Importance of Activity to Prepare for Kindergarten, *score (SD)*[2]			
Social and emotional learning	4.9 (0.31)	4.9 (0.29)	-0.02 (-0.25, 0.22)
Make believe play	4.7 (0.59)	4.7 (0.49)	-0.02 (-0.44, 0.41)
Outside play time	4.5 (0.95)	4.8 (0.39)	-0.33 (-0.86, 0.19)
Story time	4.2 (1.06)	4.0 (0.89)	0.20 (-0.6, 1.0)
Music	3.9 (0.85)	3.8 (0.98)	0.08 (-0.7, 0.87)
Science activities	3.8 (1.08)	3.8 (0.87)	-0.03 (-0.84, 0.78)
Lunch time/snack time	3.8 (1.21)	3.4 (1.29)	0.48 (-0.59, 1.54)
Arts and crafts	3.7 (0.93)	3.7 (1.01)	0.01 (-0.82, 0.84)
Learning ABC's and numbers	3.2 (1.06)	3.4 (1.43)	-0.16 (-1.26, 0.93)
Inside play time	3.0 (1.23)	3.8 (1.11)	-0.88 (-1.82, 0.05)
Nap time	2.8 (1.44)	2.7 (1.42)	0.07 (-1.12, 1.27)

Abbreviations: standard deviation, SD; confidence interval, CI.
[1] All self-reported by parents.
[2] Scores calculated as a mean for each item on a scale of 1 (least important) to 5 (most important).

Table 5
Parent-reported limits of comfort with inclement weather conditions by preschool type[1]

	Nature Preschool n=20	**Controls n=12**	**Difference, 95% CI**
Weather condition preferences, *N (%)*[2]			
Wet ground/puddles on the playground	20 (100%)	10 (91%)	0.09 (-0.1, 0.3)
Light rain/mist/drizzle	20 (100%)	11 (92%)	0.08 (-0.09, 0.26)
Steady rain/showers	14 (70%)	5 (46%)	0.25 (-0.16, 0.65)
Heavy rain	7 (35%)	1 (8%)	0.27 (-0.03, 0.56)
Light snow or snow on the ground	20 (100%)	12 (100%)	0 (0, 0)
Heavy snow	18 (90%)	10 (83%)	0.07 (-0.21, 0.35)
Temperature preferences for outdoor play, *degrees Fahrenheit (SD)*	**n=20**	**n=10**	
Lowest temperature	21.0 (12)	30.0 (19)	-9 (-24.2, 6.2)
Highest temperature	93.5 (5)	92.7 (10)	0.8 (-7.0, 8.6)

Abbreviations: standard deviation, SD; confidence interval, CI.
[1] All self-reported by parents.
[2] Percent of parents reporting that they would take their child outside in the specific weather conditions.

Discussion

In this study, we examined objectively measured physical activity, children's behavioral strengths and difficulties, and parents' perception and practices around outdoor play in children attending a nature preschool compared to children not enrolled in such a preschool. To the best of our knowledge, this is the first study to examine children's physical activity and their behavioral strengths and difficulties in an exclusively nature preschool model. Overall, we found that physical activity levels were high in both groups, with children attaining over the 180 minutes per day of total activity recommended by many international groups (Australia's Physical Activity and Sedentary Behaviour Guidelines, 2014; United Kingdom Physical Activity Guidelines, n.d.; Lipnowski, Leblanc, & Canadian Paediatric Society, Healthy Active Living and Sports Medicine Committee, 2012), and greater than the 60-90 minutes of MVPA recommended for school age children in the US (American Academy of Pediatrics & American Public Health Association, 2011). Unexpectedly, there was no indication that the children enrolled in nature preschool were engaged in more physical activity, despite spending considerably more outdoor time at school. In addition, parents of nature preschool preschoolers reported (a) wanting their children to spend more time outside at school, (b) that their children do spend more time outside at school, and (c) a higher tolerance for their children to be outside in wetter and colder weather conditions. There were no other observed differences in actual child behavior or parent protectiveness or preferences between children in the nature preschool versus those not enrolled in this type of preschool. Thus, both children attending a nature preschool and children in more traditional indoor childcare settings have ample opportunities for MVPA. While we can be certain that all activity was outdoors in the children attending a nature preschool, we do not know where the MVPA was occurring in the control group. Thus, children in the indoor childcare setting may have active play opportunities, but the frequency to engage in these opportunities outdoors in a natural environment is uncertain. Because parents in the overall study sample were highly educated (25% had a college degree and 75% had a graduate degree in both groups), it is possible that families in both groups appreciate the importance of outdoor play and provide these opportunities to their children independent of type of childcare environment.

Evidence suggests that children who spend more time outdoors are more physically active than those who spend more time indoors (Cleland et al., 2008; Hinkley et al., 2008; Kneeshaw-Price et al., 2013; K Lachowycz & Jones, 2011; Kate Lachowycz, Jones, Page, Wheeler, & Cooper, 2012; Schaefer et al., 2014; Tandon et al., 2015). One recent study found that Swedish children in preschools with high quality outdoor play environments were less likely to be overweight, slept for longer periods of time, and had more daily steps per minute than their peers with lower quality outdoor preschool environments (Söderström et al., 2013). Our findings are inconsistent with the literature examining the impact of outdoor time on physical activity. There may be unanticipated differences between nature preschools and indoor childcare settings that offer high quality outdoor play opportunities. Recent studies examining outdoor time in children suggest that outdoor environments provide more diverse spaces and opportunities for different types of play, and provide an environment for children to be more engaged for longer periods of time (Drown & Christensen, 2014; Herrington & Brussoni, 2015). It is possible that children attending a nature preschool, while engaging in high levels of overall physical activity, had lower total MVPA compared to the other group due to being more engaged with the outdoor learning environment or that the natural outside environment was less conducive to active play then say a playground might be. A study examining movement patterns in children before and after installation of a more natural outdoor play space at two preschools in Canada found that children were more likely to "channel surf" – walk back and forth or engage in repetitive motions indicating boredom – before the installation (Herrington & Brussoni, 2015). Post-installation, there were more pauses in movement to interface with the environment, and movement patterns were more spatially complex. The authors concluded that children were more engaged in their play after the installation of natural elements (Coombes, van Sluijs, & Jones, 2013; Herrington & Brussoni, 2015). Children attending nature preschools may be more engaged in their learning environments even if such activities are outdoors but mostly sedentary. It could be that the novelty or change in context to going outdoors for children in traditional preschools who spend most of their time indoors is what encourages more physical activity. In contrast, nature preschoolers are always outdoors and would not be expected to be active the whole time they are attending preschool.

During childhood, natural outdoor environments can improve mental health (Amoly et al., 2014b; JACKSON, TESTER, & Henderson, 2008; Kuo & Taylor, 2004; Wells & Evans, 2003), behavioral problems (Balseviciene et al., 2014; Markevych et al., 2014), motor development (Fjørtoft, 2001, 2004; Little & Wyver, 2008), and social and emotional development (JACKSON et al., 2008; Wells & Evans, 2003). Though in the present study both nature preschool and control preschoolers' average scores fell within the normal range on the Strengths and Difficulties Questionnaire, control preschoolers had somewhat higher hyperactivity/inattention scores than children attending nature preschool (Table 3). While we cannot discern directionality of this relationship, it could be that children who are more hyperactive are more likely to be enrolled in a nature preschool perhaps because their families felt they would do better in this environment compared to a more traditional preschool setting. The use of waitlist controls mitigates this concern because if families with children who were more hyperactive/inattentive were more likely to want to enroll in a nature preschool, we would expect that they would be non-differentially distributed based on their enrollment status (enrolled vs. on the waitlist). Alternatively, our finding could be consistent with other literature that reports time in nature reduces attention deficit/ hyperactivity disorder symptoms in children (Amoly et al., 2014a; Faber Taylor & Kuo, 2011; Kuo & Taylor, 2004; van den Berg & van den Berg, 2011). For parent-reported preferences for outdoor time, both total desired and actual active outdoor play time at preschool were higher for nature preschool families. These findings suggest that having a child enrolled in a nature preschool may magnify attitudes and beliefs about how much time parents want their children to be active outdoors during the school day. While nature preschool families reported higher actual active outdoor time than desired outdoor time at school, control families reported lower actual outdoor time than desired. This suggests that while families in the control group valued outside time – their current childcare arrangement may not be providing them the amount of time they would like their children to be outside (Table 5). On both typical school days and on non-school days, nature preschool families reported spending more time being outside while children were not in preschool. This may be due to strengthened attitudes and beliefs that occur as a result of having a child enrolled in a nature preschool. For example, families may become more tolerant of less favorable weather conditions after habituating to a nature preschool environment or develop social relationships and engage in outdoor activities with other families that have children attending the nature preschool.

Strengths of this study include objectively measured physical activity using accelerometry, a robust control group of preschool children who were waitlisted at the nature preschool but in a different childcare setting, and additional assessment of parental supervision attributes, domains of child behavior, parental values and beliefs, and preferences for outdoor activities and weather conditions. In addition, this is the first study evaluating physical activity in an exclusively nature-based outdoor preschool. Given that enthusiasm and legislation for outdoor educational opportunities has accelerated in recent years (North American Association for Environmental Education, n.d.; Washington State Legislature, 2017), evidence regarding the health and behavioral implications of nature-based outdoor preschools could be beneficial for future programs and policies (McCurdy et al., 2010; Tremblay et al., 2015b). There are a number of limitations to this study. First, it was cross-sectional, thus limiting the ability to establish temporality of the relationship between outdoor time and physical activity. Second, the sample size was small, and thus results are exploratory and hypothesis-generating in nature. Third, the study population was highly educated, with approximately 75% of parents in each group completing graduate school. It is possible that more highly educated families prioritize physical activity as part of a healthy family lifestyle. Fourth, we did not track how many of the children in the comparison group were attending the 2-hour outdoor enrichment class offered once per week. It is possible that these children had higher levels of physical activity than they would have if they had been indoors. Nonetheless, given that accelerometers were worn for five consecutive days, it is unlikely that a single 2-hour program dramatically impacted their mean physical activity. Fifth, although our control group was chosen as a mechanism to compare families with similar beliefs and values towards outdoor time, it may be that both groups – independent of preschool enrollment – were highly motivated to engage in outdoor time and thus the reason why MVPA was high in both groups. Lastly, physical activity in children is known to be impacted by seasonality (Shen, Alexander, Milberger, & Jen, 2013; Tucker & Gilliland, 2007). This study was conducted in 2016 from April through June, months that can be more inviting for children to want to be outside. These months were unusually dry compared to historical averages in the study area, though no differences in physical activity were found between groups by weather condition (Table 6). Because outdoor play, by design, is a component of a nature preschool model, there may be differences in overall physical activity based on weather and seasonal conditions compared to traditional indoor preschool models. It is possible that the mild weather led to more MVPA than would normally

occur in the control group, had there been more precipitation and the weather followed a more traditional trajectory.

A Canadian multidisciplinary expert panel conducted two systematic literature reviews and concluded in a position statement that for children aged 3-12 years, "Access to active play in nature and outdoors – with its risks – is essential for healthy childhood development." The group recommended increasing opportunities for active outdoor play in all settings, and made specific recommendations for educators, caregivers, and school and child care administrators (Tremblay et al., 2015b). For childcare and school administrators, the group suggested choosing "natural elements over pre-fabricated playgrounds and play areas." Furthermore, they proposed that children should be: 1) encouraged to play in these natural environments, and 2) given a voice in the design process to ensure that these play spaces facilitate interest in active outdoor play. They advocated for teachers and childcare providers to "regularly embrace the outdoors for learning, socialization and physical activity opportunities, in various weather conditions." These recommendations align with the fundamental philosophy of nature preschools and highlight the need to prioritize active outdoor play - emphasizing natural elements - in early childhood educational settings.

Conclusion

Physical activity is a critical component to health in early childhood; both children attending a nature preschool and children in traditional indoor settings had high levels of MVPA that exceeded the recommendation of 90 minutes per day. Parents of children attending the nature preschool reported more desire for, as well as, actual outdoor playtime at school, and a higher tolerance for their children being outside in inclement weather. This may indicate that having a child in a nature preschool increases the value and commitment to outdoor time and lowers perceived barriers to spending time outdoors. To the best of our knowledge, this is the first study to examine objectively measured physical activity and behavioral health in children attending an exclusively outdoor nature preschool. Future research is needed to examine the longitudinal impact of a nature preschool on objectively measured physical activity, in addition to other potential health benefits of nature preschools in early childhood.

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Nature-Based Education and Kindergarten Readiness: Nature-Based and Traditional Preschoolers are Equally Prepared for Kindergarten

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ABSTRACT

Time spent outdoors benefits children's physical, social and psychological development, although children today spend far less time outdoors than children of previous generations. The nature-based school initiative has grown in popularity as a means of increasing children's connection with nature and harnessing its benefits for their educational development. The current study is one of the first to quantitatively compare a traditional and a nature-based pre-primary program at the same school. Using a multi-method approach, this study aimed to better understand the relationships between learning environment and important developmental variables, including social interaction, play, behavior, school enjoyment and nature appreciation. Results indicate that both groups are equally prepared for kindergarten with regard to social-emotional, academic and pretend play skills.

Keywords: nature-based education, kindergarten readiness, nature preschool, outdoor education, early childhood education

American children today spend far less time outdoors than children of previous generations, with a dramatic decrease in time spent outdoors over the past thirty years (Juster, Ono, & Stafford, 2004). Child development professionals, however, note the medical (Cleland et al., 2008; Pardee et al., 2007) and psychological (Suchert, Hanewinkel, & Isensee, 2015; Maras et al., 2015) risks of excessive sedentary time indoors, and the host of benefits associated with both increased physical activity (Ardic & Erdogan, 2017; Gunnell et al., 2016) and time spent in nature (Schalkwijk, van der Zwaard, Nijpels, Elders, & Platt, 2018; McCormick, 2017). Numerous researchers have

focused in particular on the psychological and physical benefits of time outdoors for children (McCurdy, Winterbottom, Mehta, & Roberts, 2010; Pretty et al., 2009). In response to the trend of more time spent sedentary and indoors, researchers and educators have become interested in ways to increase outdoor time during the school day. The nature-based school initiative has grown in popularity as a means of increasing children's connection with nature and harnessing its benefits for their educational development. Proponents of nature-based education cite numerous benefits for children's academic, social and behavioral development. As the number of nature-based education programs increase, research is needed to better understand the relationships between these environments and children's overall well-being.

LITERATURE REVIEW

Overview of nature-based education

The nature-based school initiative originated in Scandinavia and Germany, is in wide use across England and Wales, and has more recently gained popularity in the United States. Though known by different names, including *nature-based preschool*, *nature preschool*, *forest kindergarten*, *nature kindergarten*, *forest school*, and *Waldkindergarten*, the common theme of all of these programs is that nature shapes their philosophies and methodologies. Larimore (2016) points to Bailie and Finch's (Natural Start Alliance, 2014) three criteria for nature preschools as a guide for program design and developing professional principles. Those criteria are as follows:

1. "Nature is the central organizing concept of the program. That is, nature is the integrating thread that intentionally ties together the preschool's philosophy, methodologies, classroom design, outdoor spaces, and public identity.
2. A nature preschool's program is based on high-quality practices of both early childhood education (developmentally appropriate practices) and environmental education (the North American Association for Environmental Education's "Guidelines for Excellence in Environmental Education" and principles of interpretation), requiring its teaching staff to have skills and experience in both early childhood education and environmental education.
3. A nature preschool program uses the natural world to support dual goals that address both child development and conservation values. These include the development of the world of the child (in all domains – cognitive, physical, social, emotional, aesthetic, and spiritual) and the development of an ecological identity or environmental ethic."

Though some nature-based preschools operated in the United States in the late twentieth century, many more have originated over the past twenty years (Larimore, 2016). A recent nationwide survey documented the rise in popularity of these programs, with over 250 nature-based preschools currently in operation throughout the country (North American Association for Environmental Education, 2017).

Proponents of nature-based preschools cite their many benefits for children's overall development. Preschools with an outdoor learning component offer opportunities for students to develop hands-on reasoning skills, such as scientific inquiry and hypothesis testing (McClain and Vandermaas-Peeler, 2016). They build math vocabulary and concepts, such as spatial orientation, comparison, and estimation, through their work in the outdoors (Vandermaas-Peeler & McClain, 2015). Kiewra and Veselack (2016) note the positive impact of outdoor classrooms on creativity and imagination. They concluded that ample time outdoors and access to open-ended materials were especially important in fostering creativity. This finding highlights the advantages of entirely outdoor classrooms, in contrast to limited time spent outdoors using traditional playground equipment. Outdoor time in a natural landscape holds advantages for students' motor coordination and balance, above what is gained through outdoor time on traditional playground equipment (Fjørtoft, 2001). Nature-based schools may also influence students' attitudes about nature, with attendance at a nature-based school linked to a "pro-environmental attitude" (Turtle, Convery, & Convery, 2015).

The objectives of the current study were to better understand the learning process that occurs in a nature-based pre-primary program and to compare the experience of a nature-based pre-primary program with that of a high-

quality, traditional pre-primary program. A unique aspect of the current study is that both preschool programs were located in the same school and drew students from the same community, ensuring that the groups were matched on important variables, such as location, socioeconomic status, and parents' levels of education. Using a multi-method approach, this study aimed to better understand the relationships between learning environment and important developmental variables, including social interaction, play, behavior, enjoyment of school, and appreciation of nature. The specific variables assessed included children's pretend play, general behavior, social skills, and kindergarten readiness from the perspectives of parents and teachers. The study also assessed children's enjoyment of school and nature appreciation through the children's perspectives.

Overview of development during preschool

The preschool-age is an important developmental stage for acquiring skills related to behavioral and emotional regulation, such as role-playing, perspective-taking, and interacting with peers and adults. Acquisition of these skills, such as emotion regulation and social skills, in turn, begets healthier psychological functioning (Rubin, Coplan, Fox, & Calkins, 1995) and contributes to greater success in early literacy, vocabulary, and math (McClelland et al., 2007). Therefore, by assessing these key skills in preschool programs, we can evaluate the efficacy of preschool programs in establishing the bedrock of later psychological functioning and academic achievement. It is important that young children acquire these skills prior to beginning kindergarten, where demands likely become more complex and expectations are higher. For example, children must learn to ask for help when a challenging task exceeds their capacity, wait their turn for the teacher's assistance, modulate their frustration when they must share a toy, and inhibit impulsive behaviors in order to follow the rules of the classroom. Preschoolers with greater knowledge and understanding of emotions were reported as having greater social awareness and prosocial behaviors at home by mothers and grandmothers, i.e. responding to others' emotions and cooperating with others. Additionally, in the same study, children with greater self-regulation skills, specifically, the ability to maintain positive emotions, were reported by teachers as having fewer inappropriate behaviors in the classroom (Garner & Waajid, 2012).

First, behavioral and emotional self-regulation develop across the preschool period as children must learn to manage upset feelings, cope with frustration, and appropriately express positive emotions with peers. Between the ages of three and five years old, preschoolers strengthen their inhibitory control and emotion regulation (Liebermann, Giesbrecht, & Muller, 2007). The ability to understand specific emotions also develops across the preschool period. While both three- and four-year-old children are able to recognize strategies to cope with sadness, four-year-old children are better equipped to recognize coping strategies for managing anger (Cole et al., 2008).

Preschool is an important venue for teaching, encouraging, and practicing behavioral regulation skills, as they are associated with academic readiness in kindergarten and appropriate behavior in the classroom setting. In a 2012 study, preschoolers who demonstrated greater attentional control and expressed more positive emotions displayed fewer behavior problems in the classroom (Garner & Waajid, 2012). The researchers posited that more frequent expression of positive emotions allows young children to stay motivated and on-task and elicits positive attention from their teachers. In another sample of preschoolers, appropriate behavioral self-regulation skills were negatively associated with disruptiveness in the classroom (Willoughby et al., 2011).

Behavioral regulation in preschool is an important precursor for a child's academic skill development over time. Behavioral regulation skills that are important for academic success include executive functions such as attention, working memory, and inhibitory control, as these skills allow the child to resist distractions, pay attention to the teacher, and follow directions. McClelland et al. (2007) found that three- to five-year-old children's performance on an executive functioning task involving following directions was a significant predictor of their emergent literacy, vocabulary, and math skills in the spring of their preschool year. Additionally, children who made larger gains in behavior regulation from fall to spring of their preschool year also made larger gains in their academic skills. Moreover, self-control has been shown to relate to academic development via its link between interpersonal styles and academic achievement. In a sample of kindergarteners, self-control mediated the relationship between prosocial behavior in the classroom and academic achievement (Normandeau & Guay, 1998). Thus, weaker inhibitory control may in part explain why children who are interpersonally aggressive have poorer academic outcomes.

Understanding and expressing emotions appropriately has important implications for navigating successful peer interactions into kindergarten. In a sample of three- to four-year-old children, those with greater knowledge of different emotions and the situations that elicit such emotions demonstrated higher social competency on both peer nomination and teacher ratings concurrently in preschool and when followed up into kindergarten (Denham et al., 2003). Children's appropriate emotion expression and appropriate responses to their peers' emotions in preschool were also related to their social competency ratings concurrently and into kindergarten (Denham et al., 2003). In another study, four-year-old children who displayed poor emotion regulation in their social interactions were at greater risk for internalizing or externalizing problems. Specifically, children who were more social with peers during free play and were rated by mothers as poor emotion regulators were more likely to have symptoms of externalizing behaviors. On the other hand, children who tended to play alone and were rated by mothers as poor emotion regulators were more likely to have symptoms of internalizing behaviors (Rubin et al., 1995). Conversely, greater emotion regulation across children served as a protective factor and decreased the likelihood of children displaying internalizing or externalizing problems (Rubin et al., 1995). Positive peer interactions have a strong impact on learning and behavior in the classroom. In a sample of preschoolers at Head Start, children who engaged in maladaptive peer interactions, such as starting fights or destroying others' things, were rated by their teachers as having poorer emotion regulation than children who engaged in adaptive peer interactions (Cohen & Mendez, 2010). Peer interactions were assessed with The Penn Interactive Peer Play Scale (PIPPS), the same measure utilized in the current study. Another study with preschoolers at Head Start concluded that a positive peer play interaction style, as measured by the PIPPS, is associated with learning approach, motivation, and attention in the classroom. That is, children who experience more mutually fulfilling and enjoyable interactions with others are more likely to be invested and engaged in their learning. Children who were disconnected or aloof in their play interactions with peers were seen as more inattentive by teachers. Finally, children who were disruptive in their play interactions with peers exhibited more conduct and hyperactivity problems in the classroom (Coolahan et al., 2000).

Children develop the ability to pretend around age three, when they can begin to suspend reality and create imaginary worlds (Vygotsky, 1933). The ability to separate an object from its meaning is a major developmental milestone, as children begin to acquire the ability for symbolic representation. Learning that one object can be treated "as if" it were something else is a crucial cognitive process in pretend play (Fein, 1987) as it promotes the developing imagination. Moreover, acquisition of symbolic representation is a key developmental precursor to language proficiency, as language relies on using symbols to represent ideas, facts, and concepts. Thus, pretend play helps to spur language development in children (Weisberg et al., 2013). Children's own ideas, rather than the characteristics of actual objects, direct the children's play (Vygotsky, 1933). For example, a car can fly or an animal can talk in pretend play, but not in reality. Vygotsky (1933) postulated that through play, children acquire the capacity for abstract thought processes. Children learn rule-governed behavior and can try out a variety of different roles while pretending (Vygotsky, 1933). Pretend play is associated with coping skills, emotion regulation, and creativity longitudinally (Russ, Robins, & Christiano, 1999; Hoffmann & Russ, 2012; Wallace & Russ, 2015).

In order to be successful in the kindergarten classroom, it is essential that preschoolers learn how to cope with difficult emotions, manage frustrations in the face of social conflict or threats in their environment, and understand another child's point of view. Playing out real situations in a play environment allows children the opportunity to practice taking another's perspective. Imaginativeness in first- and second-grade children's pretend play was associated with their ability to generate more ideas to cope with stressful situations four years later (Russ, Robins, & Christiano, 1999). In a sample from an all-girls independent school, elementary school children who demonstrated more organized and imaginative play generated more ideas on a divergent thinking measure four years later (Wallace & Russ, 2015). Finally, in a sample of four- and five-year-old children, a strong orientation towards fantasy and pretend play was a significant and unique predictor of emotion regulation after partialling out variance attributed to age, theory of mind, and verbal ability (Gilpin, Brown, & Pierucci, 2015). Taken together, behavioral and emotional self-regulation and pretend play have important implications for later school success and healthy peer relationships. Thus, in evaluating the quality of a preschool program, it is important to assess these abilities and competencies that define the preschool developmental period.

The specific aims for this study were: (a) to gain a better understanding of the relationships between learning environment (nature-based and traditional classroom) and aspects of academic and social-emotional kindergarten readiness; (b) to determine if children in a traditional pre-primary setting and a nature-based pre-primary setting were equally prepared for kindergarten on these variables; and (c) to add to the quantitative literature on nature-based pre-primary education using a multi-rater, longitudinal research design.

METHOD

Sample

The study population included 26 pre-primary students (mean age = 51.5 months) attending an independent girls' school with a coeducational pre-primary division in the suburbs of Cleveland, Ohio. The racial group identification of the school included 49% White (not Hispanic), 34% multiracial, 12% Asian, 4% Hispanic, and 1% African-American. 46% of students attending the K-12 school receive financial assistance. Twelve of the students were enrolled in the school's outdoor pre-primary program (OPP). Fourteen of the students were enrolled in the school's traditional prekindergarten program (TPK). The OPP class had two co-teachers, and the TPK class had one lead teacher and one teaching assistant. The OPP program, in its first year of operation at the start of the study, consisted of a completely outdoor learning experience, in which the children spent five mornings per week at the school's outdoor campus. The children were outdoors in the forest for 90% of the school day. They were indoors only when putting on/removing gear, thunderstorms were passing through the area, or the wind chill was below zero. The outdoor campus contains a yurt, which was used to house gear and as an emergency shelter in the event of severe storms or cold. Children went outdoors as soon as they put on their gear in the yurt. Depending on the conditions and terrain encountered each day, the children utilized a variety of gear, including pants, full coverage one-piece suits, or a combination of pants and jackets. Once the children understood the benefits of being warm and dry, they were encouraged to make gear choices independently. The children in the TPK program attended class five mornings per week at the school's main campus. As the school's entire pre-primary program incorporates an Eco!Wonder curriculum that teaches all pre-primary children about nature and sustainability, children in the TPK class also spent some time at the outdoor campus throughout the school year. Children in the TPK class visited the outdoor campus one morning per week and spent one immersion week at the outdoor campus in the spring. The remainder of their outdoor time was spent in built environments. Both the OPP and TPK programs lasted for half the day, after which the children in both classes either went home or attended afternoon programming, including both indoor and outdoor activities, at the school's main campus. Approval for the study was received from the Case Western Reserve University Institutional Review Board; parents read an information sheet about the study and were given the opportunity to consent for their children to participate in the study. All of the families in the OPP and the TPK classes elected to participate in the study.

Procedure

One parent of each child completed several rating forms in September and again in the following May. Both teachers of each class completed several rating forms for each student in September, January, and May. The lead and assistant teachers' scores were compiled to create one teacher rating for each child. Teachers were asked to complete measures at the beginning, middle, and end of the school year to gain a more complete data set and allow for more nuanced analysis of changes over the course of the school year. Parents were only asked to complete the measures twice, to decrease the research burden for parents. The children completed two rating forms in September and again in May. The measures are described below.

Measures

Penn Interactive Peer Play Scale (PIPPS). The PIPPS is a 32-item behavior rating instrument assessing aspects of children's peer play behaviors (McWayne, Sekino, Hampton, & Fantuzzo, 2007). It assesses the quality of peer interactions in play across the dimensions of Play Interaction, Play Disruption, and Play Disconnection. The PIPPS was chosen for this study because it is empirically validated and designed for use specifically with preschoolers and kindergarteners from a wide variety of cultural backgrounds (Castro, Mendez, & Fantuzzo, 2002). It provides a

measure of peer play behaviors, which are an important component of social-emotional development and kindergarten readiness. Teachers completed the PIPPS in September, January, and May. Parents completed the PIPPS in September and May.

Preschool and Kindergarten Behavior Scales, Second Edition (PKBS-2). The PKBS-2 is a 76-item behavior rating instrument assessing aspects of children's social skills and problem behaviors (Merrell, 2002). The Social Skills scale assess the dimensions of Social Cooperation, Social Interaction, and Social Independence. The Problem Behavior scale assesses the dimensions of Externalizing Problems and Internalizing Problems. The PKBS-2 was chosen for this study because it is empirically validated, designed for use specifically with preschoolers and kindergarteners, and standardized with a nationwide sample. It provides a measure of internalizing and externalizing behaviors that are related to kindergarten readiness (Nelson et al., 2016). Teachers completed the PKBS-2 in September, January, and May. Parents completed the PKBS-2 in September and May.

Pretend play rating. The pretend play rating consisted of five questions assessing children's imagination in play, use of make-believe, enjoyment of play, amount of emotion expressed in play, and use of make-believe in dramatic play, using a 5-point Likert scale. Kaugars and Russ developed the measure for use in their 2009 study of preschool children's pretend play. A measure of pretend play was selected due to the correlation between pretend play and aspects of coping, emotion regulation, and creativity, all important to kindergarten readiness (Hoffman & Russ, 2012). Parents completed the measure in September and in May. Teachers completed the measure in September, January, and May.

Kindergarten readiness measure. Teachers completed a measure assessing the children's academic kindergarten readiness skills. Skills included letter number recognition, sorting and classifying information, counting, rhyming, and recognizing one's name in print. The skills were rated as "Never," "Sometimes," "Often," or "Always." Given the research question of kindergarten readiness, a teacher rating of this construct was essential to the study. This rating scale was developed in collaboration with the pre-primary teachers at this school, to accurately reflect the pre-primary curriculum goals. Teachers completed the measure in September and May.

Children's Attitudes Toward School (CATS). The CATS is a 14-item rating instrument designed for use with children in kindergarten and first grade (Henry, Mashburn, & Konold, 2007). A range of school activities are read to the child and the child responds to each by pointing to a face on a card that reflects the child's attitude toward the activity. With the author's permission, the CATS was adapted for use with the prekindergarten-aged sample in the present study. The measure was adapted by altering the items to better reflect the pre-primary curriculum. For example, the item, "How do you feel about doing math activities like counting, adding, and subtracting?" was changed to, "How do you feel about doing math activities like counting, sorting, or making patterns?" Items irrelevant to the pre-primary curriculum (e.g., "How do you feel about writing a story?" and "How do you feel about taking math tests?") were deleted and items reflective of the pre-primary curriculum (e.g., "How do you feel about playing with kitchen and housekeeping toys, dolls and puppets, and dress up clothes?") were added. The overall measure was shortened by two items, going from 18 items on the original measure to 16 items on the revised version. Though the children in this study were young, it was important to assess their feelings about school, as school enjoyment may be related to achievement and motivation (Raccanello et al., 2018). A research assistant administered the CATS to the students in September and May.

Children's Attitudes Toward Nature (CATN). The CATN is a 12-item rating instrument created for the present study, using the administration guidelines and instructions of the CATS (Henry, Mashburn, & Konold, 2007) as a guide. A range of nature activities are read to the child and the child responds to each by pointing to a face on a card that reflects the child's attitude toward the activity. Though children's ratings were secondary to the parent- and teacher-ratings in this study, the authors felt it important to assess children's feelings about nature in both classes. As no well-validated measures of children's attitudes toward nature are available for this age group, the CATS format was adapted, with the assistance of the lead OPP teacher, to create this original measure. A research assistant administered the CATS to the students in September and May.

Analyses

Mixed-model analysis of covariance (ANCOVA) was our primary analytic strategy. It was used to test within-class differences across time, between-class differences at each time point, and the School × Time interaction effect. These analyses were conducted with each of the completed measures while statistically controlling for age.

The within-subjects factor was time, with three time points for teacher ratings and two time points for parent ratings and child ratings. As two teachers rated each child on each variable (except for Pretend Play), the teacher ratings were averaged to create one score when possible. Mauchly's test of sphericity was applied to ANCOVAs on teacher reports, as there were three repeated measures (with the exceptions of problem behaviors and kindergarten readiness). When sphericity was violated, we applied the Greenhouse-Geisser estimates of sphericity (Maxwell & Delaney, 2004). The between-subjects factor was school (i.e. traditional or outdoor). Bonferroni-corrected pairwise comparisons were examined to determine at which time points the significant differences, if any, occurred.

Given the relatively small sample size, effect sizes were calculated using partial eta squared estimates (included in Table 1). Partial eta squared estimates are the appropriate effect size estimate to report when analyzing data using ANCOVA: For this statistic, 0.02 is indicative of a small effect, 0.15 is considered a medium effect, and 0.35 is indicative of a large effect (Cohen, 1992).

RESULTS

The results are presented in two sections. The first section focuses on teachers' and parents' ratings of the children on measures of peer play behaviors, social skills, and pretend play, as well as teachers' ratings of the children's kindergarten readiness. The second section focuses on children's ratings of their own enjoyment of school and appreciation of nature. Selected results are described by measure, below (see Tables 1 and 2 for the relevant statistics).

Table 1
Teacher-rated Outcome Measures across Condition and Time

Rater	Variable and Time of Rating	Traditional group mean (SD)	Outdoor group mean (SD)	Within-group Effect (F, η^2_p)	Between-group Effect (F, η^2_p)	Interaction Effect (F, η^2_p)
Teacher composite	Play interaction			7.94**, 0.26	2.70, .11	1.79, .07
	T1	54.96 (2.64)	49.46 (6.99)			
	T2	56.46 (3.40)	51.50 (5.80)			
	T3	55.82 (2.76)	54.69 (5.07)			
Teacher 1	Pretend play			8.96**, .29	0.00, .00	30.76***, .58
	T1	18.21 (2.12)	15.18 (1.66)			
	T2	18.64 (2.71)	17.91 (3.91)			
	T3	18.86 (3.35)	23.45 (2.12)			
Teacher composite	Play disruption			1.36, .06	17.64***, .45	2.72, .11
	T1	43.69 (6.43)	50.38 (5.96)			
	T2	41.92 (4.20)	53.79 (5.33)			
	T3	38.31 (5.53)	47.71 (7.26)			
Teacher composite	Play disconnection			1.98, .08	14.59**, .39	8.60**, .27
	T1	43.71 (5.63)	52.13 (7.34)			

	T2	39.14 (4.51)	55.17 (6.62)			
	T3	40.14 (4.69)	45.75 (9.28)			
Teacher composite	Kindergarten readiness			2.35, .10	4.05, .16	2.87, .12
	T1	23.42 (3.44)	19.09 (3.86)			
	T2	--	--			
	T3	26.79 (1.71)	24.72 (2.87)			
Teacher composite	Social skills			.33, .01	1.98, .08	.11, .01
	T1	110.07 (7.41)	101.92 (11.69)			
	T2	111.89 (5.84)	104.79 (13.95)			
	T3	112.96 (6.29)	106.21 (13.34)			
Teacher composite	Behavioral problems			.55, .02	4.81*, .17	1.33, .06
	T1	82.46 (6.39)	91.58 (9.14)			
	T2	--	--			
	T3	83.93 (5.03)	89.96 (12.26)			

Note: *p < .05, **p < .01, ***p < .001 For η^2_p: small = 0.02, moderate = 0.15, large = 0.35. T1 = September, T2 = January, T3 = May.

Table 2

Parent-rated Outcome Measures across Condition and Time

Rater	Variable	Traditional group mean (SD)	Outdoor group mean (SD)	Within-group Effect (F, η^2_p)	Between-group Effect (F, η^2_p)	Interaction Effect (F, η^2_p)
Parent	Play interaction			1.28, .07	.02, .00	.02, .00
	T1	48.00 (7.00)	46.90 (6.72)			
	T3	51.22 (9.91)	51.30 (7.46)			
Parent	Pretend play			.03, .00	.00, .00	.28, .02
	T1	21.80 (3.58)	20.90 (3.54)			
	T3	22.00 (4.03)	21.50 (3.24)			
Parent	Play disruption			.32, .02	.07, .01	.47, .03
	T1	50.00 (3.81)	49.11 (9.21)			
	T3	44.00 (7.50)	44.89 (8.25)			
Parent	Play disconnection			.48, .03	.01, .00	.83, .06
	T1	50.33 (8.54)	49.63 (11.20)			
	T3	46.11 (9.32)	48.38 (10.04)			
Parent	Social skills			1.60, .08	.87, .05	1.66, .08
	T1	104.00 (7.29)	102.20 (15.51)			
	T3	128.73 (64.96)	108.40 (12.67)			
Parent	Behavioral problems			4.35, .21	.15, .01	1.41, .08
	T1	101.10 (13.16)	97.00 (21.12)			
	T3	95.20 (9.94)	92.67 (16.52)			

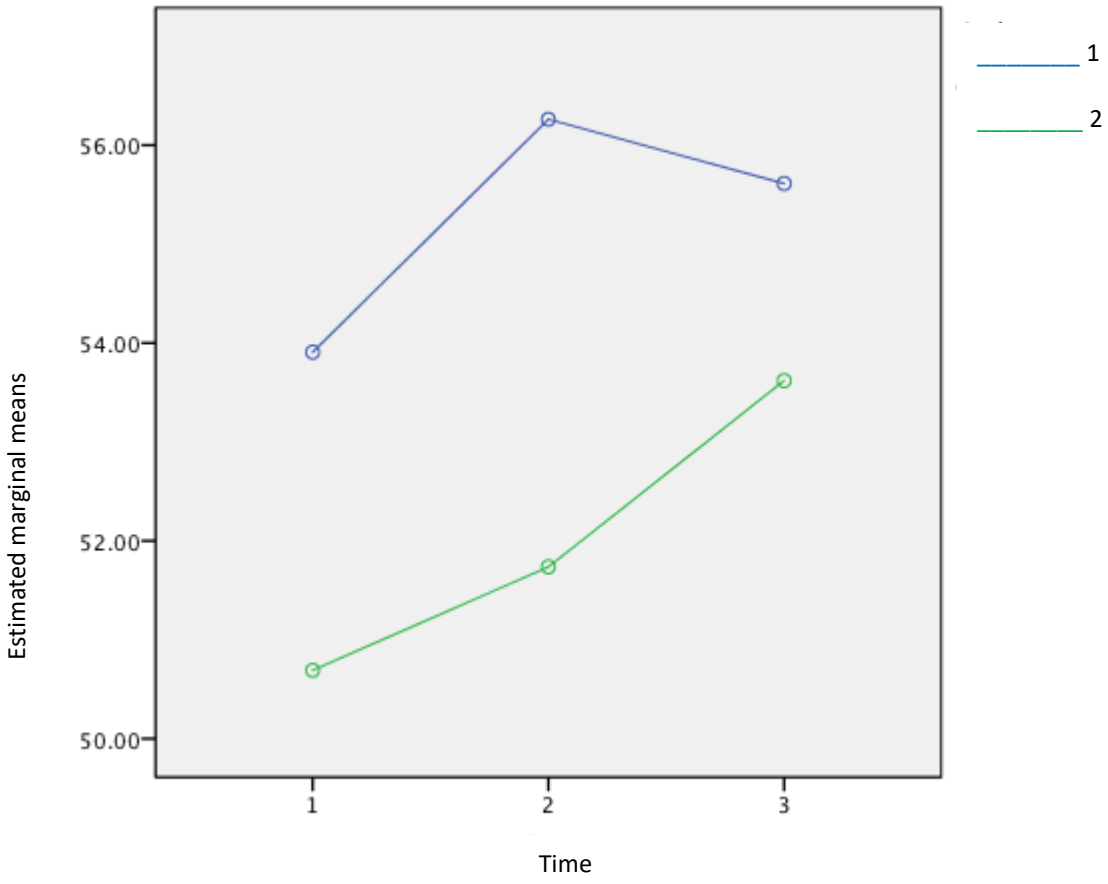
Note: *p < .05, **p < .01, ***p < .001 For η^2_p: small = 0.02, moderate = 0.15, large = 0.35. T1 = September, T3 = May.

Teacher and parent results

Peer play skills (PIPPS)

Play interaction. For the variable of teacher-rated play interaction, Mauchly's test indicated that the assumption of sphericity was met for the teacher-rated variables of Play Interaction on the PIPPS ($\chi^2(2) = .17$, $p = .92$). The mixed ANOVA showed that the main effect of age was not statistically significant ($F_{(1,24)} = 1.41$, $\eta^2_p = .06$, $p = .24$). The effect of school was not significant, nor was the interaction of school x time. The effect of time was significant. Collapsing across groups and using the Bonferroni method to adjust for multiple comparisons, there were significant increases in teacher-rated play interaction between T1 and T2 (mean difference = 1.7, $p < .05$) and between T1 and T3 (mean difference = 2.32, $p < .01$), but there was no difference between T2 and T3 (mean difference = .61, $p = .91$). See Figure 1 for a graphical depiction of these results.

For the variable of parent-rated play interaction, age did not show a statistically significant effect ($F_{(1,16)} = .43$, $\eta^2_p = .03$, $p = .52$). The main effects of school and time on parent-rated play interaction were not significant, nor was the interaction between school X time.

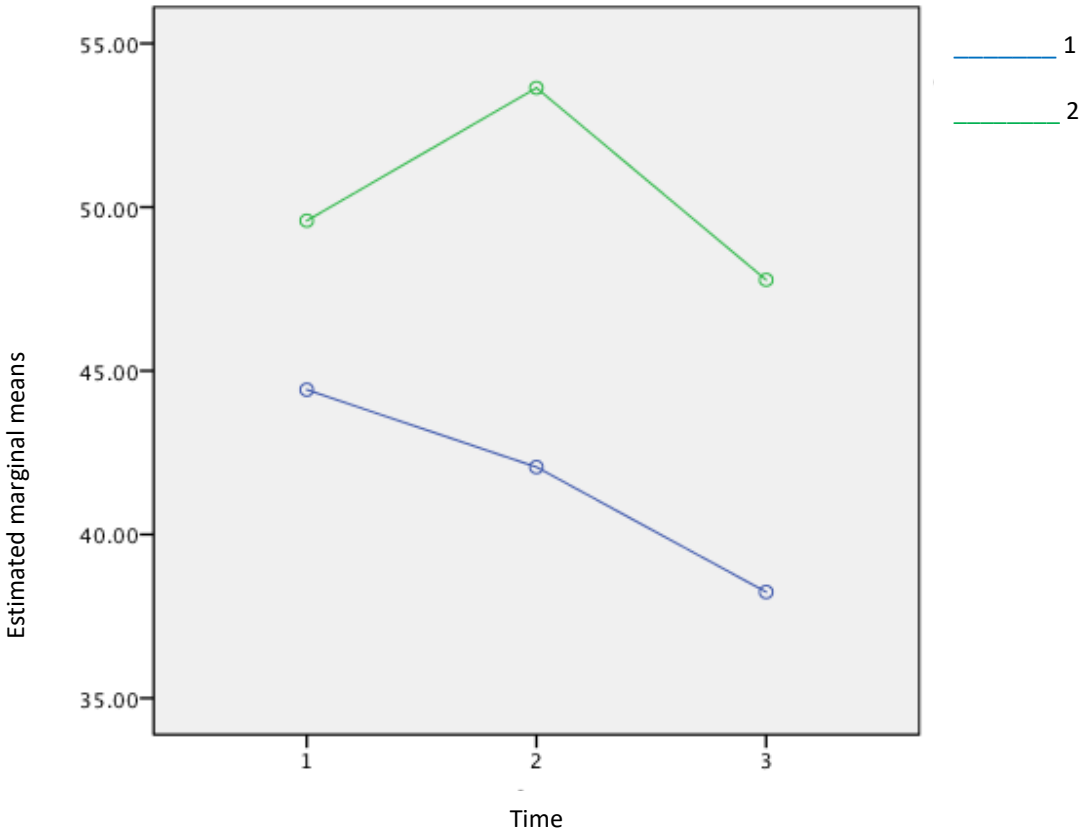


Covariates appearing in the model are evaluated at the following values: 52.3846 months

Figure 1. Estimated marginal means (covarying student age) for teacher-rated play interaction across time (1 = September, 2 = January, 3 = May) and School (Indoor = 1, Outdoor = 2).

Play disruption. For the variable of teacher-rated play disruption, Mauchly's test indicated that assumption of sphericity was violated for the teacher-rated variables of Play Disruption on the PIPPS ($\chi^2(2) = 12.05$, $p < .01$). The degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .70$) (Maxwell & Delaney, 2004). The main effect of age did not show a statistically effect ($F_{(1,22)} = .35$, $\eta^2_p = .02$, $p = .56$). The main effect of school was significant, with the outdoor group showing higher levels of play disruption across time points (see Figure 2). The main effect of time was not significant across the time points, nor was the interaction between school X time in predicting teacher-rated play disruption.

For the variable of parent-rated play disruption, the main effect of age did not show a statistically effect ($F_{(1,15)} = .48$, $\eta^2_p = .03$, $p = .12$). The main effects of school and time on parent-rated play disruption were not significant, nor was the interaction between school X time.



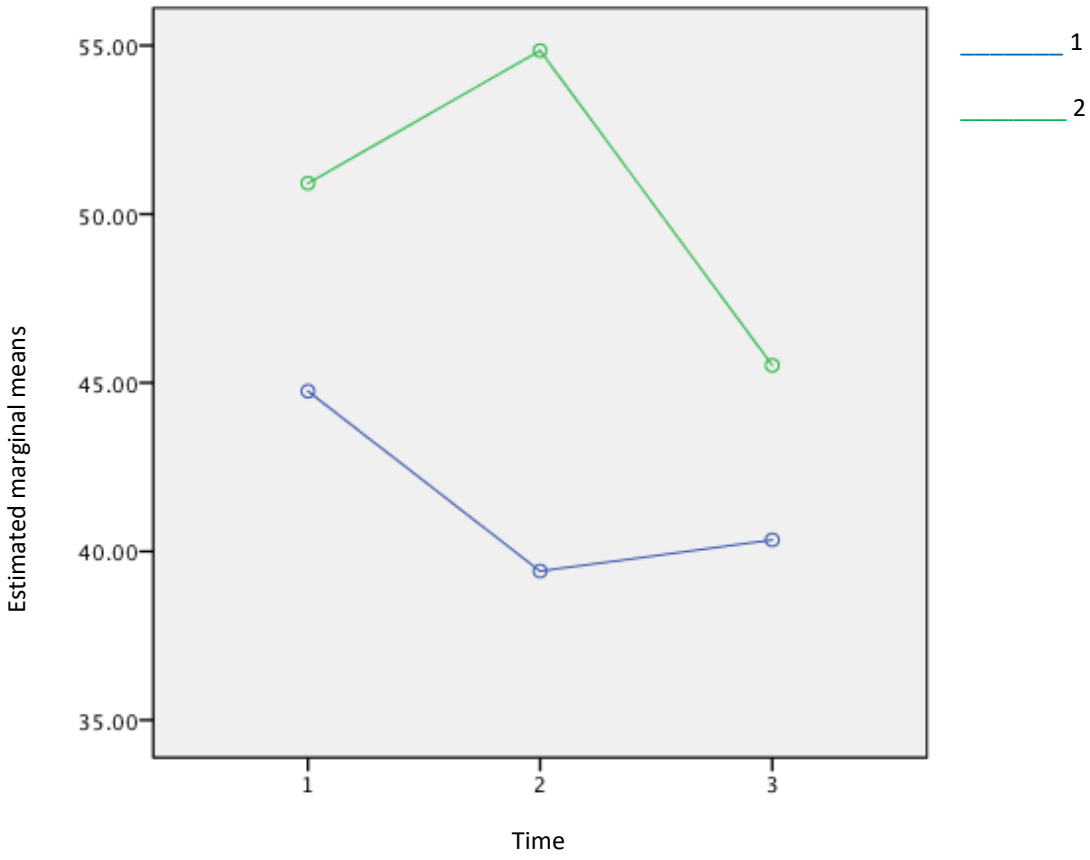
Covariates appearing in the model are evaluated at the following values: 52.3600 months

Figure 2. Estimated marginal means (covarying student age) for teacher-rated play disruption across time (1 = September, 2 = January, 3 = May) and School (Indoor = 1, Outdoor = 2).

Play disconnection. Mauchly's test indicated that assumption of sphericity was violated for the teacher-rated variables of Play Disconnection on the PIPPS ($\chi^2(2) = 12.94$, $p < .01$). The degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .69$) (Maxwell & Delaney, 2004). The main effect of age did not show a statistically effect ($F_{(1,23)} = 1.10$, $\eta^2_p = .05$, $p = .31$). The main effect of time was not significant across the time points. The effect of school was significant; this effect should be interpreted within the significant interaction of school X time. The outdoor group showed higher levels of play disconnection at T1, $F_{(1, 24)} = 10.91$, $p < .01$, partial $\eta^2 = .31$ and

at T2, $F_{(1, 24)} = 53.31$, $p < .001$, partial $\eta^2 = .69$, but there was no statistically significant difference in play disconnection across schools at T3, $F_{(1, 24)} = 3.95$, $p = .06$, partial $\eta^2 = .14$ (see Figure 3).

For the parent-rated variable of play disconnection, the main effect of age did not show a statistically effect ($F_{(1,14)} = .05$, $\eta^2_p = .00$, $p = .82$). The main effects of school and time on parent-rated play disconnection were not significant, nor was the interaction between school X time.



Covariates appearing in the model are evaluated at the following values: 52.3846 months

Figure 3. Estimated marginal means (covarying student age) for teacher rated play disconnection across time (1 = September, 2 = January, 3 = May) and School (Indoor = 1, Outdoor = 2).

Social skills and problem behaviors (PKBS-2)

Social skills. For the teacher-rated variable of social skills, Mauchly's test indicated that assumption of sphericity was violated for the teacher-rated variables of Social Skills on the PKBS-2 ($\chi^2(2) = 6.28$, $p < .05$). The degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .80$) (Maxwell & Delaney, 2004). The main effect of age did not show a statistically effect ($F_{(1,23)} = 0.50$, $\eta^2_p = .02$, $p = .49$). The main effects of school and time were not significant, and there was no interaction between school X time.

For the parent-rated variable of social skills, the main effect of age did not show a statistically effect ($F_{(1,18)}$ = .02, η^2_p = .00, p = .88). The main effects of school and time on parent-rated social skills were not significant, nor was the interaction between school X time.

Problem behaviors. For the teacher-rated variable of problem behaviors, only Time 1 and Time 3 data were available for all children, and thus Mauchly's test of sphericity did not apply. The main effect of age did not show a statistically effect ($F_{(1,23)}$ = .07, η^2_p = .00, p = .79). The effect of school was significant, with the outdoor group showing higher levels of problem behaviors (see Figure 4). There was no main effect of time or interaction between school X time predicting behavioral problems.

For the parent-rated variable of problem behaviors, the main effect of age did not show a statistically effect ($F_{(1,16)}$ = .01, η^2_p = .00, p = .94). The main effects of school and time on parent-rated behavioral problems were not significant, nor was the interaction between school X time.

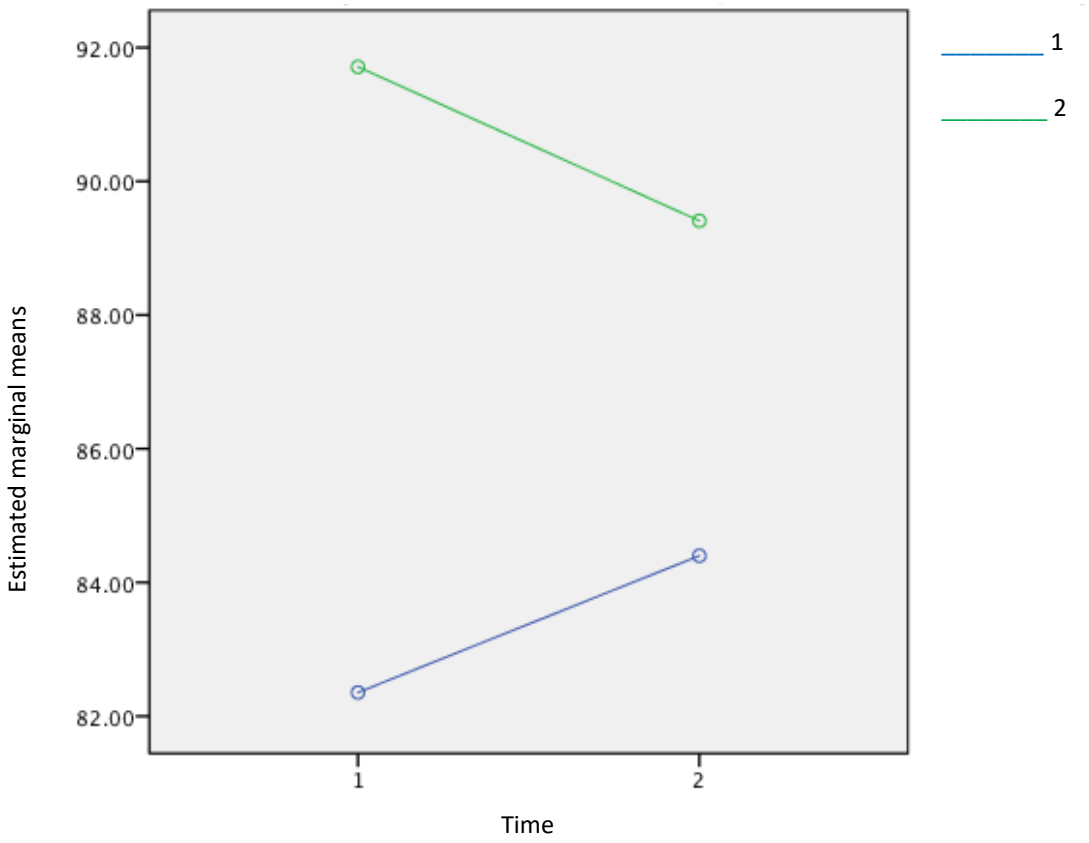
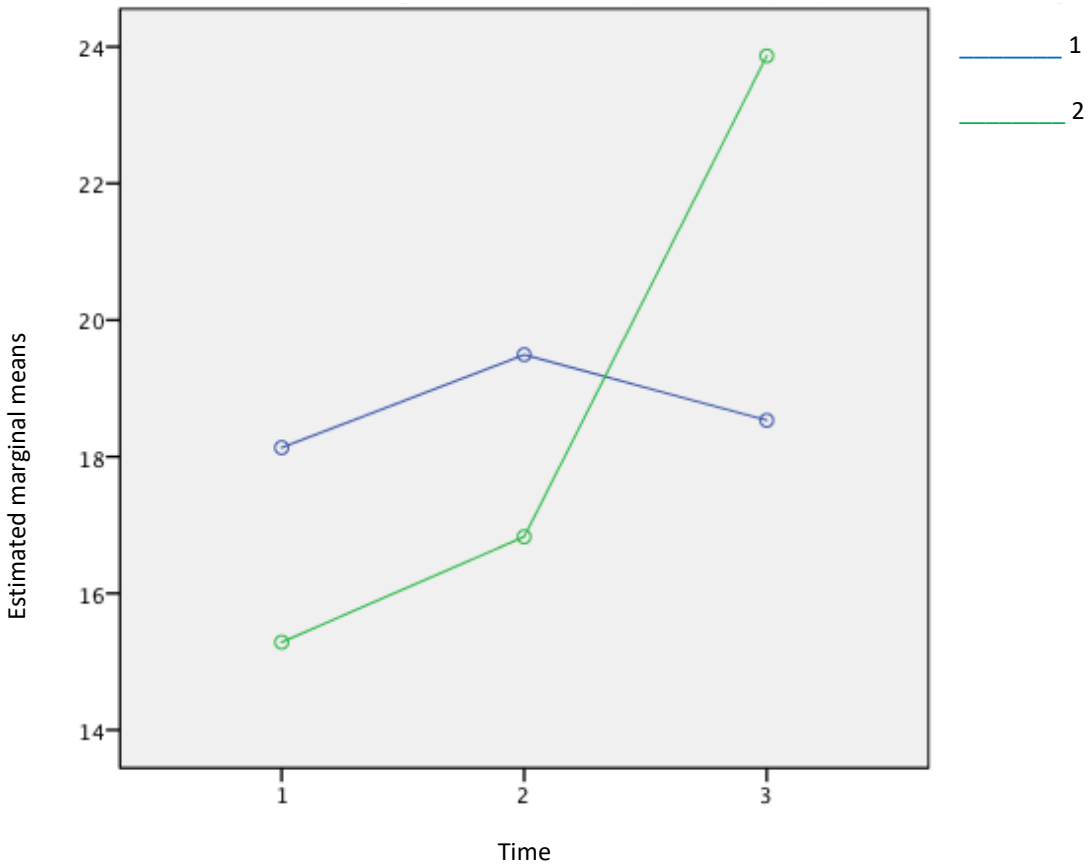


Figure 4. Estimated marginal means (covarying student age) for teacher rated behavioral problems across time (1 = September, 2 = May) and School (Indoor = 1, Outdoor = 2).

Pretend play

For the teacher-rated variable of pretend play, Mauchly's test indicated that the assumption of sphericity was met for pretend play on the pretend play rating ($\chi^2(2) = 5.45$, $p = .07$). The main effect of age did not show a statistically effect ($F_{(1,22)} = 5.46$, $\eta^2_p = .02$, $p = .54$). The effect of school was not significant. The main effect of time showed a statistically significant difference in pretend play at the different time points; this effect should be interpreted within the context of a significant interaction between school X time (see Figure 5). The traditional group showed higher levels of pretend play at T1, $F_{(1, 23)} = 15.15$, $p = .001$, partial $\eta^2 = .40$. There was no statistically significant difference in pretend play across schools at T2, $F_{(1, 24)} = .26$, $p = .62$, partial $\eta^2 = .01$. The outdoor group showed higher levels of pretend play at T3, $F_{(1, 24)} = 17.98$, $p < .001$, partial $\eta^2 = .43$.

For the parent-rated variable of pretend play, the main effect of age did not show a statistically effect ($F_{(1,17)} = .96$, $\eta^2_p = .05$, $p = .34$). The main effects of school and time on parent-rated pretend play were not significant, nor was the interaction between school X time.



Covariates appearing in the model are evaluated at the following values: 52.0800 months

Figure 5. Estimated marginal means (covarying student age) for teacher-rated pretend play (1 = September, 2 = January, 3 = May) and School (Indoor = 1, Outdoor = 2).

Kindergarten readiness

The teacher-rated variable of kindergarten readiness was assessed at Time 1 and Time 3. The main effect of age did not show a statistically effect ($F_{(1,22)}$ = 4.23, η^2_p = .16, p = .05). The effect of school and time were not significant, and there was no interaction between school X time.

Child results

Mixed model analysis of variance (ANCOVAs) were used to examine the effects of condition and time on the child-rated variables of school enjoyment and nature appreciation. These variables were assessed at Time 1 and Time 3. The results are described by measure, below (also see Table 3).

Table 3
Student-rated Outcome Measures across Condition and Time

Rater	Variable	Traditional group mean (SD)	Outdoor group mean (SD)	Within-group Effect (F, η^2_p)	Between-group Effect (F, η^2_p)	Interaction Effect (F, η^2_p)
Student	CATS			.36, .02	.24, .01	3.10, .12
	T1	2.76 (.43)	2.89 (.40)			
	T3	3.17 (.38)	2.90 (.44)			
Student	CATN			.26, .01	3.05, .12	2.59, .11
	T1	2.58 (.76)	3.19 (.53)			
	T3	3.27 (.50)	3.28 (.62)			

Note: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$ For η^2_p: small = 0.02, moderate = 0.15, large = 0.35. CATS = Children's attitude toward school, CATN = Children's attitude toward nature, T1 = September, T3 = May.

School enjoyment. The main effect of age did not show a statistically effect ($F_{(1,22)}$ = .69, η^2_p = .30, p = .42). The main effects of school and time on student-rated school appreciation were not significant, nor was the interaction between school X time.

Nature appreciation. The main effect of age did not show a statistically effect ($F_{(1,22)}$ = .00, η^2_p = .00, p = .98). The main effects of school and time on student-rated nature appreciation were not significant, nor was the interaction between school X time.

DISCUSSION

The current study presents a unique opportunity to compare a traditional, high-quality prekindergarten program with a new, nature-based pre-primary program among students from the same backgrounds enrolled at the same school. While numerous studies have used qualitative methods to underscore the many benefits of an immersive, nature-based education program for young children, this is among the first to utilize quantitative methods to assess important kindergarten readiness skills in this population. It may also be the first study to use quantitative methods to compare children's skills in these areas between a traditional preschool program and a nature-based preschool program among children drawn from the same population.

These results indicate that children in both types of preschool programs achieved expected developmental gains in their behavior, early academic skills, and social-emotional functioning over the year prior to kindergarten. In most areas and generally overall, the two groups ended the year with equal levels of preparedness for kindergarten in the domains of social-emotional functioning, academic readiness, and pretend play. This study provided a longitudinal, multi-rater assessment of these important skills. Parents' ratings of their children over the course of the year did not

indicate significant differences between the traditional and nature-based groups. Teacher ratings indicated general improvement over the course of the year in both groups. Teacher ratings did indicate significant differences between the groups on several specific variables.

Teacher ratings showed that students enrolled in the nature-based pre-primary program demonstrated higher rates of play disruption across time points. Additionally, teacher ratings show higher levels of play disconnection in the nature-based group at Time 1, though no significant differences existed between the two groups on this variable by Time 3. Finally, teacher ratings showed higher rates of problem behaviors in the nature-based pre-primary program as compared to the traditional prekindergarten program at Time 1 and Time 3. These results raise questions about what factors may contribute to higher rates of challenging behaviors in the nature-based program. However, though these results are statistically significant, they are not clinically meaningful differences. The measures used to assess these behaviors, the PIPPS and the PKBS-2, utilize T-scores as the metric of assessment. While students in the nature-based program showed higher T-scores in the areas of play disruption and problem behaviors overall, their scores remained well within the average range for T-scores. In other words, though there were statistically significant differences between the groups, these differences did not place the nature-based group in a problematic behavior area. Instead, both groups showed low concerns on these measures overall, and students in the nature-based group remained in the average range of concerns compared to other children their age in the normative samples for these measures.

Teacher ratings also provide important information about students' pretend play over the course of the year. Although students in the traditional program showed higher levels of pretend play at the start of the year, students in the nature-based program showed higher levels of pretend play at the end of the school year. It may be that the less-structured, exploratory nature of the outdoor setting allows for children to use imagination and creativity with fewer limits than in a traditional classroom setting. For example, after seeing a bald eagle perched on the top of a sycamore tree along the river on the bus ride to the outdoor campus one morning, the students looked for the eagle everyday afterward. On the days the students saw a bald eagle, they became excited and inspired to use the bald eagle as a play theme. They built a large "bald eagle nest" out of sticks and leaves, took turns caring for rock "eggs" and pretended to be adult eagles searching for fish and bringing the prey home for the nestlings when the eggs hatched. This theme created lengthy conversations about what the bald eagles would eat, how they communicated with one another and how big the nest should be.

In a nature-based program, children are provided unstructured materials (e.g. sticks, leaves, dirt, rocks) that are completely open-ended without prescribed uses. They are constantly involved in transforming these unstructured materials into new things using their imaginations. Children must activate creativity and problem-solving to play in this type of environment. They must learn to think flexibly and adapt to changing circumstances, as dirt becomes mud and rocks and leaves become slippery and wet in the rain. The open-ended materials are conducive to teamwork that incorporates the ideas of the group. In the outdoor setting, children will transform a stick shelter into a rocket ship one day and a grocery store the next.

This study also attempted to assess children's own feelings about school and about nature. Using the well-validated CATS measure and an adaptation of that measure designed for this study that assessed children's feelings about nature, no significant differences were found between the traditional and the nature-based groups. In both groups, the children appeared to understand the measure and reply with a range of responses. In future studies, the adaptation of this measure designed to assess children's feelings about nature should be carefully considered to determine if its statements reflect the processes that occur in a nature-based education program. Parents' nature appreciation and parents' perception of their children's nature appreciation were not assessed in this study, though these would be important variables to consider in a similar study in the future.

Limitations

This study possessed several limitations that would be important to address in future research. The first limitation is related to the generalizability of these results. The current sample was small and represents predominately children from a higher socioeconomic background, whose parents generally possess a higher level of education and

who are exposed to a number of enriching activities outside of school. In order to increase generalizability of these findings, it would be important to replicate this type of study with a larger sample of children from more diverse backgrounds and with a different variety of experiences. It would also strengthen generalizability to replicate this type of study with a publicly funded prekindergarten program.

Second, the traditional prekindergarten program was not a "true" control group, because the assignment of children into the traditional class or the nature-based class was done by self-selection, not random assignment. However, the design attempts to compare groups as similar as possible, as the tuition for the two preschool programs are comparable and the programs are housed in the same school. Presumably, families who selected a nature-based preschool program for their young children might place a higher emphasis on nature and the benefits of the outdoors. This study could not control for the factors that led families to select one type of preschool program over the other for their children and for factors that might have suppressed the effectiveness of the nature-based preschool program. This study also did not assess for previous school experiences, both formal and informal, that might have accounted for differences in some of the skills measured. Finally, the traditional prekindergarten program used as a comparison program in this study is an exceptionally high-quality prekindergarten program that, by nature of the EcoWonder! curriculum at the heart of the entire school's pre-primary division, includes higher-than-average exposure to outdoor learning experiences.

CONCLUSION

This study is a meaningful step in providing empirical support for the benefits of nature-based learning among preschoolers. Importantly, these results illustrate that students enrolled in a high-quality, immersive, nature-based pre-primary program are equally equipped for kindergarten as students enrolled in a high-quality, traditional pre-primary program. This information should help parents and educators choose high-quality, nature-based preschool programs with confidence, knowing that the learning that takes place outdoors provides similar academic and social-emotional benefits as the learning that takes place in a traditional setting.

At a time when nature-based education is receiving high levels of support and schools are attempting to increase the amount of time their students spend outdoors, this study provides important quantitative data supporting the value of nature-based education for young children. Critics of nature-based education programs wonder if young children will be equipped for the demands of formal kindergarten following an immersive, nature-based preschool program. These results suggest that children in a nature-based pre-primary program are as prepared for kindergarten as children in an exceptionally high-quality, traditional pre-primary program. It will be important to examine how nature-based preschool experiences shape students' long-term academic, social-emotional and behavioral outcomes across time. The nature-based program in the current study, the first of its kind in this geographic region, is a high-quality program staffed by experienced teachers and developed over several years' time. Both programs in this study provide a play-based and cognitively rich curriculum that fosters creativity and introduces students to language arts, social studies, mathematics, and science concepts. It is important to consider the quality of any nature-based education program, just as it is important to hold traditional early childhood programs to a high standard of quality. Given the myriad benefits of nature-based education for pre-primary students, as illustrated by the results of the current study and the emerging body of literature in this field, it is worth investigating how to provide a wider population of preschool-aged children increased access to high-quality, nature-based education programs. From entirely immersive nature-based programs, such as the one investigated in this study, to opportunities for nature-based learning in traditional preschool programs, all children deserve the opportunity to learn and play in natural settings. These results underscore the benefits of nature-based, early childhood education and show promise for students' academic, social, and emotional preparedness for the formal schooling to follow.

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Definitions of Loose Parts in Early Childhood Outdoor Classrooms: A Scoping Review

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ABSTRACT

Loose parts is often an ambiguous term with different interpretations depending on the context. Using the search parameters, a scoping review was implemented to narrow down over 2,400 articles related to "loose parts," "early childhood," and "outdoor classrooms" to 15 articles for in-depth review. From the selected research, a definition of loose parts in this context was formulated, a list of loose parts was extrapolated and analyzed, and descriptor words of the theory were discussed. A more uniform definition of loose parts potentially allows for more diverse application and use of this theory.

Keywords: loose parts, outdoor play, early childhood, outdoor classrooms

According to Nicholson (1971), the theory of loose parts is an opportunity for children to express creativity through use of materials that can be manipulated, transformed, and created through self-guided play. This type of active, outdoor free play allows children to lead their own inquiry, show creativity, and demonstrate understanding of various cognitive, social, and emotional skills (Ginsburg, 2007). Providing opportunities for children to actively play outdoors with their natural environment is important for healthy child development and increases the chance for children to take part in self-directed play in all environments, not just at home or school (Tremblay et al., 2015).

While Nicholson (1971) coined the idea of loose parts in the early 1970s, there has been little research to support an exact definition of what this is, what it entails, and how it is comprised. Houser, Roach, Stone, Turner, and Kirk (2016) argue that loose parts is an ambiguous term; however, they did share Nicholson's definition of loose parts as "materials that are variable, meaning they can be used in more than one way so that children can then experiment and invent through play" (p. 782). While many theorists and practitioners have shared their thoughts, ideas, and experiences, a cohesive delineation of loose parts play is lacking. The purpose of this research is to explore various definitions and theories of loose parts and construct a more unified definition within the context of outdoor classrooms.

Methods

For the purpose of this study, a scoping review was conducted. This type of review focuses on the amount of information that is available, rather than the quality of each article that was reviewed (Arksey & O'Malley, 2005). This research method is applicable when exploring the current span of literature available on a specific topic (Arksey & O'Malley, 2005).

To conduct the scoping review relating to loose parts, a literature review was conducted using the following databases: EBSCOhost, ProQuest, Google Scholar, and JSTOR. The key words used in this search were: "loose parts," "early childhood," and "outdoor classroom." To choose appropriate articles related to the research focus, inclusion criteria were established. The search criteria included current and relevant articles, from January 2008 through January 2018; full-text, peer reviewed; and a focus on children, outdoor settings, and loose parts. To narrow down the search, the articles needed to include children from birth to age eight, be in a formal educational setting (i.e. pre-school) and had to focus on outdoor settings. This set of criteria (see Figure 1) was created to make sure the articles best related to the purpose of the study.

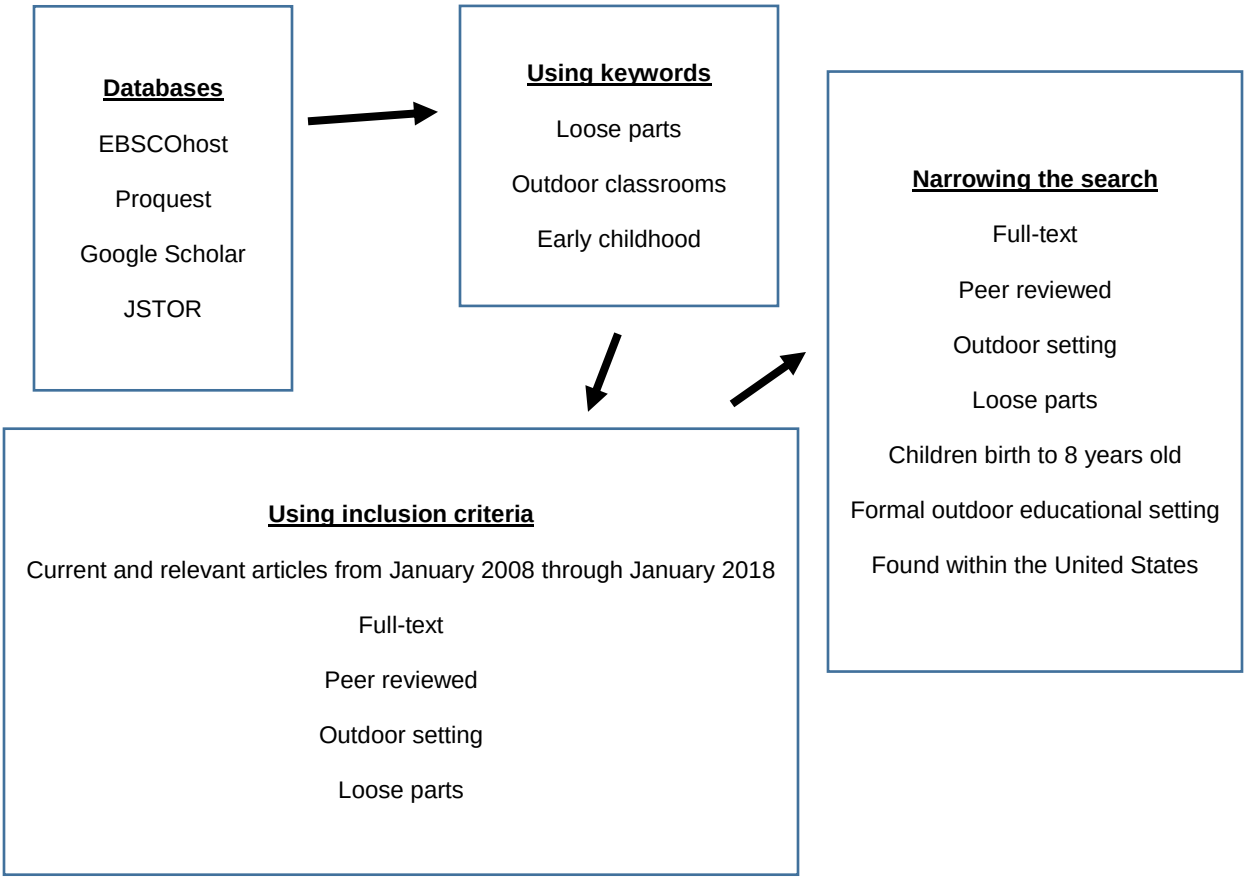

Figure 1. Process for scoping the literature. This figure represents the steps and inclusion criteria used to choose appropriate articles for the study.

Using the key words to conduct an initial search discovered that EBSCOhost yielded 2,198 results; Google Scholar had 104 articles; JSTOR contained 119 articles; and ProQuest had 2 articles. The combination of 2,423 articles were then evaluated for duplicates across databases, where a total of 552 articles were removed, leaving a total of 1,871 articles to review. The articles were then evaluated based on titles and keywords relating to descriptors of loose parts in outdoor early education classrooms, leaving a remainder of 143 articles, as 1,728 did not meet the specifications (Houser et al., 2016).

The researchers reviewed the abstracts in teams of two, reviewing each abstract for relevancy to the key word search. The 143 remaining articles were assessed using the information provided within the abstract to ensure it was relevant to the specific search criteria. During this review step, additional criteria was added, focusing on students in the United States. Eighty-three additional articles were removed, leaving 60 applicable articles. To

narrow down the amount of relevant information, 60 articles were analyzed using a full article review process (Houser et al., 2016).

Upon conducting the full article review, an additional 41 articles met the specific criteria. Left with 19 articles, the researchers evaluated these one more time using a full article review method, removing four additional articles to give the study a balanced assortment of articles and information. This study used a total of 15 peer-reviewed articles that were significantly related to the search criteria: loose parts, early childhood, outdoor classroom, and found within the United States. See Figure 2 for a breakdown of the search process using a PRISMA (2009) diagram.

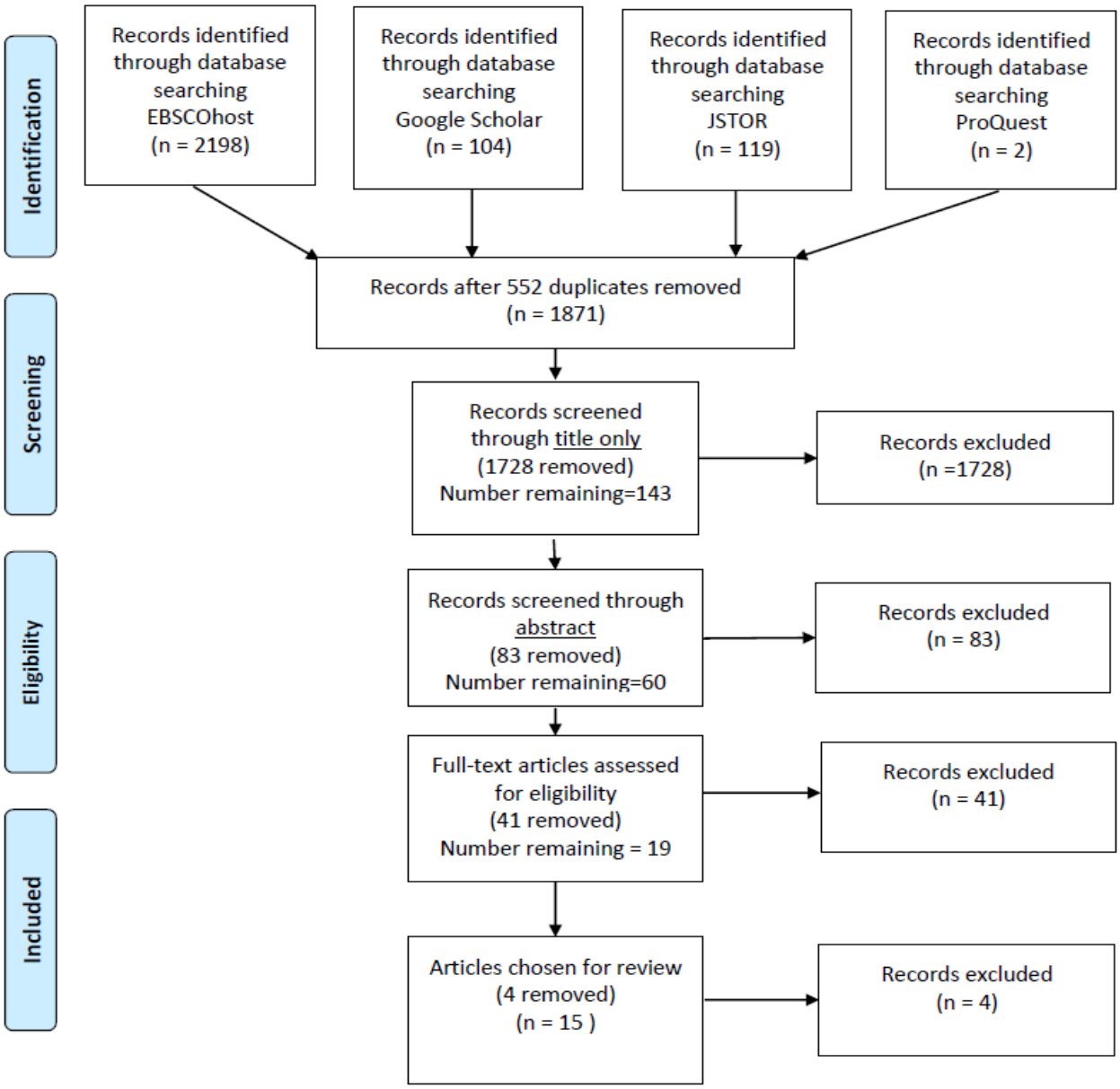

Figure 2. Article Search. This figure represents the breakdown of the search process using a PRISMA (2009) diagram.

Results

After the selection process, the 15 articles were thoroughly reviewed, noting the authors, type of document, methodology, summary of the work, definitions, and descriptors of loose parts. See Table 1 for a summary of results. While selected articles are all peer-reviewed, a variety of articles and publications are represented, such as articles intended for educators, research foundation publications, and dissertations. Various methodologies were included, such as single case qualitative studies, video-based fieldwork study, behavior mapping study, mixed methods approach, and an ethnographic study. Definitions varied, with some more detailed than others. Words that describe loose parts were also listed with words such as manipulative, materials, open-ended, props, and flexible included in many articles.

Table 1
Summary of Results

Author/ Publication	Methodology	Summary	Definitions	Descriptors
Bohling, Saarela, & Miller (2010) *Dimensions Educational Research Foundation*	Research foundation publication, Qualitative single case study	The purpose of this study was to investigate preschool children's skill development in a Nature Explore Classroom. Teachers collected data through close observation of children's outdoor play. Main research goals looked at how self-selected materials affected play, materials found exclusively outdoors, and teacher placed versus naturally occurring materials in the outdoor classroom.	"imagination and creative representation (Blizard & Schuster, 2004; Hart, 2002; Moore, 1989; Wilson, 2007)" (p. 3) "kinesthetic movement to gather and use materials, test physical limits, and carry out child-initiated play themes (Fjortoft, 2004; Lester & Maudsley; 2007; Wardle, 2000; Wilson, 2007)" (p. 3) "freedom for child-initiated activity and a smaller degree of adult control (Sutterby & Frost, 2006)" (p. 4) Lester and Maudsley (2007)…"The theory of 'loose parts' proposes that the possibilities for play, interaction, exploration and discovery, creativity, etc. may be directly related to the number and kinds of features in the environment" (p. 29).	Manipulative; action-oriented materials; alive, ever changing and renewing; green spaces; intentionally placed; naturally occurring materials; materials introduced; permanent features/ equipment
Carr, Douglas Brown, Schlembach, &	Scientific peer-reviewed journal,	Natural playscapes afford children executive function building opportunities through naturally rich play environments. Information	"playful interactions with natural loose parts and elements that afford engagement with both the	Nature-rich landscapes; purposefully planned;

Kochanowski (2017) *Children, Youth and Environments*	Video-based fieldwork study	was collected through videos and assessments to illustrate how children problem solve, set goals, self-regulate, and enhance other executive function skills.	natural environment and peers" (p. 26) "child-directed" (p. 26) "encourage children to take risks, explore, and investigate while engaging in active, sensory, collaborative, and dramatic play" (p. 26) "foster creativity, exploration, problem-solving, and more complex play scenarios" (p. 27)	create affordances; natural materials
Cloward Drown (2014) *All Graduate Theses and Dissertations*	Dissertation, Behavior mapping study	Preschoolers in natural and manufactured outdoor play settings were observed using behavior mapping techniques to look at play affordances. More complex dramatic play was observed in environments with play props, a natural setting, and a sense of enclosure.	"Nicholson's theory of loose parts states that exploration, creativity, and inventiveness are directly proportional to the variety in an environment (Nicholson, 1971)" (p. 20)	Manipulable parts; props; play props; substitute object; loose materials; junk yard playground; environmental yard; malleable organic material; malleable and flexible
Dennis, Wells, & Bishop (2014) *Children, Youth and Environments*	Scientific peer-reviewed journal, Post occupancy study	Hundreds of outdoor classrooms have been created using Nature Explore and the Outdoor Classroom Project guiding principles. The study investigated whether these outdoor spaces actually resulted in desired outcomes. Findings supported research on imaginative play, stewardship of the earth, and overall mental and physical health with recommendations for more successful environments.	"materials taken from nature, including wood, stone, plants, and water" (p. 36) "child-led exploration, and direct interaction with nature" (p. 36) "child-initiated experiences, open-ended play (Nature Explore 2014; Outdoor Classroom Project 2014)" (p. 37)	Natural, flexible, open-ended and renewable; open-ended materials, sensory materials (sensory richness); safe risks (jumping, digging, climbing), and rich, natural environment; play affordances; messy materials; play props (dramatic play); moveable

				space-making elements; flat surfaces; textures, colors, sounds; undifferentiated open areas; flexible spaces
Kiewra & Veselack (2016) *International Journal of Early Childhood Environmental Education*	Scientific peer-reviewed journal, Qualitative single case study	This study examined creativity in two outdoor classroom settings, sharing loose parts examples. Nature Notes were analyzed to reveal four key concepts that promote creativity in outdoor classrooms: "predictable spaces, ample and consistent time, open-ended materials, and caring, observant adults who support creative play and learning" (p. 71). Loose parts figure prominently in these spaces and analysis.	"Real open-ended materials that have no prescribed use seemed to support children's divergent thinking and therefore ingenuity. Our analysis shows that the non-standardization of the materials (really no two sticks are alike), the quantity of materials, and the freedom to combine materials were all important" (p. 85).	Affordances; open-ended materials; flexible thinking and wide-ranging play experiences; messing around; loose parts
Kuh, Ponte, & Chau (2013) *Children, Youth and Environments*	Scientific peer-reviewed journal, Mixed methods study	This study focused on how a change from traditional to natural playscapes can impact environmental affordances. The study explored the attraction and holding time between play types, role of loose parts, and the design of playscapes.	"loose, natural materials and children's creative explorations (Lester 2007; Nicholson 1971)." (p. 53)	Building materials, nature materials
Luken, Carr, & Brown (2011) *Children, Youth and Environments*	Scientific peer-reviewed journal, Field report	The Cincinnati Nature Center and the Arlitt Child and Family Research and Education Center at the University of Cincinnati partnered in 2008 to create the Nature Playscape Initiative (NPI). They evaluated low-income, preschool children enrolled in a Head Start program. The goal was to create natural playscapes to increase interest and learning in science.	"Playscape materials provide affordances, or opportunities to be touched, manipulated, dug, moved, picked, dammed, climbed, built, and experienced by children as they choose to do so." (p. 329)	Natural elements
Maxwell, Mitchell, & Evans (2008)	Scientific peer-reviewed	The study analyzed the methods in which the addition of loose parts to a playground	"'loose parts' (i.e., lumber, tires, large cardboard boxes, stackable blocks)	Play props, play materials, and manipulatives;

Children, Youth and Environments	journal, Multi- study research	contribute to constructive and dramatic play behaviors.	that children can use in ways related to play themes, thereby increasing constructive and dramatic play opportunities" (p. 39) "'Loose parts' refers to open-ended play materials and manipulatives that children can use in a variety of ways (Nicholson 1971)" (p. 39)	open-ended play materials (e.g., cardboard boxes, pipe cleaners, and pieces of cloth); well defined intended uses (e.g., tea sets, dolls, trucks, and tool kits)
Miller, Tichota, & White (2013) *Dimensions Educational Research Foundation*	Research foundation publication, Single case study	The study centered on creating natural outdoor classrooms describing features, native plants, etc. The research concluded that when children were engaged in outdoor play they were developing skills in a variety of domains simultaneously.	"creative and imaginative play that fosters the development of language and collaboration skills" (p. 9) "rich, multi-sensory learning experiences through their interactions with nature" (p. 18) "the open-ended nature of the materials available for children to explore; and the opportunity for children to engage in unstructured, child-initiated play" (p. 46) "the degree of creativity and inventiveness in any environment is directly proportional to the number of variables in it (Nicholson, p. 87)." (p. 51) "imperfectly perfect, filled with loose parts and possibilities (Louv, 2005, p. 97)" (p. 51)	Diverse, rich, natural; a variety of colors, shapes, smells, sizes and textures; intentionally placed/ selected; messy materials; availability; and versatile open-ended, natural materials; organic shapes
Monsalvatge, Long, & DiBello (2013) *Dimensions of Early Childhood*	Peer-reviewed journal, Article	This article focused on setting up an outdoor classroom, designating spaces for nature art, dramatic play, block building, etc. One important lesson from these experiences is to have a large supply of loose parts.	"grow and change as new ideas are implemented and new materials are acquired" (p. 27)	Materials; tinkering; props; loose parts

Sisson & Lash (2017) *YC Young Children*	Peer-reviewed journal, Article	The article studied three different outdoor environments in early childhood, sharing five essential aspects of outdoor time: "reflecting the local landscape, balancing risks and benefits, reconsidering time, materials, and space, introducing children's voices, and sustaining the natural learning environment" (p. 14). In "reconsidering time, materials, and space" (p. 14), loose parts are examined in more depth with suggestions on using these more fully in outdoor spaces.	Loose parts—"materials that can be moved, carried, combined, redesigned, lined up, and taken apart in multiple ways (Kable 2010)" (p. 13) "Loose parts have no directions for use and invite open-ended play with high levels of complex, unstructured, creative exploration (White & Stoecklin 1997; Keeler 2008; White 2014)." (p. 13) "The interactive properties of loose parts stimulate discovery, dramatic play, and imagination; they also attune children to their environments (White & Stoecklin 1997)." (p. 13)	Materials; interactive properties; open-ended; manipulate
Spencer & Wright (2014) *YC Young Children*	Peer-reviewed journal, Article	This article explored the Play Space Assessment, part of Head Start's push for more physical outdoor play. Key components of the assessment, sharing important elements such as natural elements, anchored play equipment, risk and challenge, wheeled toys, manipulative equipment, loose parts, trees for climbing, music and movement, etc. Manipulative equipment and loose parts are listed as two separate characteristics.	"manipulate materials and experiment" (p. 32)	Manipulative equipment; props
Stanley (2011) *Children, Youth and Environments*	Scientific peer-reviewed journal, Ethnographic case study	This study researched recess play values of children attending a lab preschool. The methods in which the children encountered outdoor elements through free play was investigated and expressed in interviews with teachers, administrators, and parents.	"treasures provided by our school grounds" (p. 186) "objects in the environment that are able to be freely moved and manipulated" (p. 206)	Manipulation and sensory stimulation of the elements, treasures, object, freely moved, manipulated

Veselack, Miller, & Cain-Chang (2015) *Dimensions Educational Research Foundation*	Research foundation publication, Qualitative study	This study considered the importance of children learning through outdoor play and connecting to nature. Four play yards were described and each one supported child-initiated experiences. Each day, the teachers brought out the equipment and play materials from storage sheds and classrooms, based on the children's needs. The teachers wrote Nature Notes that included observing children's skills using different materials found outside.	"Provide ample opportunities with a wide array of materials to encourage and provoke children in meaningful experiences" (p. 39)	Hands on manipulation of a variety of materials; open-ended materials; willingness to allow the materials to be used in unconventional ways; explore their surroundings; explore, experiment, and engage with materials; "Physically manipulate objects of a variety of shapes, colors, sizes; to physically experience concepts of area, volume, diameter, depth, and length; to create patterns and sequences and explore rhythm and speed; to experience quantity and to use numbers" (p. 41)
Wirth & Rosenow (2012) *YC Young Children*	Peer-reviewed journal, Article	This article presented an overview of how to create an outdoor classroom in accordance with the Nature Explore Outdoor Classroom approach, including nature, defined spaces, native plants, and variety of features.	"Experiment with concepts of size, scale, weight, and balance; move hands and bodies through space to manipulate objects; and work cooperatively on a shared plan" (Bohling, Saarela, & Miller, 2010, 3) (p. 44)	Manipulate objects, experiment

Table 2 outlines specific loose parts found in the articles listed in Table 1. The researchers extracted items listed as loose parts from each article and compiled them into one list, categorizing by natural or manufactured loose parts. Trees are prevalent in the natural loose parts options, including the whole tree as a loose part, branches, seeds, twigs, bark, wood, and other bits and pieces. Other plants such as shrubs, bamboo poles, pumpkins, and flowers were often used as loose parts. Rocks, soil, and water in various states and combinations were noted. Additional living things, such as worms, bugs, and the children's own bodies, were also noted.

In manufactured items, tools such as cameras, garden tools, magnifying glasses, and clips became part of the loose parts experience. Many loose parts were used to facilitate building, such as various types of blocks, wooden or plastic milk crates, and bricks, though these same items could be used for other purposes. Dramatic play items took the form of fabric, medical kits and props, dress up play, and cooking items. Items that beget movement included bean bags, balls, scarves, hoops, exercise ball, and tubes. Toys were also included as loose parts such as a car, trucks, dolls, and play props.

Table 2
Detailed list of loose parts mentioned in selected articles

Natural		Manufactured	
Acorns	Plants	Balls/Rubber ball	Mailbox
Bamboo poles	Pumpkins	Bamboo blocks	Mats
Bark	Recycled	Bean bags	Measuring cups
Berries	evergreen	Bench	Metal cake pan
Boulders	(Christmas) trees	Bottles	Milk crates
Bulbs	Reeds	Bowls	Mini-bricks
Bushes	River rocks	Brick structures	Muffin tin
Clay	Rocks/rock piles	Bricks	Musical instruments
Corn (cobs, kernels, and ears)	Roly poly bugs	Buckets	Old clothes
Cornhusks	Rose quartz	Building blocks	Paint
Dirt	Sand/sand pits	Building materials	Pans
Driftwood	Seed pods	Cameras	Paper
Feathers	Seeds	Cardboard boxes	Paper and pens/pencils
Flat stones	Shells	Cardboard tubes	Pipe cleaners
Flower and herb gardens	Snow	Cars	Pipes
Flowers	Soil	Ceramic tiles	Planks
Frozen snow	Spiky seed pods	Chalk	Plastic bat
Grass	Squash	Climbing structure	Plastic cones
Grassy hills	Sticks	Clips	Plastic plates
Heavy wood pieces	Stones	Colorful blocks	Plastic playhouse
Hedge apples	Stream	Containers/small containers	Plastic shovels
Ice	Stumps	Costumes	Pots
Insects	Sweet gum pods	Dramatic play props	Pottery
Large tree branches	Their own body	Empty plant pots	Raised garden bed
Large wooden chunks	Tree blocks	Empty plastic sandbox	Ramps
Leaves	Tree cookies	Fabrics/Large fabrics	Scarves
Living things	Tree limbs	Foam building blocks	Scoop
Logs	Tree branches	Garbage can and lids	Shovels
Loose gravel	Trees	Garden hand tools	Simple toys
Lumber	Twigs	Gutter	String
Mud	Vegetation	Hand-held instruments	Sunglasses
Mud pies	Water	High structure toys (telephone,	Tables
Native grasses	Wildlife	medical kit, trucks, dolls)	Tire
Native plants	Willow branches	Hoe	Trucks

Natural blocks	Wood chips	Hoops	Tubes
Palm fronds	Wood mulch	Hose	Waffle blocks
Pebbles	Worms	Large exercise ball	Water basin
Pine branches		Large plastic barrels	Wheels
Pinecone needles		Low brick wall	Wooden blocks
Pinecones		Magnet blocks	Wooden crates
Plant parts		Magnifying glasses	Wooden or metal spoons

The words in the *descriptors* column in Table 1 were used to create a word cloud, which is a distribution analysis of the words used. See Figure 3 for these words, with the most used words as larger size than other words, descending in size with frequency used. The word cloud is a visual representation of how these words are used as descriptors of loose parts in the collective articles, with materials, open-ended, props, natural, and manipulative being used more frequently.

Figure 3. Loose parts word cloud. This figure is a text analysis of the words used as descriptors of loose parts.

Discussion

While definitions of loose parts varied slightly throughout the chosen articles, the definitions focused on manipulating, experimenting, and interacting with a variety of objects for promoting imagination and creativity. Natural loose parts offer more variability due to property changes and seasonality. Verbs used in definitions and descriptions are important elements in defining the theory of loose parts. Some loose parts included in the article were surprising yet fit the definitions of loose parts and expand understanding of the concept. When looking at this definition, types of loose parts, terminology, the impact of nature, and mindsets are important to note. Reviewing the definitions in the selected articles focusing on outdoor classrooms in early childhood settings using loose parts in the United States, the authors synthesized the definitions into one cohesive definition applicable in many settings and inclusive of many approaches to loose parts (see Figure 4).

Loose parts are open-ended, interactive, natural and manufactured materials that can be manipulated with limitless possibilities. Interaction with loose parts includes experimentation, exploration, and playful interactions with variables through creativity and imagination. Children have the freedom to explore variables, combine materials, and react to complex themes and ideas that emerge in the outdoor classroom setting. Adults encourage children, make loose parts available, stimulate discovery, provide opportunities, allow for open-ended play, and prompt meaningful connections and experiences. Through loose parts exploration children develop imagination, creativity, and collaborative skills. Process is more important than the end product fostering overall growth and development.

Figure 4. Loose parts definition in early childhood outdoor classrooms. This definition is a result of the scoping review.

In other literature, Houser et al. (2016) defined loose parts as adaptable and active, appropriate for the supplies themselves. Objects can be implemented as tools for play and discovery as long as these are age appropriate and made available. Sutton (2011) created a working definition, arguing that loose parts are part of a collection of moveable materials, inspiring a child to use them and repurpose them to fit his or her personal needs. Loose parts can be of any size and require different levels of strength to use them. The hand and mind, however, must work together to promote inquiry (Sutton, 2011). Loose parts are intended to encourage children to be open-minded while interacting with the surrounding environment. This type of play assists children in creating associations between learning and fun (Sutton, 2011).

Cloward Drown (2014) restated this definition by sharing, "Child-scale constructive and small-scale accessory 'loose parts,' and non-prescriptive surroundings afford more complex dramatic play" and advocates for some manufactured settings and play props as part of loose parts in outdoor settings (p. 60).

Many manufactured loose parts were mentioned in the articles reviewed, including tools, various building materials, dramatic props, and even simple or structured toys. Maxwell et al. (2008) noted more varied and engaged play in settings with manufactured loose parts rather than no loose parts. Kiewra and Veselack (2016) emphasized the idea that natural items that can be anything. Some natural items may suggest something specific; however, children are encouraged to be innovative and use these in unique ways, fitting to personal needs and interests. Closed-ended, or materials requiring specific use leaves little room for imagination and originality (Kiewra & Veselack, 2016). Cloward Drown (2016) reiterated the dynamic seasonal and other changes of nature arguing that seasonal shifts on a traditional playground can pose limits for children to specific types of events; however, a playground with dirt that turns to mud or deciduous shrubs that turn red in the fall allows for more inventiveness. Veselack et al. (2015) also mentioned the importance of natural loose parts for infants and toddlers stating, "Children stayed with self-selected activities and explored elements of nature demonstrating both an ability to focus and attend as well as showing curiosity that held their attention and supported their engagements" (p. 35).

Some loose parts listed were unexpected based on initial definitions. Table 2 lists a low brick wall, raised garden beds, trees, and a plastic playset as loose parts, which are typically not moveable. However, it is another variable in the environment. In using loose parts materials in a museum with an outdoor play setting, Sutton (2011) expanded

her initial definition noting that the more access to loose parts a child has, the more broad his or her mind becomes. Children are allowed to view and use the entire earth surrounding them as a canvas. Loose parts are examined and evaluated for potential use and assessed based upon attributes such as color, qualities, shape, and ease of use (Sutton, 2011).

In situations like this, the whole environment becomes part of the variables and options available as loose parts, in accordance with the theory of affordances. "An affordance can be thought of as an 'action possibility' for an individual in relation to the environment, dependent on that individual's capabilities" (Stanley, 2011, p. 189). Stanley (2011) additionally defined this as "the direct manipulation and sensory stimulation of the elements that he perceives as affordances" (p. 191).

Natural loose parts were clearly preferred in some settings. Kiewra and Veselack (2016) challenged the value of toys and premade props in play, preferring that loose parts such as sticks, logs, snow, and sand can be repurposed into anything that a child wants these to be. The authors also provided an example of the changing and unpredictable aspects of nature allowing for different experiences as a pumpkin froze or snow becomes ingredients in recipes, stating, "This element of unpredictability brought forward opportunities for children to engage in problem-solving, ingenuity and flexible thinking" (Kiewra & Veselack, 2016, p. 80). They also recorded 23 or more plants or plant parts as part of play. Living plants seem to be the most useful when it comes to play because they create things such as pinecones, acorns, and leaves. This type of environment allows children to use the dirt, sand, grass, mulch, and ground to transform the environment into something different. The next most used materials were parts of the trees, such as twigs, branches, logs, bark, and stumps. Table 2 lists many plant products as well, with trees and tree parts a large component of outdoor loose parts exploration.

While many of the manipulable items center on a wide range of natural items; manufactured metal, plastic, and wood loose parts; highly structured dramatic play items; and child-made and man-made tools; it is curious to note the inclusion of living things, children's own bodies, and roly poly bugs as loose parts in Table 2. Ultimately, the way these are used can be moveable variables in the environment. Monsalvatge et al. (2013) mentioned the changing nature, variety, and unpredictability of outdoor settings stating, "Whether there are seasonal changes to note, animals and insects to study or gardens to be tended to--nature is the best teacher!" (p. 29). Kuh et al. (2013) argued the proximity of play spaces near nature is critical, and purposefully arranging items within the natural environment allows children to form a stronger bond and connection with these materials during play. Natural items can be many things as in this example by Monsalvatge et al. (2013), with natural items such as leaves, rocks, sticks, and berries becoming paint brushes and paint. The same materials might transform into a collage or props for dramatic play with a children's book.

Verbs are an important concept within loose parts. Wirth and Rosenow (2014) shared an example of how using loose parts as part of play develops many domains sharing an example of making a castle by using words to communicate and show perspectives, experiment with materials, manipulate materials with their bodies, and work together on a shared vision. The example illustrated play as complex with constructing, sharing, experimenting, moving, manipulating objects, and working cooperatively. Similarly, Nicholson's (1971) original theory also shared the complexity of the concept of loose parts as evidenced in the verbs used in his theory. Gull (2017) listed the verbs from the theory as "build, construct, play, experiment, invent, explore, discover, evaluate, modify, study, think, consider, measure, draw, model-making, calculate, destruct, slide, fold, hide, paint, and bounce" (para. 24). Kiewra and Veselack (2016) observed similar and expanded actions with loose parts, relating the ability to "explore their process, to problem solve together, to negotiate and debate and to have support from a caring adult. They were able to work, rework, consider, test, posit theories and discover" (p. 83). Manipulate, climb, build, experience, explore, engage, dig, touch, experiment, work, carry, combine, play, redesign, and other verbs are listed as part of the definitions in Table 1.

Figure 3 looked at descriptors of loose parts from the articles selected in the scoping review, noting many verbs and broader terms of the theory of loose parts. While the term *open-ended* has been prominently shared in the articles, Gull (2017) reported an absence of the terms "child-led, unstructured, open-ended" in Nicholson's work (para. 25). Gull (2017) noted Nicholson used descriptors such as "variables, loose parts, playing around, self-instructional"

(para. 23). Open-ended opportunities may certainly be a part of defining loose parts, but may not be a limiting factor as discussed with the inclusion of loose parts that may not be as open-ended such as dramatic play props and structured toys in Table 2, leaving greater opportunity to see loose parts from many angles. Alternatively, some materials may be more open-ended than generally thought; however, when using a loose parts mindset approach, things like the low brick wall or human body which may not be considered open-ended traditionally can be used in many different ways.

Limitations and Future Recommendations

Limitations of this study include the search article criteria and the search terms established for the scoping review. For the purposes of this study, the search terms of "loose parts," "early childhood," and "outdoor classrooms" were used. Using a larger variety of search term synonyms and looking in different environments may have yielded different results. The theory of loose parts has many applications beyond this research; however, using the search criteria included current and relevant articles, from January 2008 through January 2018; full-text and peer reviewed. This set of search criteria were created to select the articles best related to the purpose of the study; however, these restrictions potentially limit the application of loose parts (see Figure 1). Different search article criteria and search terms are recommended for future studies.

A clearer definition of loose parts can be helpful for early practitioners trying to implement loose parts more fully, while still allowing for the larger context of the theory which allows for a more robust interpretation as it is implemented. As Gull (2017), the founder and moderator of the largest online social media group focusing on the discussion of loose parts, notices:

> Educators often come to the Loose Parts Play Facebook group thinking they must get rid of all their plastic dramatic play toys and replace them with tree cookies, acorn caps, and sticks. While that could be one application of the theory of loose parts, the possibilities are really limitless. We do a disservice to our educators and children when we have a narrowly defined view of loose parts that doesn't include the mindset of being able to use materials and the environment in unique ways as part of play and learning. A better definition that educators can easily understand may include the natural bits and pieces, plastic dramatic play, and the whole environment as part of the loose parts, basically variables, and allows for a fuller application of this powerful principle to promote creativity and imagination. (C. Gull, personal communication, March 14, 2018)

Ultimately, sharing a better definition with larger application of loose parts in early childhood outdoor classrooms and other settings with the educators and parents working with the children will be helpful for a wider range of loose parts experiences and developing a loose parts mindset. Exploring how to best share this definition and implications could help with effectiveness of implementation.

By removing limitations of child/adults and the place setting of an outdoor classroom, the definition derived from the scoping review may have even broader applications to any setting where loose parts are implemented, such as senior centers, creativity exploration for adults, etc. (see Figure 5).

Future studies may test this more generalized definition in various applications to see if this same definition could apply in indoor settings, with different ages and stages, and with various educational philosophies and approaches within the context of loose parts.

Loose parts are open-ended, interactive, natural and manufactured materials that can be manipulated with limitless possibilities. Interaction with loose parts includes experimentation, exploration, and playful interactions with variables through creativity and imagination. Participants have the freedom to explore variables, combine materials, and react to complex themes and ideas that emerge. Facilitators encourage participants, make loose parts available, stimulate discovery, provide opportunities, allow for open-ended play, and prompt meaningful connections and experiences. Through loose parts exploration participants develop imagination, creativity, and collaborative skills. Process is more important than the end product fostering overall growth and development.

Figure 5. Loose parts universal definition. This definition is a result of the scoping review.

Conclusion

Defining loose parts more specifically allows for greater implementation and deeper conversations and professional development around the topic. This scoping review narrowed down over 2,400 articles connected to "loose parts," "early childhood," and "outdoor classrooms" that met the study requirements, selecting 15 articles for thorough review and analysis. A definition of loose parts was created, loose parts from the research were categorized as natural or manufactured, and words describing loose parts were analyzed.

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Seeing the Forest and the Trees: A Historical and Conceptual Look at Danish Forest Schools

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ABSTRACT

This narrative review examines the history and future implications of Forest School, a pedagogical approach to early years outdoor education. Forest School is considered a philosophical perspective towards learning outdoors that values holistic development. There are numerous benefits to Forest School and the opportunities that it presents for young children to learn within a natural environment and to engage with nature. Due to the significance of a region's culture and history, the consideration of education and outdoor learning differs greatly depending on the geographical context. The theory of social constructionism allows for a more precise analysis of Forest School's history as it developed first in Scandinavia, then in the United Kingdom and North America. Forest School is a relatively new phenomenon within the realm of outdoor education that has taken on unique characteristics unique to the cultural setting. Forest School is becoming popular, yet more research is needed to understand the complexities of standardization and Forest School's application within distinct cultures.

Keywords: forest school, nature preschool, outdoor education, outdoor learning, social constructionism

> *A five-year-old bounds through the forest, dragging a stick along the muddy ground. She pauses momentarily to assess the steepness of a ravine slope, then begins walking purposefully downwards, sliding expertly over fallen pine needles. Her friends are waiting for her at the bottom, ready to continue building their secret den next to a large rock. They gather supplies methodically, stacking semi-decaying logs and fallen branches. The young girl proudly hands over her stick to two other children who contemplate how to wedge it between the rock and a tall stump for structure. One boy is twenty feet up a nearby tree, collecting acorns to be used as a loose-part building material. He offers to help, shimmying down with care, excited that his peers find his climbing skills useful. The teacher/caregiver – known in Denmark as the pedagogue – stands watching his young charges, comfortable in their ability to assess risks thoughtfully and to choose their own outdoor activities. This is Forest School.*

Due to the amount of time that children are now spending in school and the lack of time they are spending outdoors, many industrialized nations are beginning to further explore outdoor learning opportunities (Bentsen, Jensen, Mygind, & Randrup, 2010). This narrative review will cover the arch of Forest School (FS), a subset of outdoor education (OE), looking back at the history as well as towards future implications. This study will use both a historical and conceptual outline to weave the story of FS from the very beginning up until the present day. Additionally, this review will analyze the future trajectory of FSs and what implications this style of learning will have on OE, principally within North America (NA). Because the pedagogy of FS is steeped within cultural and social norms, its history is best analyzed through the social constructionist lens (Waite & Goodenough 2018). Thus, this study will address the general inception of FS, and then follow its development within Scandinavia, the United Kingdom (UK), and NA. In an attempt to portray both the forest *and* the trees, the details of FS's history will be constructed alongside of the general OE big-picture.

Literature Review

FS is a pedagogical approach (Waite & Goodenough, 2018) that exists within the greater context of OE. Within the literature, there is a great debate regarding the term *outdoor education,* some arguing that it "defies definition" since it is a changing, growing concept strongly dependent on time and place (Nicol, 2002a, p. 32). Opposing views on the nature of OE do not agree on whether it is a methodology or content, a formal or informal practice, or even if it is an actual discipline with a distinct approach (Nicol, 2002a; Potter & Dyment, 2016). Dillon et al. (2005) posits that there are "differing possibilities about both priority and process" in regards to OE, particularly in the approach and emphasis within various contexts (p. 3). There are clearly many underlying philosophies about OE that prevent it from being homogenously defined across cultures (Nicol, 2002b). While the report of Rickinson et al. (2004) states that the idea of OE is "broad and complex", researchers also point out that outdoor learning can have distinctive foci, outcomes, and locations while still being considered OE. In its most basic sense, many researchers quote Donaldson and Donaldson (1958) when applying a wide meaning to the concept of OE as being "education *in, for,* and *about* the outdoors" (p. 17).

Although OE is an agency that is difficult to define, FS is a much more clearly delineated approach that falls within its parameters. Knight (2018) recognizes that "good outdoor and environmental education and experiences can and should take many forms" (p. 23), suggesting that FS is *one* of these methods that is both valuable and appropriate for a suited setting. Although it is commonly seen within an early year setting, the FS philosophy has also been applied to a variety of ages and environments. According to the Forest School Association (2018), a UK non-governmental organisation (NGO), FS is a unique early childhood approach to learning that emphasizes a holistic development of young students within a natural woodland setting. To be considered a FS, children must have access to the forest setting on a permanent basis, at all times; some FSs have on-site forested areas, while others provide daily transport to an outdoor site (Bilton, 2010). The ultimate aims of FS are not merely academic, but rather integral in nature, seeking to use the outdoors to develop the whole child, including character, social proficiencies, and critical thinking ability (Williams-Siegfredsen, 2012). Specific skills and competencies are intentionally targeted and nurtured: self-esteem, self-confidence, independence, and risk-taking (Maynard, 2007). Experiential learning is a key component of FS, as well as general environmental education objectives. FS pedagogy is not very recent, but until lately, the majority of FS research was not available in English, making it difficult for many in NA to fully understand this element of OE (O,Brien, 2007). Within the past couple of years, the quantity of and quality of FS research in the English language has grown, making it possible for English-speaking countries to comprehend this particular style of OE pedagogy: early childhood education and development within a natural, outdoor space.

FS, like other types of OE, takes place in an outdoor learning environment, allowing children many experiential opportunities and a multitude of mental and physical benefits (Louv, 2008). Research has demonstrated the importance of the outdoors, specifically in young children. Fresh air, sunlight-sourced vitamins, physical peace, rest, general exercise, and motor development are some of the documented benefits of regular outdoor engagements (Bilton, 2010). Studies have also shown an increase in physical movement prevalent in FS settings, as well as a growth in cognitive development and critical social skills, such as language and attention (Williams-Siegfriend, 2012). Even attention deficit hyperactivity disorder (ADHD) and obesity have been reduced by time spent outdoors (Munoz, 2009). Besides the multitude of health and mental advantages of FS, young people gain opportunities to develop a love towards outdoor places and "close allegiances" as they grow in empathy towards the natural world (Sobel, 2008, p. 32). This leads to a nourishing connection to outdoor environments, allowing children to strengthen their compassion towards nature. FS, a philosophy that emphasizes more than simply academic endeavors, has the capacity to move children, teachers, and communities "towards the resolution of environmental questions, issues, and problems." (Davis, 1998, p. 118). Understanding FS will enable teachers with older students to incorporate FS concepts into their own science classroom within the context of an outdoor setting. A firm knowledge of the FS approach will also empower educators and policy makers around the world to advance their understanding of how to best educate children in an outdoor environment.

Theoretical Framework

The theory of social constructionism states that reality is formed through social exchanges and the way in which a group of people generate meaning (Gergen, 2011). Hence, a certain area's culture and history connect closely to the way in which those people view education, the outdoors, and, subsequently, OE. Social constructionism is an extension of the related idea of social constructivism which asserts that the mind produces through social actions generating a separate meaning in a cultural context (Detel, 2015). In the case of FS, a social constructionist viewpoint is more appropriate, since knowledge is embedded within social relations to and from the outdoors. Using this theoretical framework, one can perceive how a community's outdoor learning is closely connected with its environment, established within interactions between people, places, and activities. As a type of OE, FS is a social construction, unique to each culture based on how a distinct group of people actively and historically view the outdoors (Leather, 2018). Waite and Goodenough (2013) propose the term *cultural density* to describe the significance of place in impacting learning outcomes, particularly as it relates to OE. Because such educational contexts are unique to a country and a region, models of OE, like FS, are heavily reliant on culture, social setting, and geographic location (Bentsen, 2010).

The idea of social constructionism within OE is also evidenced by the scope of reports that individual nations have commissioned, each focusing on particular aspects of the field relevant to the commissioning nation. These reports demonstrate cultural diversity of OE perspectives. Leather (2018) discusses FSs as being rooted in social norms, pulling from what is considered normal within Scandinavian culture where it has its origin. Waite and Goodenough (2018) agree that FS is a sociocultural construct, and notes the dissonance between its historical philosophies and its current introduction into UK culture. The values and customs of Denmark's culture have "shaped the use of the outdoors in kindergartens in their own unique and cultural way" (Williams-Siegfredsen, 2012). Historically, a sense of connection with the land has been embedded within the Scandinavian culture which contrasts the UK's colonial outlook on land governance as well as its structural control of schooling (Leather, 2018; Waite & Goodenough, 2018). According to the FS philosophy, outdoor interactions are meant to be an extension of everyday life – a cultural norm – as opposed to a novel, adjunct experience. Despite major differences within cultural constructs of FS, there are commonalities across cultures and geographical areas: a natural setting, experiential learning, and student-led engagements. Understanding the social constructionist nature of FS properly frames this subfield of OE within *each culture,* leading to a better understanding of its complex socially layered history.

History of FS

Tilling the Soil

The events and philosophies that led to the development of FS were steady in nature, a growing awareness that took place over many decades, gradually culminating into a current social construct. People, events, and cultural subtleties helped prepare the soil, so to speak, for the idea of FS to take hold. As Western nations moved towards industrialization in the 1800s, the outdoors shifted away from an adversary to battle or entity to endure into a "positive aesthetic experience" (Williams-Siegfredsen, 2012, p. 7) Individuals and families found more time for fun and leisure in an outdoor environment once labor moved primarily indoors during this time of industry growth (Williams-Siegfredsen, 2012). Shortly after Western nations began looking at nature as a free-time activity, early childhood educators – Vygotsky, Paiget, Montessori, etc. – started exploring and writing about best practices in early childhood education. In the late 1800s and early 1900s, the work of researchers and philosophers focused on young children's cognitive development, helping prepare the way for the inception of FS philosophy. FS has been influenced and "supported by numerous theorists from around the world" (Williams-Siegfredsen, 2012, p. 9). It is significantly rooted in the pedagogy of Friedrich Froebel, a German educator who felt that the early years should occur in natural places, yet FS can also trace its ideas back to a variety of theories during this time. In this way, a combination of a growing interest in outdoor engagements and a rising understanding of early childhood development through expert educators laid the groundwork for FS to take root in many Western nations. The foundation for FS was established by a combination of work carried out by philosophers, naturalists, and educators that developed into the current concept of FS learning (Forest School Association, 2018).

Tending the Seedling

While the majority of Western nations were growing in their awareness of early childhood development and nature-based experiences, FS officially began in Denmark. There were a couple factors that allowed this conceptual seedling to develop steadily and to flourish within this country. First, in the 1950s and 60s, women were entering the workforce in large numbers due in part to the women's liberation movement and a general need for more workers (Williams-Siegfredsen, 2012). Denmark was faced with an immediate shortage of childcare facilities, particularly for children who were not yet of school age. In a grassroots fashion, Danish pedagogues began using readily-available woodlands as a childcare and educational site. Around the country, cohorts of three- to six-year-olds became the first group of children to enter FS.

Additionally, since Denmark had recognized the general health and leisure benefits from an outdoor environment from a very early period, FS became a natural extension of a cultural norm. (Williams-Siegfredsen, 2012). Time spent outdoors engaging in rest, leisure sports, and contemplation has been and continues to be a core value in Danish culture. Placing young children in need of supervision and learning engagements into an outdoor setting was in line with the country's general outlook towards nature. Across Denmark, educators and stakeholders worked on cultivating a place where young children could develop positively and gain an appreciation of a natural outdoor setting.

At this point in the timeline, FS as both a philosophy and an early years educational program was young but developing rapidly across Denmark. The changing workforce and rising societal outdoor connection created an ideal setting for the new idea of FS to grow steadily in the 1970s and 80s. The development of environmental concerns was also a contributing factor to the beginnings of FS in Denmark. This will be further explored within the context of Scandinavia and the history of FS philosophy in countries like Norway and Sweden. It took some time for FS ideas and practice to spread to other parts Westernized nations, beginning first in the rest of Scandinavia, and then moving to the UK and NA In the past few years FSs have extended rapidly within these Western nations (Knight, 2013), being grafted onto to other cultural foundations within the realm of OE.

Grafting the Branches

Due to the nature of outdoor learning, its important to analyze the history of FS through the lens of social construction. This allows one to see the individual components of FSs that differ between countries and regions. The narrative of FS history is very place-dependent; each country's interpretation of the original Denmark FS differs due to geography, customs, and social constructs. This section will delve deeper distinct areas of the world, noting key historical moments, timelines, and present-day interpretations of this type of OE.

Scandinavia. Although most documentation indicates that FS first originated in Denmark, sources indicate that other Scandinavian countries were approaching early years OE in a similar fashion and at the same time (O'Brien & Murray, 2007). In fact, this "mutual inspiration between Norway, Sweden and Denmark" (Bentsen, Mygind, & Randrup, 2009, p. 39) suggests that Danish FS concept were quickly adopted by other Scandinavian countries who were already doing similar practices. This is not surprising, considering the closely connected cultural norms in Scandinavia This region of the world has been heralded as the exemplary standard of school-based outdoor learning, and still serves as a model for other nations seeking to emulate their practices (Bentsen et al., 2010). Both Norway and Sweden have their own versions of compulsory school-based outdoor education, with many commonalities across the Scandinavian socio-cultural context (Bentsen et al., 2010).

Since the 1970s all the Scandinavian countries have sought to educate children and the general public on the outdoors, consistently producing OE research, some of which has focused exclusively on FS (Jensen, 1999). The 70s saw the rise of the Energy Crisis, leading to an increased awareness of environmental issues (Williams-Siegfredsen, 2012). The progression of knowledge regarding the benefits of outdoor engagements encouraged the steady growth of recently established FSs. The OE movement in Denmark, Sweden, and Norway, and, subsequently, the growth of FS, followed the trend of caring about the natural world.

In the 1990s, it became clear that the strong outdoor recreational roots of Scandinavia were a critical component of the culture that also helped promote environmental protection and awareness (Jensen, 1999). This was also when the Danish parliament introduced the "care guarantee" that ensured parents of preschool-aged children full-time care (Williams-Siegfredsen, 2012). The need for quality education of this age group increased, and the number of FSs within the country more than tripled within the daycare sector (Jensen, 1999) Likewise, Norway encouraged the movement of regular school locations towards trails and camps, and Sweden focused on nature-culture schools (Jensen, 1999).

In the early 2000s, Denmark placed into law a general curriculum for all preschools, yet gave each individual setting the autonomy to create a curriculum plan based on specific areas of learning set forth by the government (Williams-Siegfredsen, 2012). This autonomy allowed and supported freedom for Danish educators to develop an OE curriculum that met the needs of each region and community (Williams-Siegfredsen, 2012). Sweden underwent a similar reform at this time; the decentralization of school led to free-choice for stakeholders and gave teachers more independence in how to interpret curricular goals (Wermke & Forsberg, 2017). At the turn of the century, the relative freedom of Scandinavian teachers guided the development of many grassroots educational ventures in the respective school systems (Bentsen et al., 2010). Within these Scandinavian countries, FS continues to be a unique construct that depends greatly on the area, context, and individual goals of both the parents and educators.

United Kingdom. While FS was developing in Scandinavia throughout the latter part of the 20th century, it did not reach England until 1993. Brought to the country by a group of students from Bridgewater College, the FS philosophy was officially introduced, eventually leading policy makers and authorities around the country to develop the idea for the UK (Forest School Association, 2018; Williams-Siegfredsen, 2012; O'Brien & Murray, 2007). The Bridgewater students who first noticed this particular innovative OE approach recognized the potential for college's Early Years Learning Centre (O'Brien & Murray, 2007). This style of learning was also very much a response to the recently introduced national curriculum in the UK, offering an alternative to the outcome-centered approach (Forest School Association, 2018). Thus, FS began to take hold in the country, beginning in 1995 with course offerings and certifications at Bridgewater College (Forest School Association, 2018).

A couple years later, the UK government began a push to both understand and implement OE practices (Rickinson et al., 2004 and O'Brien & Murray, 2007), which naturally led to a greater interest in FS. British policy makers commissioned an extensive report covering the existing research on OE with intent purposes of reconnecting young people back to the land and of understanding the value of learning in an outdoor environment (Dillon et al., 2005; Rickinson et al., 2004). At the same time, NGOs sought to evaluate FSs in the early 2000s as they became more prevalent and widespread around the country (O'Brien & Murray, 2007). The body of research focusing on outdoor learning in the UK grew due to both government sanctioned reports and NGO interest and evaluations. Across the UK, the importance of OE and FSs became evident to educators and policy makers: "There is strong evidence that good quality learning outside the classroom adds much value to classroom learning" (Department for Education and Skills, 2006, p. 5).

As the national interest in OE grew, the UK concept of FSs began to develop into a more standardized approach similar to National Curriculum already in place (Department for Education, 2018). In contrast with Scandinavian countries, the UK has developed a highly structured, regulated construct of FS (Waite & Goodenough, 2018). At the National FS Conference in 2002, the UK definition of FS was developed; six governing principles were agreed upon to define this learning approach (Forest School Association, 2018). The principles that were developed in 2002 listed the key features of FS as follows:

> It is run by qualified level 3 practitioners.
>
> It is a long term process with regular contact with a local wooded environment (preferably over the seasons).
>
> It follows a child-centred pedagogy where children learn about and manage risk.
>
> It has a high adult:child ratio.

> Observations of the learners are key to enabling scaffolding of the learning.
>
> Care for the natural world is integrated. (Forest School Association, 2018, "History of Forest School, para. 6).

Since their formation, these governing principles have been reviewed and published, becoming part of the national standards within the Forest School Association (2018) as a governing body (Leather, 2018). The UK developed a system for regulating FS to ensure quality and conformity to the six agreed-upon principles (Leather, 2018), which is very different than the non-hierarchical mindset of Scandinavia. Yet Waite and Goodenough (2018) argue that these FS principles are still in discord to more conventional UK educational practices, the whole-child development approach contrasting to the traditional outcome-centered focus. The play-based philosophy that is a hallmark of the original FS educational model in Denmark seems to become hard-pressed development when translated to a UK environment and pre-existing educational model (Waite & Goodenough, 2018).

Because of its socio-constructionist nature, FS within the UK has evolved into a different style, its implementation taking on a different format than the original Scandinavian versions. Lloyd, Truong, and Gray (2018) recognize the value of learning in the outdoors, but argue that a "drag-and-drop" approach for FS does not work; one *must* take into account the "cultural-ecological context" and specific attributes to each geographical region (p. 46). From a social constructionist perspective, it is evident that the development of FS within the UK has diverged from the Scandinavian prototypes. For some, FS within the UK becomes a novel approach that is an alternative between more traditional schooling methods. The disconnect between home and school in a British FS directly contrasts the continuity experienced within the Scandinavian model and mindset (Waite & Goodenough, 2018). In March 2018, the Journal of Outdoor and Environmental Research published a special issue focusing on FS, particularly within the UK Multiple authors – Leather, Lloyd et al., Knight, Waite and Goodenough – addressed the growing concern that FS within the UK had become commercialized and "McDonaldized", deviating from the original Danish approach (Lloyd, et al., 2018, p. 46). Although it continues to grow in popularity, the future of FS within the UK is unsure. Some researchers are concerned about the integrity of OE and FS as they are transferred to other nations, and note the overt procedural focus of FS within the UK that differs from its foundational Scandinavian philosophies (Lloyd et. al, 2018).

North America. The standardization of FS within the UK progressively led to the spread of this philosophy to North American nations. After the UK adopted FS ideas from Scandinavia, the quantity and quality of UK research and publications on FS appealed to other countries, like Canada (Knight, 2018). Before this, as early as 1982, American researchers were identifying the need for wild places and natural spaces as a critical part of childhood development (Hart, 1982). Although trailing the Scandinavian environmental conservation trend, the United States (U.S.) began growing in its awareness of the changing environments and limited resources, particularly in the early 1990s (Jensen, 1999). While at first this led to an increase in outdoor educational pursuits, researchers identified that learning about the environment does not need to be the only objective of OE (Munoz, 2009). By 2004, at the time of Rickinson et al.'s OE literature review report (2004), the U.S. and Canada had produced a large portion of outdoor *adventure* education research literature. Although adventure-based outdoor learning and FS are substantially different, both exist under the construct of OE. This demonstrates a commonality between all three regions – Scandinavia, UK, and NA – that OE is a much-needed and significant form of learning, regardless of its distinct format.

An extensive online journal search reveals that the majority of FS research in the English language originates from the UK or Canada. Some has been translated into English from Scandinavian countries as researchers and stake-holders seek to expand the body of literature into English-speaking nations. It is interesting to note that there is a key lack of U.S. research on FS philosophy or practice compared to many other Western countries. Canada, for instance, opened its first contemporary FS in 2007, and a couple years later *Forest School Canada* launched (MacEachren, 2018). *Forest School Canada* is an organization that seeks to systematize the outdoor educational approach within the country, focusing also on incorporating Indigenous groups' land and practices. Peer-reviewed articles, like those from MacEachren (2018) and Power (2015) are available on these types of FSs in Canada. This is also a prime example of how outdoor learning has a strong cultural basis, as evidenced by Canada's rich Indigenous people's history and current social norms (Child and Nature Alliance of Canada, 2018).

While minimal FS research has come from the U.S., there is still a steady grassroot movement of FSs emerging around the country framed by the nation's specific cultural background. Often called *nature school* or *forest kindergarten,* these centers have loosely based structures or organizing bodies, all of which have come about within the past fifteen years. Cedarsong in Washington state was the first FS within the U.S., opening in 2006; its founder also began the Forest Kindergarten Association (2018) to unite stakeholders around the country. Long before the Forest Kindergarten Association was developed in the U.S., The North American Association of Environmental Education (NAAEE) began in 1971 (Disinger, McCrea, & Wicks, 2001). Its purpose was to play a leadership role within the North American field of OE, growing out of a general concern of environmental issues. While FSs were appearing in Scandinavian during this time, the NAAEE started using conferences, publications, and networking to promote environmental education in NA (Disinger et al., 2001). Although the NAAEE began as a uniting force for OE within NA, comparatively very little of its work has focused on FS. In comparison to Scandinavia and the UK, NA has been years behind in acknowledging or adopting FS philosophy.

Finally, in 2015, the NAAEE recognized the need and importance of FS within this region of the world. The National Start Alliance (2018), an offshoot of the NAAEE, very recently developed The Council of Nature and Forest Preschools in response to a growing need *and* a growing trend of this style of OE pedagogy. "The Council for Nature and Forest Preschools began to form in 2015 at a meeting at the National Conservation Training Center to explore how the Natural Start Alliance could help accelerate the nature-based preschool movement." (Natural Start Alliance, 2018, "Nature Preschools", para. 4). This movement is still in its beginning stages, and, noticeably, the actual term *forest school* is absent from the literature and reports that are put forth by this North American NGO. The NAAEE also identifies the problem of semantics and nomenclature when defining and implementing OE concepts (Disinger, et al., 2001). An in-depth reading reveals that the general philosophy and approach of the National Start Alliance nature-based preschools are comparative in OE philosophy and approach to that of the original Danish FS.

The history of FS is rich and nuanced, showcasing unique cultural characteristic as the idea has been grafted into tracing the history of FS from its inception in Denmark, through Scandinavia and the UK, across the Atlantic, and then to the continent of NA. Figure 1 illustrates the non-linear timeline of FS, showcasing its unique cultural fluctuations and regional characteristics. Due to its social constructionist nature, FS has grown and changed as the idea has been grafted into these other cultures. There are countries not mentioned in this review that have also begun to incorporate FS concepts, and some that already have a large number of established schools. Australia has a rigorous OE curriculum, so FS has naturally taken hold within the country. FSs can also be found in South Korea, Japan, Germany, and New Zealand (Child and Nature Alliance of Canada, 2018; Chait, 2016). Covering the entire history of FSs around the globe would be complex and time-consuming; the concept is growing and being assimilated in new ways into new cultures. Although no one can be certain of the future of FS, there are many implications and possibilities that exist.

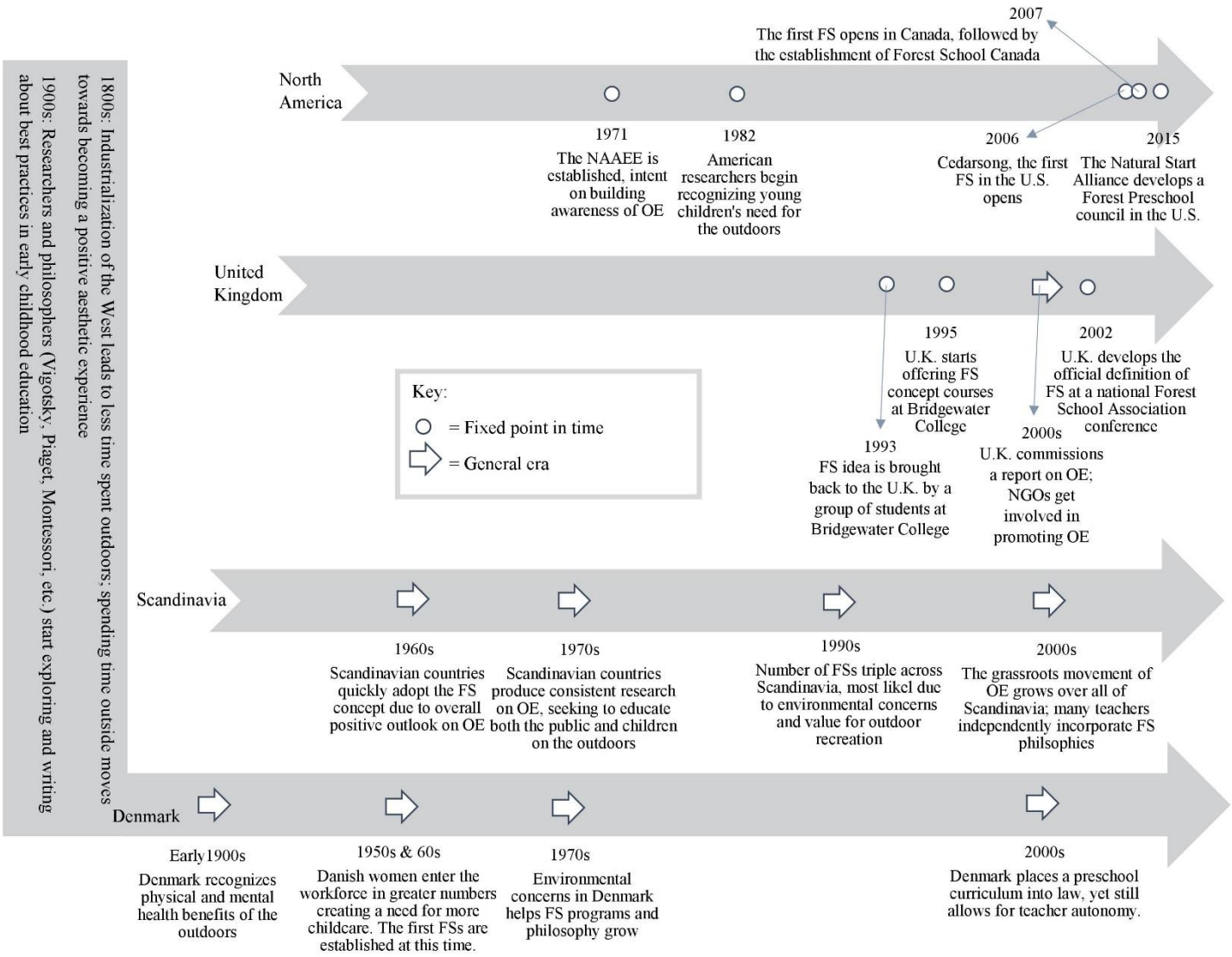

Figure 1. History of FS highlighting significant advances across time and regions

Discussion

Implications

As evidenced by its spread around the globe, FSs are becoming more popular in Westernized nations as they grow in number and in influence. This can be traced, in part, to an international interest in the Scandinavian construct of the outdoors as a place of adventure, education, leisure, and all-around connection (Bentsen et al., 2009). For educators, the implications of this style of learning are prodigious – the benefit of education in the outdoors has been documented extensively. Children who spend time outdoors involved in free play have greater physical movement, more social interactions, and a more prominent nature-connectiveness (Munoz, 2009). Besides the numerous health benefits of outdoor engagements, FS specifically helps build character, risk-taking, and both fine- and gross-motor skills (Bilton, 2010). It is essential for young students to have opportunities to connect with a natural outdoor environment on a regular basis. FS is one promising avenue that educators and care-givers can employ within an early years setting.

In his book, *Last Child in the Woods,* Richard Louv (2008) laments the severe decrease in time spent outdoors in young people. Louv (2008) points out the significant restorative and therapeutic capacity of nature and then admonishes educators to "improve the situation" even without an "official sanction" (p. 139). When children are educated outside of the classroom, they are able to grow in stewardship, leading to academic gains, as well as key problem-solving and critical-thinking skills (Louv, 2008). Thus, a child who attends FS at a young age will be able to grow in his or her ability to relate to nature. This will inevitably lead to a joy towards natural and wild spaces that is founded upon academic knowledge (Louv, 2008). Williams-Siegfredsen (2012) explains the beneficial implications of FS based on an in-depth 1997 study comparing an indoor kindergarten to an outdoor FS. Students who attended a FS had: (1) "better concentration", (2) "better physical and motor development", (3) "more varied and imaginative types of play", and (4) were sick less often (Williams-Siegfredsen, 2012, pp. 93-94). Advantages of FS are found within a physical, social, psychological, linguistic, holistic, didactical, and parental perspective (Williams-Siegfredsen, 2012).

Planting the Future

Although the importance of FS is clear, there are still many questions and gaps within the research regarding this OE approach and how it might be specifically applied to the U.S. There have been numerous FS studies within Scandinavia that are not available in English for the U.S. or other countries to access. Additionally, the social constructionist nature of FS means that the history and values of a country, or region within a country, will have a great effect on a FS's characteristics, greatly reducing the generalizability of available studies. According to Bentsen et al. (2010), this "socio-cultural perspective on pedagogy and learning are almost absent from the literature" (p. 242). Rickinson et al. (2004) also agrees that a key "blind-spot" in the current OE literature involve "the historical and political aspects of outdoor education policy and curricula" (p. 8). Indeed, the U.S. needs country-specific research that will enable this method of OE to be understood and implemented effectively. The No Child Left Inside campaign of 2009, later amended in 2013, demonstrates the country's growing awareness in learning outside the classroom. Future research needs to concentrate on FSs within the country and their relationship to other OE endeavors.

There are some evident gaps within *all* the available FS literature, particularly when trying to apply it to a specific nation, such as the US. First of all, how can we, as a country, incorporate the philosophies of a Danish FS without pushing child development, as Waite and Goodenough (2018) mention in the UK model? There seems to be an inevitable clash to the culture of schooling within highly standardized countries – the UK and US – as opposed to Scandinavian countries wherein teachers have more autonomy. This "demand for standardisation" and "curriculum objectives" can usurp the student-centered framework through which students have the locus of control (Waite & Goodenough, 2018, p. 42).

Another timely question involves the range of FS and how these philosophies may impact older students. Namely, how can we extend FS to include elementary and high school students while maintaining rigor? Scandinavian schools have already begun incorporating nature and outdoor engagements on a regular basis that are tied into the compulsory curriculum (Williams-Siegfredsen, 2012). Known in Denmark as *udeskole*, translated as "outdoor school", this form of OE is closely related to FS, but revolves around older students. Many of the same FS principles apply: whole-child focused, experiential learning, etc. (Bentsen et al., 2010). Due to its grounding in cultural constructs, an idea like *udeskole* would look very different if applied to an American setting. Further research is needed to look at the implications for FS at an older age range, and how regular school-based outdoor learning impacts achievement and attitude.

The future of FS is certain, yet also unknown. Across the globe, more and more FSs are being opened, yet stakeholders still have countless questions regarding this unique form of education. FS began as a grassroots movement and still continues to develop with little or no endorsement by departments of education or the national curriculum. Some government organizations have recognized the connection between access to a natural environment and good health (Munoz, 2009), yet it is not yet clear how this understanding will impact the field of OE. It is evident, however, that FS will continue to progress as *one* component of OE, maintaining distinct characteristics based upon the surrounding culture and community. Over the past 60 years, FS has developed from

a tiny seedling into a well-established forest replete with unique ideas bearing distinctive regional attributes. These noteworthy details are reassuring, demonstrating how FS has taken hold in a variety of climates. Seeing both the forest *and* the trees also involves looking globally and understanding FS for the big idea it truly is: a childhood approach to learning that emphasizes a holistic development of young students within a natural woodland setting.

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Bit by Bit:
How One Preschool Increased Its Natureness

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ABSTRACT

Preschool teachers are becoming increasingly aware of the benefits of nature connection during early childhood, including the development of healthy bodies, social-emotional competency and eventual academic success (Sobel, 2015; Warden, 2012). However, for many preschools located in urban settings, the question isn't whether nature connection is important for young children – the question is how to enable it? This article lays out an incremental approach to achieving nature connection for urban preschool teachers by telling the story of how one preschool – the one I direct – has approached the problem. The approach we took can be used in almost any preschool setting to increase nature connectedness. It is incremental, and takes time, but its impact can be transformative and lasting.

Time in nature is important for us all, yet we are living in an era when screen-time and indoor time is increasing, and time outdoors is on the wane, with disturbing results (Twengy, 2017). Florence Williams (2016) in her recent book, *Nature Fix: Why Nature Makes Us Happier, Healthier, and More Creative*, reviews extensive research extolling the positive effects that nature has on our brains, bodies and psyche, at all ages. So, it is no surprise that among preschool teachers, there is a growing awareness of the important benefits of nature connection during early years, as it supports the development of healthy bodies, social-emotional competency and eventual academic success (Sobel, 2015; Warden, 2013).

For many preschools located in urban settings, however, the question isn't whether nature connection is important for young children; rather, the question is how do we enable it? With increasing urbanization, this goal will continue to become more and more challenging for teachers. I have been grappling with this issue myself for the last nine years while directing a cooperative preschool in an urban setting, and I have formulated an approach that I believe can be used in almost any preschool setting to increase nature connectedness. The approach is incremental, and takes time, but its impact can be transformative and lasting.

Figure 1. Child is studying the newly unfurling leaves of a California sycamore tree.

Those who have read to young children may remember this conversation from *The Velveteen Rabbit* (2007; pg. 4)*:*

> *"Real isn't how you are made,' said the Skin Horse. 'It's a thing that happens to you.'*
> *'Does it happen all at once, like being wound up,' he asked, 'or bit by bit?'*
> *'It doesn't happen all at once,' said the Skin Horse. 'You become. It takes a long time."*

This article is the story of our multi-year efforts to become a *Real* Nature-Based Early Childhood Education Program at The Oaks Parent-Child Workshop in Santa Barbara, California. It's the story of how, within the limits of our location, budget and governance constraints, we have increased our *natureness* at The Oaks, as Patti Bailie of the University of Maine calls it. And finally, it is the story of how we worked to help children learn with nature "inside, outside, and beyond" as Claire Warden and others have noted. As with the Velveteen Rabbit becoming real, it feels like this story didn't happen all at once, but rather developed over a long time, bit by bit. And, we still have much more work to do. But it's a story I believe any school can learn from and incorporate into its daily routine.

Our journey culminated in the creation of our Nature-Based Program at Fairview Gardens, a cooperative farm/garden in Santa Barbara, scheduled during the summer when our preschool is typically closed. It was the first program of its kind for The Oaks, and in this article I will document our planning process, our goals, our rationale in selecting our location, our commitment to play and exploration, reflections on the curriculum, and finally our reflections and observations of our week on the farm. I hope that sharing our experience will help others who want to increase nature connections within their own urban preschool programs, and that others following a similar journey will inform us of their efforts so that we can continue to grow our own early childhood environmental education program.

One point I'd like to highlight: during our planning, I often referred to the *NAAEE Early Childhood Environmental Education Programs: Guidelines for Excellence* (2016) because it provided us with a useful framework to guide our efforts (see Appendix A). This free resource can be downloaded from the NAAEE website.

Background

The Oaks Parent-Child Workshop is a cooperative preschool program affiliated with the Santa Barbara City College serving an average of 50 - 60 families each year. It was founded over 70 years ago and has been in its current location for over 60 years. What once may have felt like a quiet neighborhood, now is a busy medical hub for the city of Santa Barbara. While there is a city park across the street, it also is a park that sadly sometimes has a homeless encampment. Daily ambient noises include ambulances, helicopters and the local freeway traffic. Also, the school property itself is small, and when it rains, we are really cramped. Though I'm sure there are more challenging locations that preschools currently occupy, it's clear that many, many schools fall on a spectrum of various degrees of urbanness that present significant challenges for nature education.

During my first five years at the Oaks we made great strides in improving the curriculum and school environment, both inside and outside, in order to increase opportunities for parents and children to connect with nature. We removed asphalt and replaced it with a bike path landscaped with tufty grasses, willow and animal tracks. We replaced a chain link fence and planted native grapes (Vitis californica). We also planted edible fruit trees, and installed raised beds seeded with edible greens and herbs, a source of food for our bunnies and children.

Once we completed these new outdoor improvements, we faced some challenges. Children were pulling young plants out of the garden boxes and monarch caterpillars were being plucked off the Asclepias/Milkweed, their only food source. We decided we needed to help cultivate a culture of responsibility for living things among the preschoolers. We called a school-wide meeting, and offered the children a chance for them to become protectors of plants and caterpillars by taking a pledge:

> "I promise to be a plant protector; gently harvest with two hands so the roots can remain in the soil, and only harvest what I will eat or feed to the bunnies."

or:

> "I promise to be a caterpillar protector. I will study them with my eyes and allow them to grow strong on their host plants."

When a child decided to take the pledge, they would tell the director, take the pledge, and bind it by shaking hands. Once the pledge was made, a small stamp sized "plant protector" or "caterpillar protector" was ceremonially taped to the child's name tag.

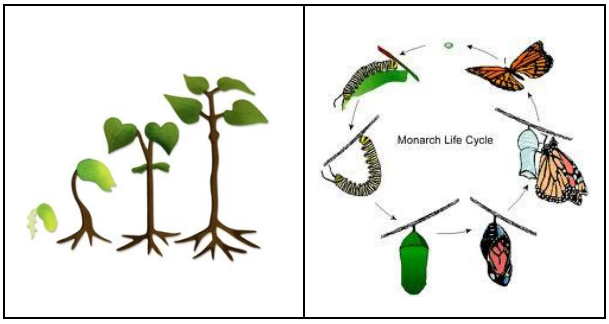

Figure 2: Plant Protector, Caterpillar Protector 'stickers'

Within the classroom we set up a Nature Corner to display natural history artifacts and visiting insects. We subscribed to the Santa Barbara Natural History Museum - Nature Connection Membership, a program that allows educators to borrow museum quality educational displays for their classrooms. We borrowed taxidermy mounts of animals, bird nests and eggs, animal skeletons, bones and skin – all in order to expand on emerging children's interests, seasonal changes, and relevant to our local coastal, chaparral, and woodland environments. We invested in additional field guides and added the topic of nature pedagogy to our weekly evening parent education classes. We collaborated with the local city Creeks Division to install more native plants along our property line that runs adjacent to Mission Creek and we reduced our waste by joining the city of Santa Barbara's Food Scrap Composting program.

We also started Nature Notes – based around a Nature Journal made from an 11" X 14" artist's pad. It became a home for Nature Discoveries made at school and at home. For Nature Notes, teachers and families bring or send in pictures and stories of nature discoveries they have made at home or at school. For example: teacher Laura photographed the Great Horned Owls bathing in her backyard; Anton brought in pictures of his family hunting for Chanterelle mushrooms; Grandpa Steve shared a picture of ant lions' sand traps located near the school parking lot; and Fin and his mother brought in a photo of a centipede next to her eggs. The Nature Notes journal is always out for children and adults to look through and add to. It has become a lovely transitional activity for some children first thing in the morning.

Though we had made progress inside and out with these initial efforts, I felt there was more we could do. It was time to provide access to places and spaces that would deepen our nature-connections in the beyond. With this goal in mind, I went to the parent board requesting approval for an off-site nature-based program during the summer when the school is typically closed. The board unanimously approved the proposal, with the understanding that the program would: 1) serve currently enrolled Oaks families; 2) be self-sufficient; and 3) be covered by our insurance. Many of the details would need to be worked out – including location, budget, and curriculum. But, with the board approval we could begin to plan in earnest.

Getting Started

During the planning stage, I asked Rebecca Borgioli, a local credentialed elementary school teacher with a graduate degree in Early Childhood Education (ECE), and a former Oaks parent, as well as regular substitute teacher at our own program, to co-teach. She agreed, though with some hesitation. Having taught in Italy at a Reggio Emilia School, as well as in Elementary Schools in our area, Rebecca has a strong skill set with regard to developmentally

appropriate curriculum planning and the arts. But she did not feel as confident with environmental education (EE). And, to be honest, the same was true for me. I had worked previously as a school psychologist, and now was a parent education instructor & director of a cooperative nursery school, but I too had not been directly engaged with EE for some time. This pilot program provided us both with an opportunity to take some risks, practice place-based environmental education, and connect deeply with a dozen children within a more natural setting. Patti Bailie, of the University of Maine, says that it is not unusual to have either the ECE competencies or EE competencies – but a marriage of both is an unusual skill set.

During this initial phase, we scheduled planning sessions, gathered materials, and read articles. We discussed David Sobel's *Nature Preschools and Forest Kindergartens: The Handbook for Outdoor Learning* (2015), specifically chapter 5: "The Sticks and Stones of Curriculum Planning" and Chapter 10: "Best Practices in Nature-Based Early Childhood Education". We also discussed *NAAEE's Early Childhood Environmental Education Programs: Guidelines for Excellence* (2016). These resources provided us with a shared framework to build upon based on research and theory.

Given our graduate level of training in ECE, we felt we were well equipped to support learning that considered the whole child, and was developmentally appropriate, child-directed, and inquiry-based. Also, while I hadn't been working with EE for some time, I felt I could draw upon previous experiences including installing and maintaining a school garden program, leading local family nature-based adventures, and Master Gardener training at the local Botanic Garden.

Selecting a Place and Space

During the planning phase, we deliberated long and hard on choosing a location. Across the street from our school there is an urban park. That would certainly have been a convenient place to run the program. We walked the length of the park from east to west more than once, as we considered whether this would be the right location. The park had a creek restoration zone that looked promising, with picnic tables, native plants and ample shade, rocks and sticks. However, each time I walked to the east end of the park, I encountered an entrenched homeless community. I tried to imagine sharing this space with these homeless folks. And, I wondered how it would look through the eyes of my young children, and their parents. I conferred with colleagues. And, I spoke to a father considering enrolling his daughter in our program. He said he didn't think the park was a good idea. As an ambulance driver and paramedic, he had been on a number of calls to this area, responding to the needs of the homeless encampment. In the end, we decided to keep looking.

After investigating several other options, we discovered Fairview Gardens. Fairview Gardens is an urban farm about fifteen minutes' drive from our school. Although it was minimally planted due to an ongoing drought, it provided us with an ideal location for our summer nature-based program because it afforded us an abundance of opportunities to connect with nature and with each other. The facility has bathrooms – an obvious plus – and we would get to work with Fairview Gardens interns who were well-versed in EE and ready to share their knowledge of farming and nature with the children.

The farm was replete with natural components – trees to climb; loose parts to repurpose; chickens and a chicken coop; a children's garden to harvest from; sunflower teepees; food crops, and so much more. When it was hot, "Sister Mulberry", an ancient fruiting mulberry tree, provided an expansive shady canopy to retreat to. The farm also had tables for activities and pathways to explore. Environmental sustainability was a focus. Children watered the garden with water they washed their hands in, and they composted their lunch leftovers. We felt that the Farm met all the guidelines the NAAEE laid out for location.

Planning and Implementing Nature-Based Education

Parents attended a planning session before the school year ended. Some parents later reported they hadn't known what to expect. Perhaps they had been harboring concerns about safety and questions about what the program would be like for their children. Then, the first day of our Nature-Based Program finally arrived. Families walked up

the hill from the parking lot of the public library, through the orchard and past the children's playground to meet us at Sister Mulberry Tree and we all met to start the day under branches that created an accessible canopy for our nascent tree climbers.

Rebecca and I agreed that we would need to build in plenty of time for discovery and exploration. We also wanted to incorporate many of the authentic experiences that our outdoor environment afforded us. A half hour after our first morning began, once parents had departed, we gathered for our first morning circle. Rebecca read the story *Sunflower House* by E. Bunting (1996), allowing us to deepen our connections with the abundant 6 to 7-foot sunflowers growing throughout the farm. We had displayed drying sunflowers on the picnic table ready for seed harvesting. Small field magnifiers and tweezers were also available. As lovely as this curriculum activity was, though, it was not a draw for our children on their first day. We made note of this in our journals.

During our first morning circle time we discussed with the children their options at the farm. The children reached consensus – they wanted to play follow-the-leader with our farm intern, Arianna, around the farm. Each child was offered a small basket to take on their tour, to support foraging. Arianna lead us through the children's garden filled with rock-ringed planters of flowers, herbs and edibles, past the magnificent sunflower stalks that rose high above our heads. We walked underneath the grape bower, beyond the tire slide and the fava bean field, to the far southwestern corner of the farm and 'the tunnel.' The tunnel, a culvert 5-feet in diameter, became the source of great imaginative story telling over the week and a growth opportunity for many children, as children were able to confront their fears of the dark by walking more deeply into the tunnel with every visit, increasing their confidence with each attempt. Indeed, "the tunnel" became one of the children's favorite destinations. One of the children explained how he loved going into "the deep, dark, darkest, dark-like-the-night tunnel." And, after visiting the tunnel, children began to talk to each other about what might live in the tunnel – maybe even bears.

When we did return to Sister Mulberry Tree our first day, children were HUNGRY. Indeed, it was almost lunch time as we had missed our morning snack. Arianna reported that the tour took much longer than she thought it would. This was reassuring to me, since Arianna's observation indicated that we were making time for connecting conversations with children, and that we had slipped into 'kids' time.'

Each morning after that first day opened with a circle time – which allowed us a chance to greet each other, sing our good morning song, and plan our day. Each afternoon we ended with a closing circle, which allowed us a chance to reflect on the morning adventures and sing favorite songs. Children also used this end-of-the-day circle time to make suggestions for the next day. The days that followed found their own rhythm. There was plenty of time to climb trees, look for chicken eggs, explore the asparagus forest, re-enter into the tunnel, and harvest elderberries. Some activities were serendipitous – the staff at Fairview Gardens offered us fava beans to shuck, herbs for tea, and a fig tree to plant. I had also found an Anise Swallowtail Caterpillar that was ready to change into a chrysalis. Children had found loose parts that they could repurpose into their self-directed play – tires, a wheel hub on an axle, sticks and rocks. And, on our last day at the farm, Arianna stoked a fire in a cob stove, so we could make pizzas to share with parents.

Each morning we posted a daily curriculum guide (see Appendix B). We planned for each day, but also remained open to let the day follow the direction and interests of the children.

Gratitude

Early in the week, we established a practice familiar to our children - the practice of gratitude. By the end of the week, Rebecca and I had made notes of what children appreciated. Parents also checked in with us, either by email or in conversation, offering us feedback and thanks. These statements of gratitude suggested that our weeklong program had been a success.
Children's appreciations follow:

- "My favorite thing is you [Rebecca]. I like the tree in back of 'Sister Mulberry', the one with the ponytails (i.e., a Banana Tree)."
- "My other favorite thing besides climbing Sister Mulberry and the dark tunnel is Sunny and you [Rebecca]."
- "I like the tire slide, the dark cave and the rat tunnel."
- "I like the deep, dark, darkest, dark-like-the-night tunnel; pretending I am a bad guy and I am going to jail; and playing with the wheelbarrow with the wooden blocks [painted branch blocks]."
- "I like Sister Mulberry Tree. And, when I took off my shoes it was tickly on my feet!"
- "I like climbing and climbing because we just have a Cherimoya [tree at home]. Our Cherimoya doesn't have that many roots."
- "I like the chickens!"

These heartfelt appreciations reflected that nurturing relationships were in place, a necessary foundation for learning and growing.

During the week, Rebecca and I found a balance between being prepared (teacher-directed thematic curriculum planning) and going with children's emerging themes (child-directed curriculum planning). We found our sweet spot: pre-planned, developmentally appropriate activities allowed us to have resources easily on-hand when children wanted them (e.g., water colors and journals). We also came to realize that children have a great capacity for self-directed engagement in this beautiful natural setting.

Figure 3: Journaling under the bean teepee.

What Did We Learn?

The *NAAEE Guidelines* state that, "Early childhood environmental education programs ensure opportunities for nature-based play and exploration, both indoors and outdoors" – something we wholeheartedly agree with. However, for our summer program we decided to provide an outdoor-only experience in order to more fully explore the benefits of the location we had arranged at the Fairview Gardens. We were not disappointed. We looked forward to using natural materials and loose parts that came directly from our surroundings. We also looked forward to providing some new activities like tree climbing that balanced risks with benefits and were not readily available at our licensed facility. We knew that what we had to offer would be enriched due to the partnership we had forged with Fairview Gardens Educational staff. This also worked out quite well, because the interns had familiarity with the farm property and EE than we did not. The partnership allowed for us to take advantage of the farm fully.

Figure 4: Tree climbing: an opportunity to practice risk assessment and build confidence

Social and emotional growth is also a key NAAEE guideline for nature education, and something Rebecca and I felt we already did well. I am a credentialed school psychologist who has made social emotional competency the focus of much of my life's work. Rebecca's gentle style of interaction with children helped create an environment that further supported the development and practice of empathy, communication, cooperation, and self-regulation.

Rebecca and I both were comfortable with the notion of having a planned curriculum, taking advantage of the many affordances the farm had to offer, and deviating from the plan if children's interests or serendipity pulled us in other directions. What was in bloom? What could be harvested? What could we shuck? What was there for us to discover?

We organized the schedule so children had ample opportunities to observe, discuss, investigate, and ask questions. The environment provided us with endless possibilities – the drainage culvert became the bear cave; the asparagus field became a jungle; the prolific elderberry shrubs became a source of dye and berries. Fairview Gardens also has a chicken coop. This provided us with an opportunity to support the development of empathy and self-regulation for some of the children as they learned that chickens don't like to be chased.

While the EE component of our program was undoubtedly enriched by the participation of permaculture interns, we also learned that skilled ECE teachers with a passion and comfort in the outdoors can serve children quite well in outdoor learning environments.

This summer marks the fourth consecutive year we have offered this program at the farm. At the end of each session, I ask the teaching staff what they noticed about teaching outdoors at the farm in contrast to teaching at school. Their responses at first astonished me (they shouldn't have, but they did). They reported that our nature-based week at Fairview Gardens resulted in:

- Fewer conflicts
- Simpler clean-up
- Less need to entertain
- Children were more engaged
- Children were more hands-on
- Children were better listeners
- Children were more reflective
- There were more appropriate risk-taking opportunities/ and children took full advantage of these opportunities
- Children worked more cooperatively and as a group

It is exciting to note that our teachers' responses resonate with other research investigating the benefits of outdoor programs in early childhood, like the PEER study on Forests Days in Vermont Kindergartens (Powers, 2017). The kindergarten teacher at Ludlow Elementary in Vermont, reported (pg. 11):

> "We see minimal conflict in the forest. We try to model solving your own problems, and we focus on how to negotiate, how to do a self-evaluation. We teach them about the difference between a safety hazard and a risk, and frankly this all happens with minimal prompting in the forest."

Figure 5: End-of-day circle time provides an opportunity to connect and reflect

What's to come?

Bit by bit we increased the '*natureness'* of our traditional parent cooperative preschool, with gratifying results. We have included opportunities for our children, parents and staff to connect with nature, inside, outside and beyond.

In the last year, staff and families collaborated in the launching of ***Saturday Family Adventures***. These monthly outings get families out into the beyond – exploring our local beaches at low-tide, visiting a local preserve managed by the Land Trust of Santa Barbara County, and taking hikes on our local trails.

This year, we have begun taking rain walks. We needed to make changes to our environment in order to accommodate rain coats and boots. Last spring, we installed outdoor pegs and a flagstone area underneath, so children had a place to store their gear. This fall, children come to school on rainy days eager and ready for time outdoors.

The governing board has also recently agreed to assemble a 'steering committee' to help us plan for the future. Hopefully, a commitment to increasing our '*natureness'* will be core to the future work we do. Meanwhile, I am filled with hope for future possibilities!

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Appendix A

KEY CHARACTERISTIC 1: PROGRAM PHILOSOPHY, PURPOSE, AND DEVELOPMENT
- Guideline 1.1—Focus on nature and the environment
- Guideline 1.2—Focus on education of young children
- Guideline 1.3—Culturally appropriate goals, objectives, and practices
- Guideline 1.4—Environmental literacy: board, staff, and providers
- Guideline 1.5—Health and safety
- Guideline 1.6—Ongoing evaluation and assessment
- Guideline 1.7—Partnerships
- Guideline 1.8—Interpersonal and intergenerational relationships

KEY CHARACTERISTIC 2: DEVELOPMENTALLY APPROPRIATE PRACTICES
- Guideline 2.1—Based on research and theory
- Guideline 2.2—Authentic experiences
- Guideline 2.3—Child-directed and inquiry-based
- Guideline 2.4—The whole child

KEY CHARACTERISTIC 3: PLAY AND EXPLORATION
- Guideline 3.1—Use of the natural world and natural materials
- Guideline 3.2—Play and the role of adults

KEY CHARACTERISTIC 4: CURRICULUM FRAMEWORK FOR ENVIRONMENTAL LEARNING
- Guideline 4.1—Social and emotional growth
- Guideline 4.2—Curiosity and questioning
- Guideline 4.3—Development of environmental understandings
- Guideline 4.4—Skills for understanding the environment
- Guideline 4.5—A personal sense of responsibility and caring
- Guideline 4.6—Physical health and development

KEY CHARACTERISTIC 5: PLACES AND SPACES
- Guideline 5.1—Spaces and places to enhance development
- Guideline 5.2—Natural components
- Guideline 5.3—Comfortable for both children and adults
- Guideline 5.4—Maintenance and usability
- Guideline 5.5—Health, safety, and risk
- Guideline 5.6—Environmental sustainability

KEY CHARACTERISTIC 6: EDUCATOR PREPARATION
- Guideline 6.1—Foundations of early childhood environmental education
- Guideline 6.2—Professional responsibilities of the educator
- Guideline 6.3—Environmental literacy
- Guideline 6.4—Planning and implementing environmental education
- Guideline 6.5—Fostering learning
- Guideline 6.6—Assessment and evaluation

Appendix B

Circle Time Songs at Nature Camp

May We Be Happy

May I be happy, may I be well
May I be safe and sound
May I be peaceful, may I be at ease
With love in my heart and all around

May you be happy, may you be well
May you be safe and sound
May you be peaceful, may you be at ease
With love in your heart and all around

May we be happy, may you be well
May we be safe and sound
May we be peaceful, may you be at ease
With love in our hearts and all around

My Roots Go Down

My roots go down, down to the earth.
My roots go down, down to the earth.
My roots go down, down to the earth.
My roots go down.
Many new verses have been created:
* I am a pine tree on a mountainside.
* I am a willow swaying in a storm.
* I am a waterfall skipping over rocks.
* I am a sunflower growing towards the sun.
* I am a mountain tall and strong.

Good Morning Song (Traditional Waldorf)

Good Morning Dear Earth (hands as if holding earth on abdomen)
Good Morning Dear Sun (stretch arms above head in a circular arc)
Good Morning Dear Trees (stretch arms to side, like tree branches)
And the Flowers Everywhere (hands holding flowers on ground)
Good Morning Dear Beasts (hands as if petting a dog, etc..)
And the Birds in the Trees (hands “fly” away like birds flying away)
Good Morning Dear You and Good Morning Dear Me. (hands reaching to each other, then hands cross over our chest)

The Garden Song

Inch by inch, row by row
Gonna make this garden grow
All you need is a rake and hoe
And a piece of fertile ground.

Inch by inch, row by row,
Please bless these seeds I sow,
Keep them warm and safe below

'Til the rains come tumbling down.

Pulling weeds, removing stones, we are made of dreams and bones,
Need a place to call my own upon the earth so grand.
Grain from grain, sun and rain, find my way through nature's chain,
Tune my body and my brain to the music of the land.

Inch by inch, row by row
Gonna make this garden grow
All you need is a rake and hoe
And a piece of fertile ground.

Inch by inch, row by row,
Please bless these seeds I sow,
Keep them warm and safe below
'Til the rains come tumbling down.

Blessing on the Blossoms

Blessings on the blossoms
Blessings on the roots
Blessings on the leaves and stems
And blessings on the fruit

Appendix C

Parent Flyer

The Oaks Nature-Based Summer Adventure Week

Summer Program:
This summer, we are providing a week-long outdoor nature-based program for 4 & 5 year-olds, currently enrolled at The Oaks PCW program. This program is suitable for children who are at ease with new experiences and who can follow directions (director's approval is required). The summer program will be located at Fairview Gardens. The summer program will be play-based, with opportunities to explore, discover, create and have fun. Children will have an opportunity to experience the following: field plans (activities in nature) and field guides (discovering and researching local flora and fauna); creative art projects and nature journaling. While daily activities may differ – we will begin and end each day with a circle time.

Philosophy:
Our summer program reflects the values and philosophy of the Oaks PCW program. Learning will be play-based and child-directed. We will emphasize the process of learning over content. We will provide children with the space and environment to explore, reflect, represent and connect with each other, within an outdoor setting. We will make time and space for childhood wonder and delight.

Preparations:
Children must come prepared for a busy half-day, outdoors. Please be prepared, by doing the following:

- Arrive at the designated location on time.
- Have your child use the toilet before drop-off.
- Have your child's bag or backpack, packed with the following:
    - Change of clothes, water, sack snack/ lunch
- Have your child dressed appropriately, including:
    - Appropriate shoes - Wear shoes that protect feet and that are comfortable for walking (no rain boots, sandals, crocs or cowboy boots, please); consider a hat.
- Apply sunscreen before drop-off.

Orientation: Wednesday, June 1, 6:45 – 7:15 pm, before our evening class.

Cost: $160/ 4-day week. To be paid by the end of the school year (June 10th)

Our Daily Routine
Drop-Off and Pick-Up: Please park in the back parking lot of the Christian Science Church, at 480 N. Fairview. Follow the signs, visible from the north-east corner of the parking lot, to Fairview Farm. We will gather at Sister Mulberry Tree.

9:00 am: Arrival & Morning Circle Time —Will we gather in the morning at Sister Mulberry Tree. During our morning circle time, we will check in and have each child contribute their ideas for the day. Activity options will be discussed. Free play, self-directed work and creative activities will follow. There will be opportunity for individual check-ins and small group activities as the morning unfolds.

10:30 am: Morning Snack - Children will break for a morning snack, provided by the parent. Filtered water is available at Fairview Gardens.

11:15 am – noon: Continued Activity Time until lunch.

Noon: Picnic Lunch - We will eat our sack lunches under Sister Mulberry tree, unless otherwise specified.

12:45 pm: End-of-the-day Circle Time — We will reflect on our adventures. Sing some songs, share and document our experiences.

1:00 pm: Goodbye—Children depart. Once again, please park in the back of the Christian Science Church parking lot and follow the trail to Fairview Farm.

Appendix D

Plant Protector and Caterpillar protector Pledges

An intervention was needed. Young plants were being pulled out of the garden boxes and monarch caterpillars were being plucked off the Asclepias/ Milkweed, Monarch's only food source. After calling a school-wide meeting, children decided they would be protectors of plants and caterpillars. When children felt they were ready for this commitment, they would ask Sunny, the director, if they could take one of the following pledges.

> "I promise to be a plant protector; gently harvest with two hands so the roots can remain in the soil, and only harvest what I will eat or feed to the bunnies" or "I promise to be a caterpillar protector. I will study them with my eyes and allow them to grow strong on their host plants."

Once the pledge was made, a small stamp sized "plant protector" or "caterpillar protector" was ceremonially taped to the child's name tag (see Figure 2). Children would shake hands to bind their pledge. While this practice was initially suggested by the writer, it actually is maintained and perpetuated by the children. These are commitments they are proud of.

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