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Educational Environments and Practices Associated with Enhancement of Children's Nature Connectedness in Early Childhood Education: A Scoping Review

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ABSTRACT

This scoping review explored, what kind of educational environments and practices have been used when children's nature connectedness in early childhood education has been studied. While the beneficial influence of forest preschools – and others alike based on substantial nature contact – is well-established, little is known about how ordinary early childhood education units could enhance children's nature connectedness. Earlier studies have shown nature connectedness to have wide beneficial consequences related for example to mental and physical health, prosocial, and pro-environmental inclinations. We included in the scoping review empirical studies with different setups that concerned children attending early childhood education and reported the association between certain educational environments or practices and children's nature connectedness. We searched six online databases and included 14 studies in the scoping review. We found that some practices were associated with enhanced nature connectedness more often than others. Indigenous perspectives, stories about nature, and personizing nature were associated with enhanced nature connectedness every time but only rarely mentioned. More often mentioned practices with substantially high association (over 75%) were taking walks or hikes in nature, structured play in nature, using empathy and caring or sense experiences in enhancing nature connectedness, and teaching arts and music or autonomy in nature. To a large extent, however, the existing research does not sufficiently describe what is actually done and in which kinds of surroundings: More detailed research is needed, focusing either on one educational environment or practice at a time, or conducting more specified reports of interventions consisting of several practices.

***Keywords*:** human-nature connection; biophilia; early childhood education; environmental education

The objective of this scoping review was to follow a systematic approach to map evidence regarding the kind of educational environments and practices that are associated with an enhancement of children's nature connectedness in early childhood education (ECE). During recent decades the research on human-nature connection and its effects on physical and psychological well-being, prosocial inclinations, and pro-environmental behavior have been under growing interest (systematic reviews e.g. Andersen et al., 2021; Barragan-Jason et al., 2022; Houlden et al., 2018; de Keijzer et al., 2016; Mackay & Schmitt, 2019; McMahan & Estes, 2015; Oh et al., 2017; Putra et al. 2020; Roberts et al., 2019; Shuda et al., 2020; Stevenson et al., 2018; Trøstrup et al, 2019, Twohig-Bennett & Jones, 2018; Weeland et al., 2019; Whitburn et al., 2019). The reviews

show that mere contact (i.e., exposure) with nature in itself elicits many positive effects. Moreover, it has been suggested that an added subjective experience of connectedness with nature mediates the positive effects that contact with nature can have (Liu et al., 2022). Although there are many concepts for nature connectedness, and different scales with which to measure them, most of them, related to studies with adults, have been found to correlate strongly (Tam, 2013). In the context of ECE research, for example such concepts as connection to nature, affinity toward nature, biophilia, nature appreciation, love of nature, close/empathetic/emotional relationship with nature, positive attitude toward nature, environmental consciousness, eco-friendly attitude, or nature relatedness have been in use. Nature exposure also comes in many forms: for example, forest trips, natural yards, gardening, or biowalls in the facilities. In this scoping review, the different forms of nature contact and all the different relevant concepts of subjective nature connectedness are jointly referred to as human-nature connection (HNC).

A gap in the research on environmental education – often a corner stone for enhancing nature connectedness – in early childhood education was identified 15 years ago (Davis, 2009). Since then, interest in the importance of environmental education and specifically nature connection in young children's education has been expanding rapidly (Systematic reviews, e.g. Dankiw et al., 2020; Tillmann et al., 2018; Mygind et al., 2019; Sella et al., 2023; Arola et al., 2023; Mygind et al. 2020; Johnstone et al. 2022; Putra et al. 2020; Ernst et al. 2021; Whitburn et al. 2019). Although the concepts and measurements used in research with children vary to a great extent, to our knowledge, a correlational analysis of different concepts, similar to that of Tam's (2013) of adult nature connectedness, has not been conducted. Furthermore, reviews on this topic frequently report problems such as lack of randomization, lack of control groups or before-after measures, small sample sizes, and heterogeneity of the methods used (For an overview, see for instance Beery et al., 2020). All in all, the research into children's HNC is not as advanced as it is with adults.

Previous research has emphasized outdoor situated ECE units. However, spending all or most of the time outdoors in natural areas is not easy to implement in every daycare centre, for instance in urban ECE units. It is thus of interest to review more specifically, what kind of smaller everyday choices concerning educational environments and practices are present in the studies that measure or report enhancement of nature connectedness. In this scoping review, we combine knowledge provided by varied research methods and different kinds of interventions to reach a comprehensive overview of the topic.

Young children's subjective experience of nature connectedness has been somewhat understudied compared to that of older, primary school children and adolescents. One explanation could be that until recently, when Sobko et al. (2018) provided the first validated tool for measurement, there had not been a validated measurement tool to test children under 8 years old. The methodology in the field has varied, ranging from interviewing or surveying parents or daycare personnel to "games testing", interviewing children with puppets or pictures, observing everyday life, and analyzing drawings.

Conducting a systematic review in these circumstances would be premature. A scoping review can be used to summarize findings that are heterogenous in their methods. The choice of conducting a scoping review instead of a systematic review was also justified with the exploratory aim of this review: In a scoping review, research questions can be broader and it is possible to identify in an exploratory manner certain specific characteristics in the selected sources of evidence, map them, and produce an overview of the topic. Additionally, a scoping review can be used to determine the value of undertaking a systematic review in the future by examining the extent, range, and nature of the evidence in the field of study in question. (Peters et al., 2020.)

According to a preliminary search into the databases, no reviews on this topic were found to be published or pre-published. One study with a similar approach was identified (Ardoin et al., 2020), but instead of subjective nature connectedness, the focus was on environmental education.

Research Question

The scoping review was guided by this question: "What kind of educational environments or practices applied in early childhood education are associated with enhancement of children's nature connectedness?"

Inclusion criteria

The inclusion/exclusion criteria for the review were defined using the PICOS framework (population, intervention, comparison, outcome, study design; Amir-Behghadami and Janati, 2020.)

As for **Population**, we included all studies on children attending ECE that implemented some educational environments and practices to enhance nature connectedness. We excluded studies on children with special physical or psychological conditions, single-case studies, and studies that had both ECE and primary school aged children and did not report the results separately.

Concerning **Intervention**, we included only studies that measured or reported whether there is an association between an enhanced nature connectedness of children and at least one educational environment or practice applied by the ECE unit.

As for **Comparison**, we included studies with and without a comparative design: pretest-posttest setups, control group setups, longitudinal setups, different combinations of those, and studies that merely reported the evaluations of parents or educators concerning possible changes in children.

The inclusion criterion for the **Outcome** of the study was "all relevant definitions/concepts of children's nature connectedness". Due to the research field having no settled, established definition or concept for nature connectedness, any study having to do with a relationship or emotional/cognitive connection or relatedness with nature was included. For example, concepts such as connectivity, immersion, respect, appreciation, commitment, love, affinity, and empathy toward nature, or environmental identity, consciousness, or awareness have been used.

Concerning **Study design**, we included all qualitative and quantitative empirical studies and all randomized, non-randomized, or cluster-randomized study designs. This decision was based on the presumption of finding only a few fully randomized trials. We excluded grey literature, and the included literature was restricted to peer-reviewed articles and relevant dissertations. The authors were aware that qualitative research might be more reachable in some of the grey sources. However, as the review was expected to include also non-randomized and possibly even non-comparative studies with small sample sizes, the peer-review of included material was considered important in making the results stand on firmer ground.

For more detailed information on the inclusion criteria, please contact the first author.

METHODS

We conducted this review following the PRISMA-ScR checklist for preferred reporting items for scoping reviews in accordance with an *a priori* protocol (Salmi et al., 2023, https://osf.io/jy29v/). The most central deviations from the protocol are reported and justified in the appropriate section of the methods (but a more precise list can be accessed by contacting the first author).

Search strategy

We searched six databases: PubMed, Web of Science, Scopus, ERIC (Ebsco), Education Database (ProQuest), and PsycINFO (Ebsco). In the databases that gave the option to do so, we limited the search to studies in English. The searches were conducted on 21 November 2023. Monthly alerts for subsequent hits for the search queue were ordered from Web of Science, ERIC, Education Database, and PsycINFO. The alerts did not provide articles that would have fit the inclusion criteria.

IS and VM developed the search strategy by going through relevant systematic reviews, meta-analyses, and singular studies to identify appropriate search terms. In addition, we conducted preliminary searches in the databases to refine the search queue. During the process, an information specialist evaluated the strategy, and we modified it accordingly. The search focused on three points: (1) outcome: nature connectedness, (2) population: early childhood education, and (3) intervention: educational environment or practice. For more information about the full search strategies, the first author may be contacted. We used the same search terms in all databases:

("nature contact*" OR "immersion in nature" OR "nature connect*" OR "connection to nature" OR "connection with nature" OR "commitment to nature" OR "connectedness to nature" OR "connectivity with nature" OR "connectivity to nature" OR "emotional affinity toward nature" OR "environmental identit*" OR "inclusion of nature in self" OR "inclusion with nature" OR "nature relatedness" OR "relationship with nature" OR "disposition to connect with nature" OR "human-nature" OR HNC OR "human-environment" OR "nature experience*" OR "environmental consciousness" OR "affinity with the biosphere" OR "affinity with nature" OR biophil* OR "nature-deficit disorder" OR ACHUNAS OR "nature-based" OR "enviro-kindy" OR "nature-human" OR "emotional affinity towards nature" OR "bioaffinity" OR "bio-affinity" OR "significant nature situation*")
AND
("early childhood" OR preschool* OR "child care" OR "daycare" OR "day care" OR childcare OR kindergarten OR "ECE" OR "ECEC" OR "ECEfS" OR "young child*" OR "preprimary" OR nurser* OR "early elementary" OR "early primary")
AND
("outdoor classroom*" OR "eco-school*" OR "ecoschool*" OR "nature journaling" OR "Reggio-Emilia" OR "forest school*" OR "forestschool*" OR "forest kindergarten*" OR practic* OR implement* OR program* OR strateg* OR project* OR intervention* OR method* OR "educational setting*" OR "learning activit*" OR pedagog* OR didact* OR "learning environment*" OR "educational environment*" OR "nature play*" OR "eco-early childhood education" OR "nature education*" OR "outdoor education*" OR "nature-based pre-primary program*").

In addition to the database searches, IS and VM searched additional records from the reference lists of included articles and other systematic reviews and meta-analyses conducted in the area of nature connectedness and early childhood education. IS and VM also searched their article collections for further relevant material.

Study selection

IS and MH managed the records of the search with Zotero reference management software. IS and MH processed and selected reports independently through each phase, negotiated conflicts of judgement, and acquired a third opinion whenever needed from PS.

Before screening, duplicates were removed. IS and MH then screened the titles and abstracts against the inclusion/exclusion criteria. In this phase, they included all articles that appeared to meet the inclusion criteria along with all cases where there was any uncertainty. Throughout the process, they documented all decisions of irrelevance by naming (at least one of) the specific eligibility criteria the report did not fulfill.

From the first reading in the abstract and title phase, IS selected 57 records and MH selected 44 records for the second round. Of these, there were 37 common records. After negotiations, two records were excluded from the list of IS: Johnson (2015) for not being an ECE study and Guardino et al. (2019) for including disabled children. From the list of MH, four records were excluded: Sella et al. (2023) and Johnstone et al. (2022) for being systematic reviews and two book chapters from Cutter-MacKenzie (2014a & 2014b). Therefore, 62 records in total were selected for the full-text screening phase.

The eligibility process continued with full-text screening to decide whether the obtained articles met all the inclusion criteria. In this phase, IS and MH linked reports concerning the same study together. The most often used criteria for exclusion were that the study did not (1) measure the nature connectedness of children or describe a change in it; (2) did not report any practices or educational environments; or (3) did not concern children participating ECE, or concerned them only partly and without separating the results.

The most difficult decisions concerned whether the definition or concept used could be categorized as “nature connectedness” in the sense described in this review. IS and MH excluded for instance “human–environment relationship” in Cengizoglu et al., 2022, where it was further described as “children’s perceptions about sustainability”. The latter definition did not seem to indicate an experience of being connected with nature.

IS and MH compiled a list of excluded studies to inform the reader about refined reasons for certain studies not fulfilling the eligibility criteria. The list does not include reports discarded by both reviewers due to obvious irrelevance. Rather, it includes the studies of which IS and MH had to negotiate to reach an agreement of exclusion. The full list can be accessed by contacting the first author, but for instance, there were studies where

the concept of nature connectedness was further described in a manner not consistent with our idea of subjective nature connectedness. There were also studies that otherwise fulfilled all the inclusion criteria, but did not report a *change* in the subjective nature connectedness. The results of the search and the study inclusion process are reported and presented in Figure 1, in a PRISMA flow diagram (Page et al., 2021).

As a result of the full-text screening, both IS and MH selected independently the following nine reports to be included in the review: Barrable and Booth (2020), Cordiano et al. (2019), Hu (2022), Jorgensen (2016), Lee et al. (2021), Lithoxoidou et al. (2017), Omidvar et al. (2019a), Omidvar et al. (2019b), and Yilmaz et al. (2020b). The following seven reports were selected by either IS or MH and their inclusion/exclusion was negotiated: Ashmann (2018), Boileau and Dabaja (2020), Cengizoglu et al. (2022), Deniz and Kalburan (2022), Donison and Halsall (2023), Glettler and Rauch (2020), and Yilmaz et al. (2020a). After negotiations, IS and MH included Deniz and Kalburan (2022) and Glettler and Rauch (2020). Hence, we included eleven reports in the scoping review. We identified two of these as part of the same study (Omidvar et al. 2019a and Omidvar et al. 2019b): thus, ten studies were included in the scoping review through the database search.

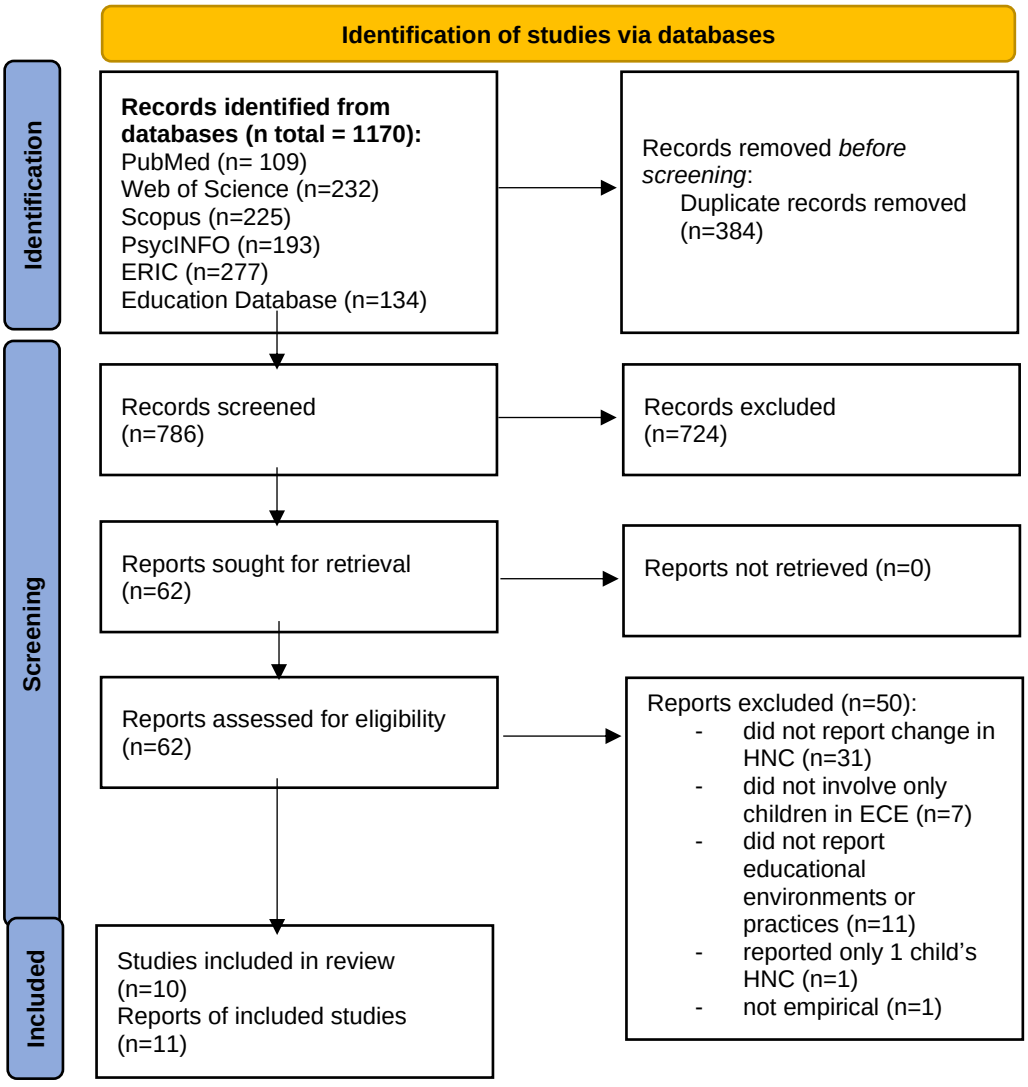

Figure 1. The PRISMA flow diagram describing the selection process.

In addition, four studies were included in the review through snowballing from the reference lists of previous, closely related systematic reviews and meta-analyses and the studies included through the eligibility process. IS and MS conducted the inclusive selection of these four articles. The articles are the following: Acar and Torquati

(2015), Cincera et al. (2017), Elliot et al. (2014), and Rice and Torquati (2013). Thus, in total, the current scoping review consists of 14 studies.

It should be noted, that the results of this review should not be taken as an overview of the status of research on nature connectedness of children participating in ECE as a whole: considerably many studies on the subject were excluded due to a lack of specific description of the environments and practices.

Data extraction

Data from the studies fulfilling eligibility criteria was managed with Zotero and Microsoft Excel. IS and VM conducted the piloting tool for extracting data from the included studies. IS and MS calibrated the piloting tool before data collection to detect possible misunderstandings, difficulties, or ambiguities.

IS extracted the data twice, first before the calibration to reach an overview and then at the same time with MS. After the independent data extraction phase, IS and MS conducted a rereading together concerning the points of disagreement, and to extract data which was added or specified in the data extraction tool during the iterative process. Any suggestions on changes to the categories or other extracted data were negotiated during the first round to achieve a unanimous final form for the data extraction tool.

Also in the data extraction phase, in cases of unclarity, PS gave a third opinion. During the process, IS and MS noticed that the topic and approach of the review resulted in multiple situations involving highly interpretative decisions: many negotiations followed, in order to reach joint interpretations. In cases where the reports offered inconsistent information about the study, IS and MS relied firstly on the knowledge provided by the result section with its tables and figures, then by conclusions, methods section, and abstract.

In the protocol, we had planned that a separate data extraction tool would be developed for qualitative studies, one following the tool used with quantitative studies to an appropriate extent. However, we had no difficulties using the same tool for quantitative and qualitative studies.

The piloting tool was created partly relying on other closely related systematic reviews and meta-analyses, partly on the Assessment framework for Children's Human Nature Situations (ACHUNAS) created by Giusti et al. 2018, the biophilic design created by Stephen Kellert (f. ex. Kellert & Calabrese 2015), pedagogy for connection created by Alexia Barrable (2019), and other sources concerning ECE and nature connectedness (e.g. Larimore, 2018; Mohammed et al., 2023). ACHUNAS is a framework that consists of 16 elements to pay attention to in nature situations: entertainment, thought-provocation, awe, mindfulness, intimacy, surprise, creative expression, physical activity, engagement of senses, involvement of mentors, involvement of animals, social/structural endorsement, structure/instructions, child-driven, challenge, and self-restoration, as well as 10 abilities of HNC that help in assessing the breadth and depth of a child's nature connectedness. Biophilic design consists of different aspects to bring nature inside the facilities; natural colors, water, fresh air, sunlight, plants, animals, natural materials, and views of nature and habitats (Kellert & Calabrese, 2015). The pedagogy for connection by Barrable (2019) involves four important elements to build nature connectedness of children: regular time spent in nature, building compassion toward non-human species, engaging in nature's beauty, and practicing mindfulness.

In the final data extraction tool, the information gathered of the educational environments and practices were: the name of the intervention or practice if any; general description of the intervention; the total length of the intervention; frequency of the intervention; the duration of the intervention; the study setup/ experimental design if any; if there was no experimental design, how the change was described; changes conducted in the yard as part of the intervention; (at least or only) occasional trips to nature; every day in nature; (only) every week in nature; place attachment (i.e. often in the same natural place); hikes or walks; observation or exploration; gardening; unstructured play or activities; structured play or activities; risky play (such as climbing trees); free hang-around time, that was not playing or some specific activity; meditation or mindfulness; solitary time in nature (without the immediate presence of adults or peers: they may be close by but not in contact); and play or art with natural or loose parts inside/outside. Furthermore, we checked whether the intervention focuses specifically on sense experiences, or giving opportunities for helping, caring, empathy, or imagination and creativity as means to enhance nature connectedness. Other included practices and environments were personizing nature (such as giving names and inventing life stories to trees); the influence of peers in enhancing

nature connectedness; fairytales or stories about nature; discussions about nature; contact with animals; pictures or posters of nature in the facilities; house plants; planting from seeds or scratches; a natural view from the window; other indoor natural or biophilic elements (natural colors, water, fresh air, sunlight, natural materials); additional goal with nature connectedness to teach mathematics, sciences, arts and music, social skills, empathy, and emotional development, or autonomy, self-care, resilience and self-confidence; and, implementing indigenous perspectives as means to enhance nature connectedness (for example, Native American poetry). The latter was added in the iterative process and was detected with key words (Indigenous, aboriginal, native, ancestral, animism, Indian). During the construction, calibration, and iterative data extraction, some of the information planned to be extracted in the protocol was amended. For the full metadata of the final data extraction tool or the full list of amendments, please contact the first author.

Data analysis and presentation

Although we did not restrict the searches with any time limits, the included studies were all quite recent, the oldest one being conducted 11 years ago. Six of the studies were conducted during this decade, eight of the studies during 2010's. The included studies were dominantly Western-based: six of them were conducted in USA or Canada, seven in different countries in Europe, one in Turkey, and one in South-Korea. Furthermore, the sample in this review was predominantly based on urban children: none of the studies reported having studied only rural ECE units, and only one had both rural and urban ECE units included.

Of the 14 studies selected for the review, none reported having a randomized study design. Three studies had a sample of over 100 children, two studies had a sample of 50-60 children and most of the studies (9) had a sample of less than 36 children. The biggest sample size was 419 children, while the smallest was 20 children. Three studies used a pretest-posttest setup, three used a control group, and two had a longitudinal setup. Different mixtures of these setups were used in four studies. The duration of the interventions or study periods varied from 4 weeks to 2 years: one study lasted 2 years, three studies had a duration of one school year, three studies used interventions of 7-10 months, two studies lasted 1-3 months and the rest (5) did not use pretest-posttest or longitudinal setups. Two studies had no comparative setup at all: they conducted the measurements only one time without a control group. Four studies were qualitative, six studies were quantitative, and the rest (4) were both qualitative and quantitative. Half of the studies used statistical analysis.

The measurements used were versatile, and often more than one method was used. Ten studies reported interviews with children, five studies reported questionnaires or interviews with either parents or the educators, and five studies reported observation. Action research, experimental research, game-like assessment, drawings, narratives, photography, and questionnaires with pictures were all mentioned one or two times.

The concepts used for nature connectedness varied to a great extent. Connection to nature was used by four studies, affinity toward/with nature by three studies, and biophilia by two studies; other concepts used were nature appreciation, love of nature, close relationship with nature, emotional connection and positive attitude toward nature, sense of wonder and environmental consciousness, eco-friendly attitude, empathetic relationship with nature, biophilic tendencies, empathy and prosocial behavior toward peers and nature, and nature relatedness. Often, the studies did not restrict themselves to just one concept or description.

Ten studies reported a positive change in the nature connectedness of children. The change in children was further described in many ways. For instance, children were found to be more interested in the emotional needs of other beings, to be more eager to take action, and to place more value on the ecosystem; to develop more prosocial behavior toward nature; to have more pro-environmental or nature-friendly attitudes; to creatively build a personal relationship to the natural world; to become intertwined with and create meaning within the natural environment; or, to love being outdoors and be interested in nature.

Two studies reported no change, and two had controversial results: In Omidvar et al. (2019), over half of the participating children did not seem to understand the picture-assisted questions, for they answered to all either "yes" or "no" – as a whole, the sample did not show enhanced nature connectedness, but among the children who understood the questions, enhanced nature connectedness was detected. In Glettler et al. (2020), the comparison with a control group showed some similarities and some disparities when it comes to nature connectedness; in the test group all children "clearly" loved nature, but in the control group the children only eventually "learned to appreciate the outdoor time". However, in both groups, children "feel very strongly about

their natural environment, react emotionally in situations when they experience something that they perceive as harmful to nature."

The studies reported several limitations with regard to their own research practices. Small sample sizes, problems with diversity of the sample, and the exclusion of the influence of other factors were most often mentioned. As this is not a systematic review, we did not conduct risk of bias assessments, and thus, the findings presented are only indicative at best. For detailed information about the studies, see Table 1.

Half of the participating ECE units in the reviewed studies spent time in nature daily. Two studies concerned units that spent all their time in nature, one study reported nature trips weekly and one only occasionally. The rest of the studies (3) did not report how often nature was visited. Moreover, an overlook on the short descriptions on the interventions in table 1 shows, that nine of the studies emphasized more, or deeper, outdoor time.

Some of the studies measured the effects of only one specific intervention. These included setting up a biowall inside the facilities (Lee 2021), changes in the yard (Rice & Torquati 2013), and gardening (Deniz & Kalburan 2022). Other studies implemented different kinds of multimethod pedagogical approaches. Some reported the educational environments and practices with great detail, but many studies were not specific in describing the methods used. This was a distinctive problem: the most often used categorization in our scoping review was "usage not specified": it was categorized in 60% of the cases, while "yes, this was used" was categorized in 36% and "no, this was not used" in 4% of the cases. Therefore, all the results should be taken with caution: it is possible that many of the environments and practices were present in more studies than this review is able to show.

The most reported environments and practices were the use of creativity and imagination (9), observation and exploration (9), discussions about nature (9), child-centeredness (8), and contacts with animals (8) (see Figure 2). Furthermore, different pedagogical goals along with enhancement of nature connectedness were often implemented – teaching autonomy (9), social skills, empathy, emotional development (9), and arts and music (8).

As Figure 2 shows, the least used methods were meditation and mindfulness (in none of the studies), playing and doing art with natural or loose materials inside the facilities, changes in the yard, and natural view from the window (in one study each). These may be things that the original researchers did not collect information about, or did not find important enough to report in the articles, so one cannot infer that these methods were not used: only, that they were not reported.

Table 1.
Introduction to the selected studies.

Study and country	**Change in HNC**	**Qualitative/ quantitative & set-up**	**N/ test group (**control group**)**	**Intervention or program**	**Methods**	**HNC concept**	**Findings**	**List of limitations by the authors**
Cordiano et al. (2019), USA	no	quantitative pretest-posttest (1 school year), control group & longitudinal	12 (14)	Nature-based pre-primary program based on Eco!Wonder, with more outdoor time than required in the program (90% of time between 9.00-11-45)	Children's Attitudes Toward Nature (CATN, created for the study), rating forms completed by parents and educators	Nature appreciation	No significant differences were found between the traditional and the nature-based groups	Generalizability: small sample with high socio-economic background; no control group; not randomized; also the control group participated in Eco!Wonder.
Lithodoxiou et al. (2017), Greece	yes	quantitative & qualitative pretest-posttest (1 school year) & control group	17 (no mention about the size of control group)	Diverse methods during the schoolyear to improve environmental ecocentric orientation and especially empathetic relationship to nature	Interview, action research, experimental research	Empathetic relationship with nature	Children in the experimental group were (1) more interested in the emotional needs of other beings, (2) more eager to take action, (3) more emotionally active and (4) placed more value of the ecosystem than children in the control group. Furthermore, their environmental orientation increased while egocentrism and society - centered orientation were reduced.	Does not list limitations.
Elliot et al. (2014), Canada	yes	quantitative & qualitative pretest-posttest (7 months) & control group	21 (22)	Own program with forest school as a model, guiding principles: (a) connecting deeply with nature through play; (b) local ways of knowing and understanding; (c) physical and mental health; (d) learning collaboratively as part of an empathetic community, and (e) the environment as a co-teacher.	Observation, interviews, game-like assessments (Evans et al., 2007), digital photography by children and researchers, drawings, and narratives.	Nature relatedness	There was a (nonsignificant) trend for children in the nature kindergarten to have higher nature relatedness scores at the beginning of the school year. The initially nonsignificant difference between groups turned into a significant cumulative difference by the end of the year: scores in nature kindergarten increased, those of control group declined.	Small sample size.
Acar & Torquati (2015),	yes	qualitative	50 interviews	Own program that provided extended	Running record observations	Empathy and prosocial behavior	Children are able to develop prosocial behaviors toward nature	Does not list limitations.

USA		longitudinal (two years) & control group	more observed	experiences in natural settings and supported children's development of empathy and prosocial behavior toward peers and nature.	(2 years), interviews with children	toward peers and nature	through well-planned and -implemented activities in nature.	
Cincera et al. (2017), Czech Republic	yes	qualitative & quantitative pretest-posttest (8 months)	419	Eco-school: students design their own action plan for improving their school's environmental policy whereas teachers help with facilitating the process.	Interview with a picture-based questionnaire for children, interview with teachers	Connectedness to nature	Statistically significant increase in the children's pro-environmental attitudes.	No control-group; possible variation in the way in which teachers administered the questionnaires.
Lee et al. (2021), South Korea	yes	quantitative pretest-posttest (3 months)	60	Installing a biowall	Children's Attitudes Toward Scale-Preschool version (CATC-PV) (Hur, 2001; Musser and Diamond, 1999): an interview with pictures	Eco-friendly attitude	The children's eco-friendly attitude scores were higher 3 months after the installation of the biowall (compared to pre-installation scores). Under the two subcategories for the eco-friendly score, the Nature Friendly Attitude improved, while Environmental Conservation Attitude did not significantly improve over the course of the study.	The potential for children's maturation over the course of the experiment excluded; the influence of other environmental factors excluded; subject group should be bigger and broader.
Yilmaz et al. (2020), Turkey	yes	Quantitative pretest-posttest (1 month)	40	Nature-based education program with 12 semi-structured activities in a natural area.	Children's Biophilia Measure (Rice & Torquati, 2013): Visually supported scale	Affinity toward nature (biophilia) / biophilic tendencies	The results showed that a short-term, nature-based education program in a natural area was effective in terms of increasing children's affinity toward nature. The improvement in children's level of biophilia after the implementation of the program was statistically significant.	The nature-based education program was short in time, a longer program could be more effective to measure the effect; lack of any follow-up data.
Hu (2022), Canada	yes	qualitative longitudinal (school year)	28	Nature journaling	Qualitative action study: lesson plans, student work samples, researcher's reflective journals	Connection to nature	Nature journaling is indicative of creatively building personal relationships with the natural world.	Does not list limitations.
Jorgensen (2016), Norway	yes	qualitative longitudinal (10 months)	34	Daily practice of staying outdoors in nature-	Sensory ethnography (Pink, 2009) observation,	Sense of wonder, environmental consciousness	The study contributes to the understanding of preschool environmental education. The two main	Does not list limitations, but mentions that "The Norwegian culture

				dominated areas.	informal conversations, photographs		concepts, 'the sense of wonder' and environmental consciousness, are ways to elucidate how the children were intertwined with and created meaning within the natural environment.	is regarded as having a positive attitude to outdoor activities (…) This is to be considered as a cultural aspect of influence on the practice".
Barrable & Booth (2020), United Kingdom	yes	qualitative control group	132 (84)	Nature nurseries: settings that have a continuous outdoor provision, with no permanent indoor access.	Connection to Nature Index for Parents of Preschool Children (CNI-PPC, Sobko et al., 2018)	Connection to nature	Children in nature nurseries tended to score higher in CNI-PPC than children in traditional nurseries. Children's connection to nature was connected to parental nature connection, and total time spent in attendance of an outdoor nursery.	Parental reporting shows adult's perception, which has been shown to have low consistency with self-reports; no evidence of causality.
Glettler et al. (2020), Austria	partially	quantitative control group	15 (14)	Outdoor learning: mornings from 8:30 am to 1:30 pm outdoors	Semi-structured interviews with children and educators, observation, and a questionnaire for parents	Close relationship with nature, emotional connection and positive attitude toward nature	All children in the test group loved being outdoors and were interested in nature, but there was more variance in the control group (also nature-oriented primary school, but not a forest school/kindergarten). Children in both groups felt very strongly about their natural environment, and reacted emotionally in situations when they experienced something that they perceived as harmful to nature.	The authors call for studies on the influence of parents' attitudes, background information (cultural, family history), and longitudinal studies.
Rice & Torquati (2013), USA	no	quantitative control group	68 (46)	Outdoor classrooms: a specific program for enhancement of the outdoor play area to increase children's access to nature.	A semi-structured, role-playing interview using puppets	Affinity for nature / biophilia	There were no significant differences between the total biophilia scores of children attending ECE with and without natural playground elements.	Ambivalence with the concept of green-ness of a yard; mostly families with high education and income; lack of measurement of (1) time spent in other natural areas, (2) how much time spent in nature, (3) teachers' and parents' attitudes toward nature, (4) how long the child has participated in the program.
Omidvar et al. (2019a, 2019b), Canada	partially	qualitative & quantitative no comparative setup	20	Reggio Emilia pedagogy, where the educators have "respect for the natural	Games Testing for Emotional, Cognitive and Attitudinal Affinity with the Biosphere	Cognitive, emotional, and attitudinal affinity with nature	Among the children who seemed to understand the questions (11/20), the responses show some emotional	Children's weak emotional bioaffinity may be due to the deficiencies of the pedagogical

				world, which provides children with an integration of self and nature". (Omidvar et al. 2019b, 221.)	(Giusti et. al., 2014), interviews, observation, inventory (according to biophilic design)		affinity with nature, but not in the whole sample. According to Omidvar et al., contrary to the values of Reggio Emilia pedagogical approach, in this study the teachers' emphasis on anthropocentric goals was higher than on nature-related educational goals.	approach itself, its implementation in the two ECE units tested, the research instrument in testing bio-affinity amongst this age group, or its application in this context.
Deniz & Kalburan (2022), Turkey	yes	quantitative no comparative setup	20-60 (4 x teacher interview. Does not report specific group sizes)	School gardening	Semi-structured interviews	Love of nature	The educators reported that school gardening had positive effects on the development of a love of nature and ecological sustainability knowledge.	Small size of the study group, only interviews.

To reach an understanding of which educational environments and practices were present when an enhancement of nature connectedness was reported, cross-tabulations were conducted. The results indicate that there is no one means that was present in all 10 studies that reported enhancement in nature connectedness.

All the studies that reported using Indigenous perspectives (key words used here were Indigenous, aboriginal, native, ancestral, animism, and Indian; in practice, they showed for example as poetry), personizing nature (for example, giving a name and coming up with a life story for a tree) and telling stories about nature, reported an enhanced nature connectedness. However, they were mentioned only rarely: Indigenous practices and personizing nature in three studies, storytelling in four. Also, those ECE units that reported spending all their time in nature all reported enhanced nature connectedness, but there was only two of them.

The use of (1) empathy and caring and (2) sense experiences as tools to enhance nature connectedness, (3) hikes or walking in nature, and (4) structured play in nature were associated with enhanced nature connectedness in 83% of the cases (in five out of six studies). Of the studies that reported regular visits to the same place (place attachment), 71% also reported enhanced nature connectedness (five out of seven studies). Teaching arts and music in nature was associated with enhanced nature connectedness 75% of the times they were mentioned (six out of eight studies) and out of studies that mentioned teaching self-care, autonomy, self-confidence, responsibility, or resilience, 78% reported positive changes in nature connectedness (seven out of nine studies).

(1) Observation and exploration, and (2) creativity and imagination as means to enhance nature connectedness, (3) social, emotional and empathetic development as a co-goal, and (4) discussions about nature were often used methods (all were reported nine times), out of which 67% reported positive changes in the nature connectedness of children. Enhancing social skills, empathy and other emotional development as a co-goal were also mentioned in nine studies, out of which 67% reported positive changes.

Of the seven studies that reported spending time in nature daily, 57% reported enhanced nature connectedness. The same applied to using unstructured play as a method. Child-centeredness and contact with animals were both reported by eight studies, of which 62% reported enhancement in nature connectedness, gardening was reported in six studies, out of which half reported enhanced nature connectedness, and 40% of studies that reported playing or doing art with natural or loose materials outside (two out of five studies) reported nature connectedness. Playing and doing art with natural or loose materials inside and natural views from the windows were both reported by one study only. Neither reported enhanced nature connectedness.

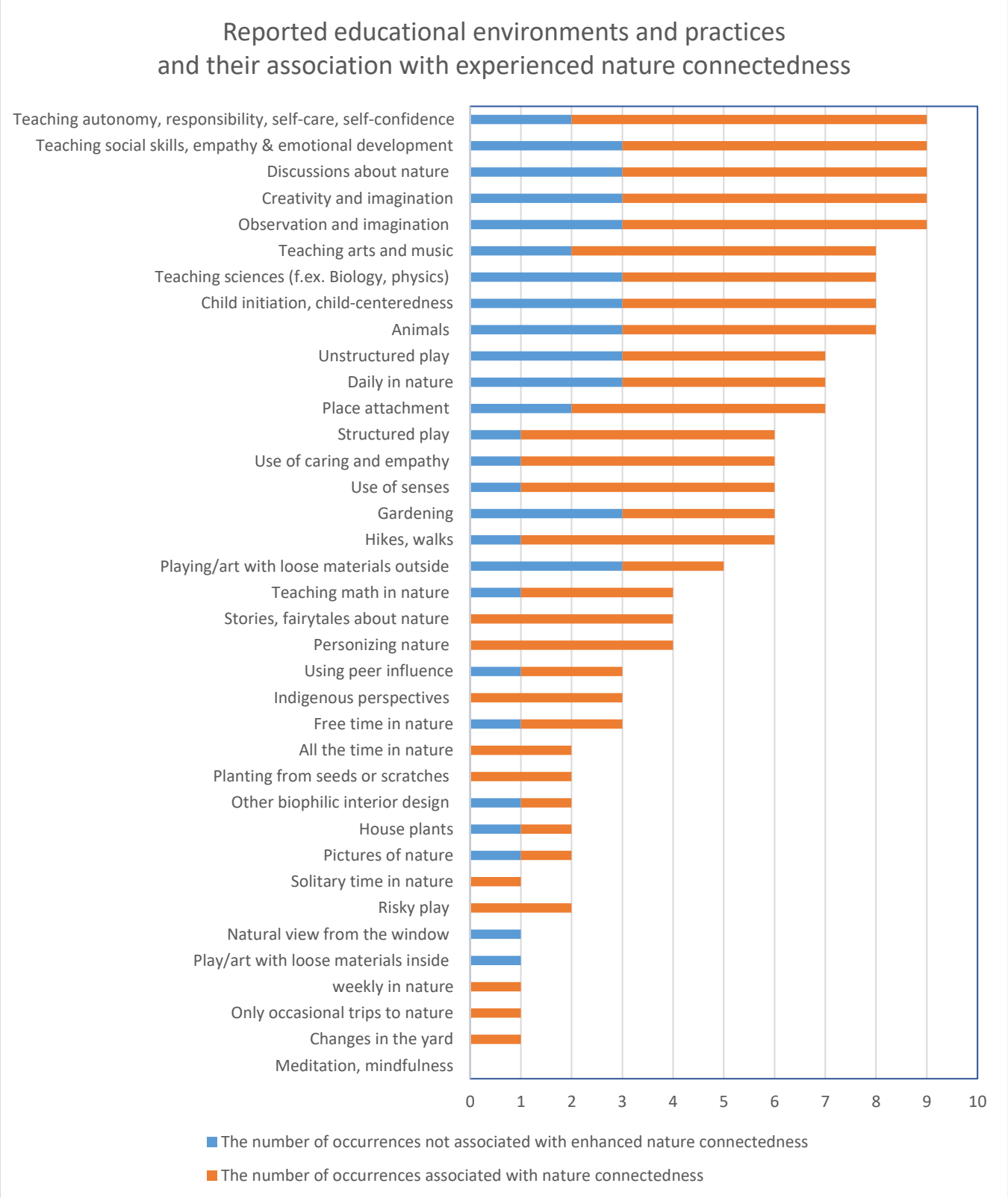

Figure 2. The number of reported educational environments and practices and their association with experienced nature connectedness.

DISCUSSION

Main results

We examined early childhood educational environments and practices in studies of children's nature connectedness. Some educational environments and practices were found to be more often linked with enhanced nature connectedness than others. An association of over 75% with enhanced nature connectedness (out of the practices which were reported more than twice) was discovered with Indigenous perspectives, personizing nature, telling stories about nature, structured playing or activities in nature, taking walks or hikes in nature, using sense experiences or using empathy and caring as tools to enhance nature connectedness, and teaching autonomy, arts, or sciences as a co-goal when in nature.

Personizing nature, telling stories, and Indigenous perspectives were associated with enhanced nature connectedness in 100% of the cases, but were all only rarely mentioned. Gaining more robust knowledge about their association with enhanced nature connectedness would be advisable before drawing any conclusions: Therefore, these methods could particularly be something that future studies could focus on. Yilmaz et al. (2020a), for instance, have already studied the use of storytelling. However, they did not measure nature connectedness but a more knowledge-based understanding of human-nature connection. In their study, only one story was read to the participants. In future research, it would be interesting to delve deeper into the world of stories by comparing different kinds of stories and their effect on nature connectedness in particular. For example, the role of raising empathy through stories would be of special interest due to the link between empathy and nature connectedness, of which indications were also found in this scoping review.

Personizing nature and Indigenous perspectives are both broad concepts with versatile implementation options. Indigenous perspectives arose as an item from the selected studies in the iterative data extraction phase. As an item, “Indigenous perspectives” was not in this study a specific program or a practice: we measured it with mentions of relevant keywords, without any requirements of specifically described practices. Whether there are some specific practices involved and to what extent these practices are parallel with the other items in this review – such as telling stories, personizing nature, or emphasizing empathetic responding – should be studied more carefully in the future. Moreover, it would be worth considering, whether Indigenous perspectives could in an educational context refer to something like a tone, an atmosphere, or a way to approach or attend to the natural world practiced in everyday life, or whether merely for instance reading Native American poetry would have the same possible effects in itself. We consider this a rich and interesting line of research in the future. A cross-cultural approach would also be beneficial in further studies concerning Indigenous perspectives in the context of early childhood education.

As for personizing nature, future studies concerning its implementation should take careful notice of not turning it into possibly harmful anthropomorphizing, where a child might think of other life forms having human needs; for instance, that a worm or a cricket would need a little house with a little bed to be happy. While giving living entities personal characters to increase empathy could be considered something to encourage, building little cardboard homes for them and trapping them there would not. Due to this difference, mentions of this kind of harmful anthropomorphizing were left out from this item in our data extraction process. Using empathy-inducing strategies as a tool was itself strongly associated with enhanced nature connectedness: In future studies, personizing nature could be one specific means to be tested in which to enhance empathy toward nature.

As a whole, the results of this review indicate that there is variance in the effectiveness of programs and interventions aimed at enhancing the nature connectedness of children. For instance, of the studies where children visited nature daily, only 57% reported enhanced nature connectedness. However, all the studies that reported children spending all their time in nature reported enhancement of nature connectedness, but little can be drawn from this result since there were only two of them in this review. Place attachment (regular visits to the same natural area) is often seen as important in enhancing nature connectedness (see for instance Basu et al., 2020). In this scoping review, place attachment was not always connected with an enhanced nature connectedness: in almost one-third (29%) of the cases it was not. One possible explanation for why in our scoping review daily nature exposure and place attachment were not often associated with enhanced nature connectedness may be that the tools and

study designs used in the included studies were not able to detect change in nature connectedness reliably. One frequent limitation in measuring nature connectedness of children this young has been the ceiling effect (Barrable & Booth, 2020). Another reason for these observations – that daily nature exposure nor place attachment may not necessarily be enough by themselves to enhance nature connectedness – is that it might matter what is done when in nature situations; it is not enough just to provide them. As Giusti and colleagues (2018) found, there are many qualities that can be present in nature situations that become significant for children. To support the development of children's HNC, it is important to provide nature situations with a set of several different qualities. We see this as a valuable line of research in the future. A comprehensive reporting of the different qualities would, however, be of utmost importance to allow and foster future practical implementation.

Half of the included studies concerned substantially long interventions of over half a year up to two years. This can be considered important, for while sometimes conceptualized as a temporary state of mind, nature connectedness has also been viewed as something fairly stable, changing only slowly, thus resembling closely personality traits (Whitburn et al., 2019). However, indications of a fast change were provided in this review by Yilmaz et al. (2020), who conducted visits to natural areas over four weeks and were able to show a statistically significant difference in children's affinity toward nature. In these kinds of short-term interventions, it would be important in the future to do follow-up measurements to see, whether the change that was detected was of a permanent kind or only temporary. This would give valuable information for the theoretical considerations concerning nature connectedness and its duration.
While most of the studies had fairly small samples, there was one study that had a significantly large sample of 419 children (Cincera et al., 2017). It used a pretest-posttest setup in an eight-month-intervention of an Eco-school approach where the children were given a chance to plan their own environmental education program. They found a statistically significant increase in nature connectedness of children after the intervention. In the future, conducting studies of this magnitude would be beneficial in extending the scientific rigor of the knowledge we have on nature connectedness and the practices or environments that affect it.

Limitations of the included studies and the scoping review

Given that all the included studies were conducted with urban children and almost all in Western countries, an approach that would emphasize diversity more would be beneficial in the future to increase the generalizability of the results. Comparative studies between Western and non-Western cultures would be needed, as well as comparisons between rural and urban children.

The motive behind the objective of this scoping review was to provide information to those ECE units that are not able to visit nature daily. However, among the selected studies, nine out of fourteen studies were conducted in urban ECE units with access to natural areas. Future research would benefit from comparing units with regular nature exposure and without one. Conducting pretest-posttest interventions in such versatile environments would give more robust and specified information on the effect of these interventions in circumstances where visiting natural areas is not part of everyday routines compared to those where it is.

While we endorse the idea of Giusti et al. (2018), that there is no one means by which the nature connectedness of children could be enhanced, we do consider it also valuable to conduct interventions that concentrate on measuring the effect of some specific practice. Great examples of such studies are Deniz and Kalburan's (2022) school gardening intervention and Lee's (2021) biowall installation. However, also these kinds of studies would benefit from a comparative setup where the same intervention is conducted in ECE units with different circumstances. Gathering observational data from the participating units' educational environments and practices would further increase the understanding of possible differences between the units and their effect on the results.

As already acknowledged, the studies used varied methodologies and conceptualizations. None of the studies used the same methodology as others. However, some studies used pre-existing methods: For instance, in Canada, Omidvar et al. (2019) used a measurement developed by Giusti et al. (2014) in Sweden (Games Testing for Emotional, Cognitive and Attitudinal Affinity with the Biosphere). Both studies involved ECE units implementing the same pedagogical approach (Reggio Emilia) which according to Omidvar (2019b, 221) values the natural world highly and

provides children with an integration of nature and self. Because it seemed that many of the children did not understand the questions, Omidvar and colleagues hypothesized in their conclusions, that among other things one reason why they did not find an effect on nature connectedness but Giusti and colleagues did, might be because the test should be adapted to Canadian children. Later, the adaptation was conducted (MacKeen et al., 2020) and a positive connection was found. However, in this study, or the study of Giusti and colleagues, no educational environments or practices were reported so they were excluded from the current scoping review.

The lack of a correlational study between the different measurements and concepts similar to that of Tam's (2013) concerning studies on adult HNC also limits the possibilities of concluding whether the studies included in this scoping review measured the same underlying construct with their differing tools and concepts. Given the heterogeneity of concepts and measurements, we do not recommend conducting a systematic review at the moment.

The research gap found fifteen years ago (Davis, 2009) concerning studies of young children's environmental education has definitely shrunk down, but similar to earlier reviews on closely related issues, we also must conclude that more work is yet to be done with the unification of methodology and the rigor of study designs. All the studies included in the review were nonrandomized (or at least did not report randomization). None of the studies controlled for how much the children spent time in nature when not in daycare, nor did they control for the nature connectedness of the educators, with only one controlling for the nature connectedness of the parents, although all these factors can have a substantial effect on children's nature connectedness as well as the evaluations of the educators and parents about it. Three studies did not even report how often children were visiting nature. In the future, these factors should be taken into more careful consideration when researching nature connectedness of children.

Due to the nature of the scoping review, which focuses on mapping out the landscape of existing research without critically appraising study quality, this review cannot definitively comment on the effectiveness of the educational practices under investigation. Another limitation of the current scoping review is the substantial amount of interpretation that the classification of data needs. To some degree, it can be doubted, whether the results would be exactly the same if conducted by other researchers. Although most of the conclusions were easily negotiated, they are tinted with the knowledge, outlooks, and intuitions of the decision-makers. For example, IS and MS concluded together that every time singing in natural environments was mentioned, it was interpreted as "music as a co-goal", for it was reasoned that singing songs in the ECE context is one main method of achieving this goal. Another pair of reviewers might have reached a different conclusion.

Situating the results to the theoretical background

To situate the results of this scoping review to the research field in general, it is useful to compare the results to the theoretical frameworks on which the data collection tool was constructed. The included ACHUNAS items received mixed results. Three items were associated with an enhanced nature connectedness over 75% of the time: engagement of senses, creative expression (creativity & imagination), and structure and instructions (structured play or activities). Thought-provocation (discussions about nature), creative expression (arts and music as a co-goal), social/cultural endorsement (influence of peers), child-driven situations, and involvement of animals were associated with nature connectedness in 57-74% of the cases. Challenging situations (risky play, 2 mentions) and intimacy (solitary time in nature, 1 mention) were a 100% match, but with only a few occurrences. Mindfulness received no mentions.

Items connected to biophilic design were mentioned very rarely, which is surprising considering the vast number of studies conducted concerning biophilic design in general and in educational contexts. Perhaps researchers of biophilia have not been as interested in experiences of nature connectedness as they have been in the direct effect of nature's presence (exposure to nature) on a wide variety of issues, especially related to health (see e.g. Gillis & Galabrese, 2015). In this review, pictures of nature, house plants, and "other biophilic design" were each mentioned in two studies. For each measure, the other one reported enhanced nature connectedness while the other one did

not. Playing and making art with natural or loose materials and natural views from windows were mentioned in one study each, and neither reported enhanced nature connectedness.

Of the elements in Alexia Barrable's (2019) pedagogy for connection, building compassion toward non-human species as a means to enhance nature connectedness was in this review linked with enhanced nature connectedness in 83% of the cases. Barrable also mentions "anthropomorphizing" nature (which we decided to call "personizing" nature to avoid misunderstandings) as a means to build compassion. Every time personizing was mentioned, the study also reported enhanced nature connectedness. The third element in Barrable's pedagogy, mindfulness, was not mentioned in any of the studies, but this does not mean it was not used, only that it was not reported. For instance, in Hu's (2022) study on nature journaling, a closely similar practice was mentioned: a "sit spot", where it was the plan to sit quietly, notice what is going on around, and then document it on the journal. It was because of the act of documentation that IS and MS decided to not interpret this as mindfulness. Finally, according to Barrable, engaging in nature's beauty can be conducted by noticing, discussing, and doing art; we did not have "noticing beauty" in our data template, but discussions (67%) and art (75%) were fairly often linked with enhanced nature connectedness.

According to our review, the association between nature connectedness and practices drawn from these theoretical frameworks that would specifically need more research in the future would be meditation or mindfulness in nature, biophilic design in the facilities, challenging situations, intimacy, and noticing beauty. These practices seem to have received only limited attention so far.

Conclusion

The results of this scoping review show that the educational environments and practices are often not sufficiently reported in the studies concerning nature connectedness of children. In the future, studies that focus specifically on more detailed reporting would be needed in order to meet the practical goal of this review to provide useful, detailed information for practitioners as well as researchers on the topic. This could involve studies that focus on the effects of one specific intervention (such as the biowall in Lee, 2021), studies that implement and report carefully an intervention with a set of several different qualities, studies with a comparative approach, and studies that document and report widely the educational environments and practices, taking into account the influence of other relevant factors than those implemented in the intervention. Finally, we would be delighted to see special attention paid in the future to the "bubbling under" practices that received only a few mentions but were associated with enhanced nature connectedness each time: Indigenous perspectives, personizing nature, and telling stories about nature. Even though Indigenous perspectives were mentioned rarely as such, it may be that it represents a more all-encompassing educational atmosphere, underlying thus possibly many of the other items in this review.
All and all, a lot has been already done in the field, but a lot still remains to be discovered.

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Author contributions
The contributions of each author in the review process were the following: IS, VM, and PS contributed to the development of the selection criteria, the data extraction criteria, and the search strategy and read, provided feedback, and approved the manuscript of the protocol. MH and MS approved the protocol in February 2024. IS and MH conducted the selection process and amended the selection criteria when facing problems. IS and MS conducted the data extraction as an iterative process. PS gave a third opinion in cases of disagreement in the selection and data extraction phases. IS conducted the analyses. PS supervised the process. IS wrote the first draft of the report, and all authors read, provided feedback, and approved the final version of the review.

Conflicts of interest

There is no conflict of interest in this project.

References

Acar, I., & Torquati, J. (2015). The power of nature: Developing prosocial behavior toward nature and peers through nature-based activities. *Young children, 70*(5), 62-71. https://www.jstor.org/stable/10.2307/ycyoungchildren.70.5.62

Amir-Behghadami, M., & Janati, A. (2020). Population, Intervention, Comparison, Outcomes and Study (PICOS) design as a framework to formulate eligibility criteria in systematic reviews. Emergency Medicine Journal. https://doi.org/10.1136/emermed-2020-209567

Andersen, L., Corazon, S. S., & Stigsdotter, U. K. (2021). Nature exposure and its effects on immune system functioning: A systematic review. *International Journal of Environmental Research and Public Health, 18*(4). https://doi.org/10.3390/ijerph18041416

Ardoin, N. M., & Bowers, A. W. (2020). Early childhood environmental education: A systematic review of the research literature. *Educational Research Review, 31,* 100353. https://doi.org/10.1016/edurev.2020.100353

Arola, T., Aulake, M., Ott, A., Lindholm, M., Kouvonen, P., Virtanen, P., & Paloniemi, R. (2023). The impacts of nature connectedness on children's well-being: Systematic literature review. *Journal of Environmental Psychology.* Advance online publication. https://doi.org/10.1016/j.jenvp.2022.101913

Ashmann, S. (2018). Developing a Nature-Based Four-Year-Old Kindergarten Program: Oak Learning Center at Bay Beach Wildlife Sanctuary in Green Bay, WI (USA). *International Journal of Early Childhood Environmental Education, 6*(1), 35-.

Barrable, A. 2019. Refocusing Environmental Education in the Early Years: A Brief Introduction to a Pedagogy for Connection. *Education Sciences 9, 1*(61). https://doi.org/10.3390/educsci9010061

Barrable, A., & Booth, D. (2020). Increasing nature connection in children: A mini review of interventions. *Frontiers in Psychology, 11,* 492. https://doi.org/10.3389/fpsyg.2020.00492

Barragan-Jason, G., de Mazancourt, C., Parmesan, C., Singer, M. C., & Loreau, M. (2022). Human–nature connectedness as a pathway to sustainability: A global meta-analysis. *Conservation Letters, 15*(1), 1–7. https://doi.org/10.1111/conl.12852

Basu, M., Hashimoto, S., & Dasgupta, R. (2020). The mediating role of place attachment between nature connectedness and human well-being: perspectives from Japan. *Sustainability Science, 15*(3), 849–862. https://doi.org/10.1007/s11625-019-00765-x

Beery, T., Chawla, L., & Levin, P. (2020). Being and Becoming in Nature: Defining and Measuring Connection to Nature in Young Children. *International Journal of Early Childhood Environmental Education, 7*(3), 3-.

Boileau, E., & Dabaja, Z. (2020). Forest School practice in Canada: A survey study. *JOURNAL OF OUTDOOR AND ENVIRONMENTAL EDUCATION, 23*(3), Article 3. https://doi.org/10.1007/s42322-020-00057-4

Cengizoglu, S., Olgan, R., & Teksöz, G. (2022). Preschool children's perceptions on human-environment relationship: Follow-up research. *EARLY CHILD DEVELOPMENT AND CARE, 192*(4), Article 4. https://doi.org/10.1080/03004430.2020.1767608

Cincera, J., Kroufek, R., Simonova, P., Broukalova, L., Broukal, V., & Skalík, J. (2017). Eco-School in kindergartens: the effects, interpretation, and implementation of a pilot program. *Environmental Education Research, 23*(7), 919-936. https://doi.org/10.1080/13504622.2015.1076768

Cordiano, T. S., Lee, A., Wilt, J., Elszasz, A., Damour, L. K., & Russ, S. W. (2019). Nature-Based Education and Kindergarten Readiness: Nature-Based and Traditional Preschoolers are Equally Prepared for Kindergarten. *International Journal of early childhood environmental education, 6*(3), 18-36.

Dankiw, K. A., Tsiros, M. D., Baldock, K. L., & Kumar, S. (2020). The impacts of unstructured nature play on health in early childhood development: A systematic review. *Plos One, 15*(2), e0229006. https://doi.org/10.1371/journal.pone.0229006

Davis, J. (2009). Revealing the research 'hole' of early childhood education for sustainability: A preliminary survey of the literature. *Environmental Education Research, 15(*2), 227–241. https://doi.org/10.1080/13504620802710607

Deniz, U. H., & Kalburan, N. C. (2022). Preschool Educators' Opinions and Practices on School Gardening. *Urban Education* (Beverly Hills, Calif.), 4208592211257-. https://doi.org/10.1177/00420859221125710

Donison, L., & Halsall, T. (2023). 'I'd rather learn outside because nature can teach you so many more things than being inside': Outdoor learning experiences of young children and educators. *Journal of Childhood, Education and Society, 4*(3), Article 3. Scopus. https://doi.org/10.37291/2717638X.202343281

Elliot, E., Eycke, K. T., Chan, S. & Müller, U. (2014). Taking kindergartners outdoors: Documenting their explorations and assessing the impact on their ecological awareness. *Children, Youth and Environments, 24*(2), 102. https://doi-org.ezproxy.utu.fi/10.7721/chilyoutenvi.24.2.0102

Ernst J., McAllister K., Siklander P., & Storli R. (2021). Contributions to Sustainability through Young Children's Nature Play: A Systematic Review. *Sustainability, 13*(13), 7443. https://doi.org/10.3390/su13137443

Gillis, K., & Gatersleben, B. (2015). A review of psychological literature on the health and wellbeing benefits of biophilic design. *Buildings, 5*(3), 948-963. https://doi.org/10.3390/buildings5030948

Giusti, M., Barthel, S., & Marcus, L. (2014). Nature routines and affinity with the biosphere: a case study of preschool children in Stockholm. *Children Youth and Environments, 24*(3), 16-42. https://doi.org/10.1353/cye.2014.0019

Giusti, M., Svane, U., Raymond, C. M., & Beery, T. H. (2018). A Framework to Assess Where and How Children Connect to Nature. *Frontier in Psychology, 8.* https://doi.org/10.3389/fpsyg.2017.02283

Glettler, C., & Rauch, F. (2020). Nature Learning - early childhood nature experience and sustainability education. *Journal of Applied Technical and Educational Sciences, 10*(3), 5–23. https://doi.org/10.24368/jates.v10i3.202

Hu, H. (2022). Rethinking nature journaling in the Kindergarten Program action research in learning and teaching. *Journal of Outdoor and Environmental Education, 25*(2), 159–179. https://doi.org/10.1007/s42322-022-00095-0

Johnstone A., Martin A., Cordovil R., Fjørtoft I., Iivonen S., Jidovtseff B., Lopes F., Reilly J.J., Thomson H., Wells V., & McCrorie P. (2022). Nature-Based Early Childhood Education and Children's Social, Emotional and Cognitive Development: A Mixed-Methods Systematic Review. *International Journal of Environmental Research and Public Health, 19*(10), 5967. https://doi.org/10.3390/ijerph19105967

Jorgensen, K. (2016). Bringing the jellyfish home: Environmental consciousness and "sense of wonder' in young children's encounters with natural landscapes and places. *ENVIRONMENTAL EDUCATION RESEARCH, 22*(8), Article 8. https://doi.org/10.1080/13504622.2015.1068277

de Keijzer, C., Gascon, M., Nieuwenhuijsen, M. J., & Dadvand, P. (2016). Long-term green space exposure and cognition across the life course: A systematic review. *Current Environmental Health Reports, 3*(4), 468-477. https://doi.org/10.1007/s40572-016-0116-x

Kellert, S., & Calabrese, E. (2015). The practice of biophilic design. London: Terrapin Bright LLC, 3, 21–46.

Larimore R.A. (2008). Using principles of nature-based preschools to transform your classroom. *YC Young Children, 73*(5), 34-41. https://www.jstor.org/stable/26783678

Lee, A. Y., Kim, H. R., Kwon, H. J., Kim, S. Y., & Park, S. A. (2021). Improving Children's Emotional Health through Installing Biowalls in Classrooms. *Journal of People, Plants, and Environment, 24*(1), 29-38. https://doi.org/10.11628/ksppe.2021.24.1.29

Liu, Y., Cleary, A., Fielding, K. S., Murray, Z., & Roiko, A. (2022). Nature connection, pro-environmental behaviors and wellbeing: understanding the mediating role of nature contact. *Landscape and Urban Planning, 228,* 104550. https://doi.org/10.1016/j.landurbplan.2022.104550

Lithoxoidou, L. S., Georgopoulos, A. D., Dimitriou, A. T., & Xenitidou, S. C. (2017). " Trees Have a Soul Too!" Developing Empathy and Environmental Values in Early Childhood. I*nternational Journal of Early Childhood Environmental Education, 5*(1), 68-88.

Mackay C. M. L., Schmitt M. T. (2019). Do people who feel more connected to nature do more to protect it? *Journal of Environmental Psychology, 65,* 1–9. https://doi.org/10.1016/j.jenvp.2019.101323

MacKeen, J., & Wright, T. (2020). Refining a Games Testing Tool for Various Cultural, Social, and Geographic Situations to Evaluate Preschool Children's Bioaffinity. *International Journal of Early Childhood Environmental Education, 8*(1), Article 1. ERIC.

McMahan, E. A., & Estes, D. (2015). The effect of contact with natural environments on positive and negative affect: A meta-analysis. *The Journal of Positive Psychology, 10*(6), 507-519. https://doi.org/10.1080/17439760.2014.994224

Mohammed, I., Onur, Z., & Çağnan, Ç. (2023) An Exploration of Biophilic Design Features within Preschool Interiors. *Sustainability, 15(*15), 11913. https://doi.org/10.3390/su151511913

Mygind L., Kjeldsted E., Hartmeyer R., Mygind E., Bølling M., Bentsen P. (2019). Mental, physical and social health benefits of immersive nature-experience for children and adolescents: A systematic review and quality assessment of the evidence. *Health Place, 58,* 102136. https://doi.org/10.1016/j.healthplace.2019.05.014

Mygind L., Kurtzhals M., Nowell C., Melby P.S., Stevenson M.P., Nieuwenhuijsen M., Lum J.A.G., Flensborg-Madsen T., Bentsen P., Enticott P.G. (2020). Landscapes of becoming social: A systematic review of evidence for associations and pathways between interactions with nature and socioemotional development in children. *Environmental International, 146,* 106238. https://doi.org/10.1016/j.envint.2020.106238

Rice, C. S., & Torquati, J. C. (2013). Assessing connections between young children's affinity for nature and their experiences in natural outdoor settings in preschools. *Children Youth and Environments, 23*(2), 78-102. https://doi.org/10.1353/cye.2013.0051

Roberts, H., van Lissa, C., Hagedoorn, P., Kellar, I., & Helbich, M. (2019). The effect of short-term exposure to the natural environment on depressive mood: A systematic review and meta-analysis. *Environmental Research, 177,* 108606. https://doi.org/10.1016/j.envres.2019.108606

Oh, B., Lee, K. J., Zaslawski, C., Yeung, A., Rosenthal, D., Larkey, L., & Back, M. (2017). Health and well-being benefits of spending time in forests: Systematic review. *Environmental Health and Preventive Medicine, 22*(1), 1-11. https://doi.org/10.1186/s12199-017-0677-9

Omidvar, N., Wright, T., Beazley, K., & Seguin, D. (2019a). Investigating Nature-Related Routines and Preschool Children's Affinity to Nature at Halifax Children's Centers. *International Journal of Early Childhood Environmental Education, 6*(2), 42-.

Omidvar, N., Wright, T., Beazley, K., & Seguin, D. (2019b). Examining Children's Indoor and Outdoor Nature Exposures and Nature-related Pedagogic Approaches of Teachers at Two Reggio-Emilia Preschools in Halifax, Canada. *Journal of Education for Sustainable Development, 13*(2), 215–241. https://doi.org/10.1177/0973408219872066

Page M.J., McKenzie J.E., Bossuyt P.M., Boutron I., Hoffmann T.C., Mulrow C.D., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ, 372*(71). https://doi.org/10.1136/bmj.n71

Peters, M.D.J., Marnie, C., Tricco, A.C., Pollock, D., Munn, Z., Alexander, L., McInerney, P., Godfrey, C.M., & Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis, 18*(10), 2119-2126. https://doi.org/10.11124/JBIES-20-00167

Putra, G., Astell-Burt, T., Cliff, D., Vella, S., John, E., & Feng, X. (2020). The relationship between green space and prosocial behavior among children and adolescents: A systematic review. *Frontiers in Psychology, 11*. https://doi.org/10.3389/fpsyg.2020.00859

Salmi, I., Halme, M., & Seeve, M., Mäkelä, V. & Salo, P. (2023). What kind of educational environments or practices indicate the enhancement of nature connectedness in preschool children? A protocol for a scoping review. Retrieved 30.7.2024 from https://osf.io/jy29v/

Sella, E., Bolognesi, M., Bergamini, E., Mason, L., & Pazzaglia, F. (2023). Psychological Benefits of Attending Forest School for Preschool Children: A Systematic Review. *Educational Psychology Review, 35*(1). https://doi.org/10.1007/s10648-023-09750-4

Shuda, Q., Bougoulias, M. E., & Kass, R. (2020). Effect of nature exposure on perceived and physiologic stress: A systematic review. Complementary Therapies in Medicine, 53, 102514. https://doi.org/10.1016/j.ctim.2020.102514

Sobko, T.; Jia, Z.; Brown, G. (2018). Measuring connectedness to nature in preschool children in an urban setting and its relation to psychological functioning. PLoS ONE, 13, e0207057. https://doi.org/10.1371/journal.pone.0207057

Stevenson, M. P., Schilhab, T., & Bentsen, P. (2018). Attention Restoration Theory II: A systematic review to clarify attention processes affected by exposure to natural environments. *Journal of Toxicology and Environmental Health, Part B, 21*(4), 227-268. https://doi.org/10.1080/10937404.2018.1505571

Tillmann, S., Tobin, D., Avison, W., & Gilliland, J. (2018). Mental health benefits of interactions with nature in children and teenagers: A systematic review. *Journal of Epidemiology and Community Health, 72*(10), 958–966. https://doi.org/10.1136/jech-2018-210436

Tricco, A.C., Lillie, E., Zarin, W. et al. (2018). PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med, 169,* 467–473. https://doi.org/10.7326/M18-0850

Trøstrup, C. H., Christiansen, A. B., Stølen, K. S., Nielsen, P. K., & Stelter, R. (2019). The effect of nature exposure on the mental health of patients: A systematic review. Quality of Life Research, 28(7), 1695–1703. https://doi.org/10.1007/s11136-019-02125-9

Twohig-Bennett, C. & Jones, A. (2018). The health benefits of the great outdoors: a systematic review and meta-analysis of greenspace exposure and health outcomes. *Environ Res. 10* (166)., 628-637. https://doi.org/10.1016/j.envres.2018.06.030

Weeland, J., Moens, M. A., Beute, F., Assink, M., Staaks, J. P. C., & Overbeek, G. (2019). A dose of nature: Two three-level meta-analyses of the beneficial effects of exposure to nature on children's self-regulation. *Journal of Environmental Psychology,* 65. https://doi.org/10.1016/j.jenvp.2019.101326

Whitburn, J., Linklater, W., Abrahamse, W. (2019). Meta-analysis of human connection to nature and proenvironmental behavior. *Conservation Biology, 34*(1). https://doi.org/10.1111/cobi.13381

Yilmaz, S., Temiz, Z., & Karaarslan Semiz, G. (2020a). Children's Understanding of Human-Nature Interaction after a Folk Storytelling Session. *Applied Environmental Education and Communication, 19*(1), Article 1. ERIC. https://doi.org/10.1080/1533015X.2018.1517062

Yilmaz, S., Çig, O., & Yilmaz-Bolat, E. (2020b). The impact of a short-term nature-based education program on young children's biophilic tendencies*. Ilköğretim Online, 19*(3), 1729–1739. https://doi.org/10.17051/ilkonline.2020.734968

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"This green tomato does not look ready to pick!": Preschool Children's Photography of Gardening and Cooking Activities

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ABSTRACT

This study was conducted to explore preschool children's engagement in gardening and cooking activities and to incorporate their perspectives on these activities through digital photography. Additionally, the study explored how connections between home and school could be fostered through a cooking activity at home. Eighteen four-year-olds in two preschools participated in gardening activities with their teachers and peers and engaged in a cooking activity with family at home. The children were videorecorded as they participated in the gardening activities, and they took photographs in the garden at school and during the cooking activity at home. Qualitative analyses of the observations and photographs yielded four integrated themes, including: photography supports playful exploration and inquiry; teachers guide integrated learning in gardens; children develop appreciation and knowledge of nature; and photography can facilitate home-school connections. Results indicated preschool gardens are engaging learning environments that facilitate co-construction of knowledge through shared inquiry and communication processes. Cameras are constructive tools for incorporating young children's voices and perspectives into research and observing the relational processes through which children take the photos as well as considering the content of their photographs is valuable for shared understanding and meaning-making. Photography, gardening, and cooking are accessible activities through which to foster home-school connections. This research underscores the important role of gardening and cooking activities in providing unique learning experiences that go beyond traditional classroom settings, fostering holistic development and distinct understandings of the natural world.

Keywords: early childhood education; school gardens; cooking; child-led photography; Mosaic approach

This study was conducted to explore preschool children's engagement in gardening and cooking activities and to incorporate their perspectives on these activities through digital photography. Additionally, the study explored how connections between home and school could be fostered through a cooking activity at home. Four-year-olds in two preschools participated in gardening activities with their teachers and peers and engaged in a cooking activity with family at home. A qualitative research design using a sociocultural theoretical framework was employed to study children's engagement and perspectives.

Sociocultural Framework and Child-led Photography

Within a sociocultural theoretical framework, young children learn through interactions with others as they participate in everyday routines and activities (Rogoff, 2003; Vygotsky, 1978). Children co-construct knowledge through shared inquiry and communication processes, sometimes known as "negotiated learning" in early childhood education (ECE) practices (Forman & Fife, 2012, p. 248). From this perspective of ECE, teachers, parents, and children form a community of learners who negotiate meaning through shared understandings. Teachers work to understand children's beliefs and theories through observation and conversation and guide their inquiry skill development and knowledge about the natural world (Forman & Fife, 2012).

From a sociocultural perspective, research with young children should include and respect their voices and perspectives. Whereas for many years psychological studies have been conducted *on* young children, with adults interpreting their experiences but not seeking input from the children themselves, researchers are increasingly moving towards Mosaic approaches that engage children's perspectives, not only verbally but also through drawing, photography, mapping, conversations, and more (Aragón et al., 2023; Calan, 2015; Clark & Moss, 2001; Einarsdottir, 2005; Green, 2017). The Mosaic approach was developed to include children's voices in research through a combination of methods, such as observation, discussion, and tools such as cameras and drawing materials. A key element of this approach is a focus on children's lived experiences (Clark, 2005). Child-led photography has emerged as one useful qualitative research method for inclusion of young children's perspectives, affording them freedom to choose which pictures to take and how to talk about them (Eirnarsdottir, 2005, 2007; Rayna & Garnier, 2021; Sturges, 2023).

In a study of children's views on their daily activities in playschool in Iceland, Einarsdottir (2005) provided children with digital cameras and asked them to show the researchers around their school, photographing what they thought a guest should see, such as play spaces, artwork, and other children. Another group of children were free to take whatever photographs they wanted with disposable cameras. Children's photographs were mainly of people engaging in typical daily activities around the school, such as eating lunch and playing outside. Interestingly, Einarsdottir found that a subset of children's "free" photos contained "taboo" subjects (e.g., taken in private spaces such as the bathroom), demonstrating their agency in taking pictures that might not be sanctioned by the adults. In another study using photography to discover what children find to be important about their preschool environment and routines, Sturges (2023) found that the majority of children's photographs were taken outdoors and most of their stories of the photos were about the relationships with these places and their peers.

In addition to analyzing the *content* of children's photographs, Rayna and Garnier (2021) explored the active *processes* of taking pictures as children aged 2 to 3 years took pictures of everyday life in their preschools in France. The researchers analyzed the relationship between the children and the cameras themselves (e.g., handling the camera and adopting certain postures), and the children's interactions with the subjects they photographed (e.g., deliberately positioning items and engaging peers as subjects). Rayna and Garnier (2021) concluded that studying young children's processes of photography adds a relational dimension beyond the content of the photographs themselves and offers deeper insights into their setting and "aesthetic products" (p. 318).

Children's voices and perspectives were incorporated in this research through two qualitative methods, digital photography and video-recorded observations. Each participating child was given a digital camera to use during gardening activities at school and to take home to photograph a cooking activity. The second means of incorporating children's voices into the study was through videorecorded observations during gardening activities at school. Observing and recording children's language and behaviors in the garden facilitated understanding of their photographic processes and their engagement in gardening activities with peers and their teachers.

Gardening in Early Childhood Education

Gardens have long been appreciated as a context for children's engagement and learning about the environment, sustainability, health and well-being, and academic domains such as math, literacy, and science (Greathouse, 2021; Muzaffar et al., 2023; Skelton et al., 2020; Soltero et al., 2021). Bowker and Tearle (2007) conducted a multi-national

study of children's experiences in school gardens and found that across contexts, children responded very positively to gardening experiences and developed complex mapping skills related to ecological knowledge and awareness. School gardens are places where children can be actively engaged with the natural world, and learning occurs through free play and inquiry (Pope et al., 2023). In their longitudinal study of a Reggio Emilia-inspired preschool, Vandermaas-Peeler and McClain (2015) observed children's participation in gardening activities over the course of one year. With their teacher's support and guidance in a wide variety of gardening experiences, children utilized complex math and science skills and displayed ecological awareness and positive affective responses to the natural world. Similarly, Hachey and Butler (2009) elaborated the potential of gardening for the development of young children's science attitudes (inquiry and exploration), process skills (seeking answers and building skills such as graphing and drawing), and content (including knowledge of plants and animals). Thus, past research has demonstrated that gardening projects in ECE environments can foster enjoyment, inquiry, and domain-specific thinking and learning.

ECE teachers' and directors' support is critical for children's holistic learning and engagement in gardening activities. In one study, ECE directors who were interviewed before and after a gardening education project cited multiple perceived benefits of gardening for children, including self-esteem, language and academic skills, and nutrition and health information, among many others (Soltero et al., 2021). One director commented that gardening experiences can help "level the playing field" for children from low socioeconomic backgrounds through social and academic skill development (Soltero et al., 2021, p. 269). Murakami et al. (2018) analyzed ECE teachers' narratives about the impact of gardening programs and reported that in addition to traditional realms of learning (e.g., food behaviors and science), garden education was utilized to foster autonomy, relatedness, and competence. These developmental benefits were purposefully supported through inquiry-based, creative activities (e.g., building houses for the "Three Little Pigs" with different materials in the garden).

Bridging School and Home Environments

Within a sociocultural framework, researchers recognize the extensive knowledge and experiences young children bring to and from home and educational environments (Chesworth, 2016; González et al., 2005; Melzi et al., 2018; Rogoff et al., 2003). Bridging, or facilitating transfer of knowledge from one context to another, is a key strategy to support early learning within and across home and school settings (Hedges, 2014; Vandermaas-Peeler et al., 2019). Teachers utilizing inclusive pedagogies acknowledge the diversity of children's home backgrounds and construct curricular connections between home and school environments. When teachers nurture diverse cultural and linguistic practices, children co-construct meaning, develop agency, and practice inclusive, creative learning and play strategies (Chesworth, 2016).

In a recent study exploring home-school connections in ECE, cooking was identified as a culturally important activity that could bridge learning at home and school (Durán & Lopez, 2022). Family members were invited to make recipes together at home and children were encouraged to integrate literacy and play through cooking activities and materials at school. Cooking enabled children to draw on knowledge from home, often through recipes, and facilitated classroom literacy and play activities (Durán & Lopez, 2022). Additional past research has identified cooking as a source of significant learning opportunities, including literacy skill development (e.g., reading recipes), numeracy (e.g., measuring and counting ingredients), and scientific reasoning (Durán & Lopez, 2022; Finn & Vandermaas-Peeler, 2013; Vandermaas-Peeler et al., 2012).

The present study aimed to create home-school connections between gardening and cooking through an activity in which families made their own recipes with ingredients that were seasonal in the garden. Children were encouraged to photograph the cooking activity and these photographs were shared with the teacher and peers in the form of a book created for each classroom.

Purpose and Design of the Study

This qualitative research study utilized a sociocultural theoretical framework to study preschool children's engagement in and perspectives on gardening and cooking activities. Children's perspectives were included through

videorecorded observations of their participation in gardening activities and through their use of digital cameras during the gardening and cooking activities. The photographic processes they enacted to take the pictures *and* the content of their photographs were studied, deepening the photography methodology (Rayna & Garnier, 2021). The following research questions were examined: (1) How does children's participation in gardening activities with peers and their teacher foster learning and engagement? (2) How do children use the cameras during gardening activities? (3) What do children take photographs of during gardening activities at school and a cooking activity at home? and (4) Do children establish connections between home and school environments through these activities?

METHOD

Research Context

In the spring of 2023, the researchers worked with outdoor learning specialists in two non-profit organizations focused on early childhood education in central North Carolina to identify preschools with active gardening programs. Directors of three preschools participating in a "Grow Fresh" program, in which ECE centers received small grants from local non-profits to support gardening activities, were invited to participate in the research project. Two preschool directors agreed to participate, both in the same suburban town of approximately 21,000 people. Each preschool director selected one teacher and their four-year-old classroom to participate. To protect confidentiality, the schools are identified hereafter as Preschool A and Preschool B.

In Preschool A, the garden is adjacent to the preschool building and the parking lot, separate from other outdoor play spaces (see Figure 1). It is surrounded by a fence and there are raised beds throughout the garden, along with gardening tools and two picnic tables. In Preschool B, the garden beds are located within a fenced playground and spread throughout the play spaces (see Figure 2). A bike track runs around the outside of most of the gardening areas and some playground equipment (e.g., a sandbox and toys).

Figure 1. The garden at Preschool A

The participating teachers in both preschools typically involve children in gardening activities multiple times a week, and sometimes daily. The gardening activities observed in this study were planned by the teachers based on their curricula and seasonal activities germane to gardening (e.g., planting or harvesting summer vegetables). The teachers identified convenient times for three to four visits to the preschools to conduct this project.

Participants

Parents and caregivers in the two participating classrooms were sent information about the research study and invited to participate. Ten out of 10 children (four males and six females) in Preschool A participated and eight out of nine children (three males and five females) in Preschool B participated in the project. All 18 child participants were four years of age. English was spoken in every home, and in one home the family also spoke Mandarin and in another, Hindi. In both preschools the parents' levels of education ranged from "some college" to PhD. Eleven children were identified by their parents as Caucasian, five as Black/African American, and two as Biracial. One parent in each family completed the demographic forms.

Figure 2. The garden at Preschool B

Procedure

The research was approved via the university Institutional Review Board (IRB) and parents gave permission for their children to participate by signing and returning the IRB-approved informed consent letters. Teachers explained the research project to the children in the participating classes. Child-friendly digital cameras were brought to each classroom and teachers practiced using the cameras with the children. Each class was observed on three occasions in the garden in July, August, September, and/or October. The activities varied, depending on the teacher's curriculum and what needed to be done in the garden, ranging from planting, picking, watering, and observing and photographing what was growing. Sometimes other activities were integrated with the gardening experiences. For example, during one observation at Preschool A, the teacher planned a scavenger hunt, with the children taking turns hiding and finding shapes in the garden beds. At Preschool B, the garden is in the center of the playground and during each observation, the children had free choice of playing, riding bikes, and gardening. Time spent in the garden averaged about 45 minutes per observation.

During the gardening activities, the cameras were available for children to use whenever they desired. There were rarely specific prompts to guide their photography, although sometimes teachers offered suggestions. All children used the cameras at least once and usually took a dozen or more (sometimes many more) photos on each day. Each class was given the cameras to keep after the research was completed.

Families were invited to participate in the project through a cooking activity conducted at home. In each class, the teacher selected one or more seasonal ingredients; one teacher (Preschool A) chose blueberries and strawberries, and the second teacher (Preschool B) chose apples. These ingredients were purchased at a local market, as the

preschool gardens generally did not generate enough produce to send home. Each family received the ingredients on a school day of the teacher's choosing, with instructions to make a family recipe of their choice. Cameras were sent home with the fruit, and children were encouraged to take photos of the cooking activity. The cooking activities were generally completed within a few days of receiving the fruit, and all children took some photos of the process. The cooking processes differed for each family, depending on the recipe they selected. Some families baked cakes, muffins, and pies, while others chose more simple recipes such as smoothies.

After all garden observations and cooking activities were completed, the researchers compiled selected photographs taken by each child into a photobook for each classroom. In Preschool A, the teacher and children were videorecorded reading the photobook together for the first time.

Coding and Analyses

The primary sources of data for this study were the children's photographs of the gardening and cooking activities and the video-recordings made by the researchers on each visit. The video-recordings were transcribed by a professional company and all transcripts were checked by two researchers. The videos were consulted as needed to clarify language and/or context (e.g., if a child's comments were unintelligible or didn't make sense without further information that could be obtained from the recording).

The research team used the "Sort and Sift, Think and Shift" methodology developed by Maietta et al. (2021) to analyze the transcripts and photographs. This method of qualitative analysis involves an iterative process of "diving in" to the data to discover the content, then "stepping back" to assess what has been learned and to determine where the findings connect to each other and to the field (see Maietta et al., 2021, for a detailed description). In this study, the analytic processes included: 1) sorting photos into categories; 2) highlighting interesting and salient conversation topics and quotations from the transcripts; 3) memo-writing about the emergent themes; 4) comparing emergent themes across data sources; 5) coming to consensus about the primary cross-cutting themes; and 6) revisiting the entire process.

In the initial phases of coding, we sorted the photographs into specific categories, such as "selfies" and "fruits and vegetables" in the garden, and "cooking tools" and "ingredients" at home. Transcripts of the videorecorded observations were read multiple times and topics of conversation were identified. Specific "episodes" in the conversations were highlighted through quotation identification and memo-writing. For example, teachers and classmates talked about topics such as "knowing when to harvest vegetables by color," and "how to put the plants in the soil." The initial coding categories were discussed by the research team and connections within and across data sources and episodes were identified through iterative analytic processes of "diving in" and "stepping back."

From these analyses, four integrated, over-arching themes were developed, including 1) Photography Supports Playful Exploration and Inquiry; 2) Teachers Guide Integrated Learning in Gardens; 3) Children Develop Appreciation and Knowledge of Nature; and 4) Gardening and Photography Facilitate Connections Between School and Home Environments. These themes are elaborated and illustrated with transcript quotes and photographs in the next section.

RESULTS

Theme 1: Photography Supports Playful Exploration and Inquiry

Children found the cameras to be an exciting new tool for exploration and they co-constructed knowledge with their friends about how to use the myriad functions on the special, child-friendly digital cameras provided by the research team (see Figure 3). They readily helped each other figure out the functions and solve problems that arose. Through trial and error, they quickly learned to use the power button not only for turning the cameras on and off, but also as a solution for resetting the camera. When a child discovered a new feature of the camera, such as taking a video, others would ask, "How did you do that?" The cameras had filters, such as a princess frame or a mustache, and the children delighted in using the filters to enhance their photos of themselves, their friends, and the gardens (see Figure 4). One child took a selfie with the princess filter and excitedly announced, "Guys, I'm a queen, I'm a queen!"

As they added mustaches to photos of tomatoes and friends, they enjoyed the process of taking and then enthusiastically reviewing their own and their friends' photos. They proudly announced these accomplishments to each other and their teachers, sometimes inviting other children to come and take photographs of the same things.

Figure 3. A child using a child-friendly digital camera

Figure 4. A child applied the princess filter to their photo

The teachers noted children's enthusiasm and also attributed their facile use of the cameras to prior experience. As one teacher noted, "well … they're so clever. At this age, they already kind of know how to use technology because either they use their parents' phones or tablets." However, these special digital cameras were clearly novel and exciting. Some children took dozens of photographs during each activity, and others were more selective. The most photographed subjects at school included the plants and other aspects of the garden environment, themselves (selfies were very popular), their friends using the cameras, their teacher, and the researcher and her video camera. The children were particularly fascinated by the video camera, further evidence of their curiosity about technology.

Although the emphasis was often on the photos themselves, children also discussed the *processes* of photography, wondering why some photos were blurry and experimenting with distance from the subject of their photographs. One technique seen in many photos was zooming in to get a close-up of the subject. Analyses of children's photos also showed their interest in juxtaposing colors and patterns. For example, one child zoomed in to capture a vibrant pink flower and the green background of the leaves and the school building. The children often took up-close photos of the vegetables in the garden, as in Figure 5, during the harvest of an eggplant. Figure 6 depicts the child's observation of light patterns on the plants. Children also took close-ups of themselves and others, for example of their own noses and eyes.

Figure 5. Close photo of child harvesting eggplant

Figure 6. Light and shadows on the leaves

The children demonstrated a curiosity about different perspectives through their photography. For example, they stooped low to examine and photograph the ground and their own feet, or expanded their gaze and took photos of something high above their heads. As seen in Figure 7, one child chose a beach-themed filter and looked up to capture a shot of a garden trellis well above their head. The children photographed a drooping, tall sunflower and wondered if it was dead, as explored below in Theme 3.

Figure 7. Garden trellis overhead

At home, children photographed the cooking processes and products, as well as the home environment and family members and pets. Many of the children's photos were evidence of their particular fascination with the use and transformation of ingredients. They photographed the process of adding ingredients, such as eggs to a bowl (see Figure 8), or of the mixer combining flour and eggs (see Figure 9). Sometimes another family member photographed the child while they cooked. Although the researchers and teachers did not observe the cooking activities at home, taking photographs of "cooking in action" with parents and other family members affords opportunities for inquiry-based learning and co-constructing meaning at school.

Figure 8. Pouring the egg into the bowl during the cooking activity at home

Figure 9. Mixing in progress during the cooking activity at home

Theme 2: Teachers Guide Integrated Learning in Gardens

In both preschools, teachers guided integrated learning as children participated in gardening activities, sometimes in conjunction with photography. They often prompted learning through basic questions, such as "Can you take a picture of something red?" and "What color is the ladybug?" One teacher encouraged children to "See if you can find [and photograph] one thing for each color in the rainbow, that's red, orange, yellow, green, blue." Identification of shapes, sizes, and colors occurred frequently, particularly in relation to whether something was ready to be harvested, such one child's comment that "this green tomato does not look ready to pick!" Comparison was another skill that was fostered through gardening, as depicted in the exchange below:

Teacher: *What shape is it?*
Child: *Round.*
Teacher: *It's round and what color do you see?*
Child: *Green.*

Teacher: *Green. So sometimes things are one color and then as they get older, they can be a different color. Does this look like another fruit that you know?*

In this exchange, the teacher asked specific questions about shape and color and offered content knowledge about how fruit can change colors as it ripens. She also fostered integrated learning through an open-ended question inviting the child to connect their previous knowledge of fruit, supporting the child's ability to bridge known and new experiences.

Sometimes the teachers planned complex, structured activities in support of literacy, numeracy, and science. Planting was an exciting activity that involved multiple steps such as writing the names of the vegetables on markers, measuring and deciding where to plant, getting your hands dirty in the soil, digging with a tool, and watering, among others. One teacher brought a ruler into the garden, instructing children to measure 18 inches as the correct distance between plants. She scaffolded the measuring process, showing them how to use the ruler and looking at the numbers together.

In another activity designed to facilitate integrated learning, children harvested, identified, and sorted the produce, ultimately creating a chart on which they wrote the names of the fruits and vegetables, counted how many were harvested, and graphed the results. The following transcript excerpt shows how the teacher integrated learning throughout the activity:

Teacher: *So, we have equal amounts of strawberry and peppers. Just one. Just one each. Now, you might not recognize what this is, but we have been growing these since winter time. Is it cold or hot in the winter?*
Children: *Cold!*
Teacher: *It's cold in the winter. These guys like to start growing in the cold season. I'm hearing some guesses. They're white like an onion. They're in the onion family but it starts with a "g" sound.*
Child: *Garlic?*
Teacher: *Good guess! It's garlic. And we have a lot of them. Garlic. You guys going to help me count the garlic today? All right. [counting together] We have one, two, three, four, five, six, seven, eight, nine, 10, 11, one more, 12. Twelve, that's quite a big number, 12. And there's enough for each of us to hold one. Give it a smell, feel it in your hand. Let's use some describing words to describe what it feels like, what it smells like, what it looks like. Let's use all of our senses. Give it a sniff. Your parents might cook with this in pasta dishes.*

The teacher's guidance afforded children opportunities to practice numeracy and literacy, think about planting seasons, develop sensory connections to gardening, and establish a connection to cooking at home.

Theme 3: Children Develop Appreciation and Knowledge of Nature

In the garden children learned to identify plants and when to harvest them, and practiced skills such as planting and watering. During these activities, they developed knowledge and appreciation for the plants in the gardens. As his friends participated in a planting activity, one child sat and ate mint leaves, putting multiple leaves into his mouth at once and delightedly munching. A friend joined him and also began to eat the mint. They had an extended conversation (that was somewhat difficult to follow because of the leaves in their mouths) about how to make mint tea by adding the leaves to water. The teacher laughed and explained that sometimes, when the director came out to look for mint for her water or tea, there was none left because the children had eaten it all. She noted the importance of cultivating enthusiasm for what is growing in the garden. Similarly, in the following exchange the teacher and a child discuss their love for sweet potatoes and the plants' need for growth and water:

Teacher: *Well, they might need a drink. We were trying to figure out how long it's going to take before we dig them up.*
Child: *Before we get to eat them!*
Teacher: *I know you can't wait to eat the sweet potatoes, can you? Me too. I like a good sweet potato. Well, I think we're done. We'll have to water them again later.*

Sometimes it was very challenging for children to wait to harvest fruits and vegetables, though this afforded opportunities to develop patience and understanding of "readiness." Two children came into the garden and lamented that all the strawberries were green. One commented sadly, "This one's not even ready yet. So there's none for us to pick today. Boring!" Meanwhile, another child picked quite a few small green tomatoes. When the teacher noticed, she commented,

(*Child's name), can we leave the rest of the green ones so they can grow into red tomatoes, please? Okay? These will turn another color soon, but we want to leave the rest of them on the bush to keep growing. They're not quite ready yet.*

Child: *What?*
Teacher: *They haven't had enough time to grow. That's why they're not red yet. They still need a little more sunshine. What else do they need?*

Child: *Water?*
Teacher: *Water.*

The teacher reinforced this theme in a subsequent conversation, explaining "that one's not quite ready, so we're going to save our picking hands for another day." With her guidance, the children were practicing self-regulation and learning respect for the natural world.

In the garden, children had encounters with the animal world as well as the plants. Children noticed and photographed butterflies and bees in the gardens and talked with their teacher about "where they are going," maybe to "get pollen." While composting their fruit from breakfast one morning, some children found slugs in the compost. The teacher explained, "slugs are really helpful … I'm glad they're in our compost. It's okay to pick it up with your pointer finger and your thumb. Does anybody want to practice picking up a slug?" Some of the children were very curious and wanted to touch them, while others were not so inclined, saying they were slimy. Several children picked up a few and moved them to a pile of leaves beside the composter, saying "I found their home!" Two children discussed the life or death of the small animals in the following conversation:

Child A: *This little cutest baby's dead.*
Child B: *No, it's not. It's just rolled up in a ball. When she's scared, she rolls up in a ball.*
Child A: *Look! His legs are not moving and his antennae is not moving. He's dead.*
Child B: *The sunflower is also dead.*

The children then took photographs of the dead sunflower and moved on to play elsewhere in the garden.

Theme 4: Photography Can Facilitate Connections Between School and Home Environments

Using the cameras at school occasionally prompted discussions of the children's home environments. When the children were taking photographs of the colors in the rainbow, one child shared, "We're painting my room a rainbow color!" Another child asked the teacher if she wanted to come home with her some day and the teacher's enthusiastic reply afforded opportunities to share information about her home:

Child (to the teacher): *Do you want to come to my house someday?*
Teacher: *I would love to come to your house someday.*
Child: *Downstairs, it has a lot of things. But then my playroom is a disaster.*

Teacher: *It's a disaster? Oh my goodness, what do you mean?*
Child: *Toys all over the downstairs!*

This child may have been relaying an adult's assessment of the toy situation, but she was very excited at the prospect of a teacher visit to her home.

During gardening activities, some children spontaneously drew connections between their preschool and home environments. Harvesting the vegetables was especially exciting and a few children recounted times they harvested the same vegetables in their home gardens. One child noted they had harvested even more tomatoes in the harvest at home, but another child sadly commented, "There's a problem at my house where the squirrels ate all the tomatoes." Sometimes the teachers facilitated these conversations, but more often these were quick, child-initiated exchanges.

On the last visit to each preschool, researchers shared the photobooks of selected photographs the children had taken during the gardening and cooking activities as well as a few from the researchers' camera. There was immense enthusiasm for viewing and discussing the photos, and children were particularly excited to see their own photos and photos others had taken of them. The following exchange occurred as the teacher read the book to the children in Preschool A:

Teacher: *Oh, oh, let me read the title page, "Gardening and Cooking: Photography Project." And on the front, I see a picture of a flower that we have.*
Child A: *Sunflower!*
Teacher: *A sunflower, that's our sunflower growing in the garden. And then there's some pictures of us.*
Child B: *It died.*
Teacher: *It did, we already took it out. You're right about that. The sunflower has lived its life. All right, so there's no words in this book, but if you see a photo that you want to talk about, you can raise your hand.*
Child C: *Hey, that's me and that's me!*
Child D: *I see myself. I see my blue shoe!*
Teacher: *It is fun to see pictures of yourself.*

As they looked at the book together, the teacher encouraged the children to guess whose photos they were seeing. After they guessed correctly, she invited each child in turn to talk about what they cooked at home. The photographs helped them remember specific details, such as "we cut strawberries" and "we used the mixer." The teacher also pointed out similarities across experiences, such as "you both made blueberry muffins!" One child noted "my dad even knows how to make muffins," and another commented that she'd cooked with her grandpa. The teacher also established connections between the children's photos and a story they'd read previously, saying: "(Child's name) made a blueberry pie! The story we read yesterday had an apple pie and a blueberry pie. That looks just like the blueberry pie from our story."

DISCUSSION

This study was conducted to explore preschool children's engagement in gardening and cooking activities and to incorporate their perspectives on these activities through digital photography. Observing children's processes of photographing, as well as the content of their photographs, afforded an in-depth understanding of their experiences in the garden. Additionally, the study explored how connections between home and school could be fostered through a cooking activity at home. Qualitative analyses of the observations and photographs yielded four integrated themes, including: photography supports playful exploration and inquiry; teachers guide integrated learning in gardens; children develop appreciation and knowledge of nature; and photography can facilitate home-school connections.

Supporting prior research, in this study children were enthusiastically engaged in gardening activities and through teacher-guided planting, harvesting, and watering, they practiced inquiry skills and developed knowledge and appreciation for the plants and animals in the garden beds (Bowker & Teale, 2007; Hachey & Butler, 2009; Vandermaas-Peeler & McClain, 2015). For example, the four-year-olds in this study learned when to harvest and discussed how the color of the vegetables can be an indicator of readiness. They also practiced patience and self-regulation skills (e.g., not harvesting crops until ready) and co-created shared anticipation for future crops with peers and teachers, for instance while waiting for the sweet potatoes to be ready. Supporting integrated learning through inquiry-based, creative activities, such as those described by Murakami et al. (2018), the teachers developed engaging activities for children to do in the garden that supported math, science, and literacy, including comparing the number, color, and size of produce harvested and creating a chart for the classroom, and using rulers to measure distance between plants while planting. There is a need for teacher education concerning how to incorporate gardening activities into early childhood curricula to support holistic development (Dawson et al., 2013; Soltero et al., 2021). This study adds to a growing body of evidence that preschool gardens facilitate inquiry and foster ecological awareness, among other emergent skills, and that teacher guidance is essential to support young children's learning outside of the classroom.

Our findings also confirm that gardens can be rich contexts for sensory experiences and playful engagement (McVittie, 2018; Pope et al., 2023). Preschoolers naturally play when they spend time outdoors and children were social and playful as they spent time in the gardens, particularly in Preschool B, where the gardens were integrated into the playground. Children were captivated by the small animals they found serendipitously as they composted and put their hands in the soil, and touching the animals provoked curiosity and sensory awareness. This was clearly more comfortable and familiar for some children than others. Our findings support previous research concluding that preschool gardens can serve as a pathway for *all* children to have early opportunities for exploration and discovery of the natural world (Soltero et al., 2021).

The cameras were tools that supported playful inquiry and social engagement. Analyses of the children's processes of taking pictures afforded an understanding of how photography was a relational process (Rayna & Garnier, 2021; Sturges, 2023). Social engagement was enhanced by giving all children cameras to use at the same time with an open invitation to take pictures of whatever they wanted in the garden. Children negotiated meaning and understanding through their discovery of camera functions and joint problem-solving when things went awry, and shared enthusiasm for taking and reviewing photos of plants, animals, themselves and each other in the gardens, inviting each other to "come and see!" and to take similar photos. The camera filters were a surprising and fun element that children discovered on their own. There was significant value added by videorecording the children as they took photos, because they often narrated their processes of taking photos and explained their actions to each other in ways they might not have done with unfamiliar adults (researchers). Einarsdottir (2005) emphasized the importance of allowing children to explain their photographs in order to understand their perspectives. The results of this study lend support for the use of videorecorded observations as another mechanism for inviting children into the research process and gaining deeper understanding of their perspectives by observing their processes of photography.

To invite families into the project and enhance connections between home and school, researchers and teachers facilitated a home cooking project using seasonal ingredients that were also grown in the preschool gardens. The photobooks of children's photographs of their home environments and the cooking projects facilitated conversations about what children cook and eat at home. As one teacher noted, children sometimes made the same food, but their processes and who they cooked with may have differed. Children used the photographs as a springboard for remembering details of the cooking activity and all children were delighted to see themselves in the photos. Bridging facilitates the transfer of knowledge and understanding, and the photographs and photobooks were tools that supported negotiated learning within the community of teachers, children, and parents (Forman & Fife, 2012; Hedges, 2014; Vandermaas-Peeler et al., 2019). Although this activity may be too complex or expensive for widespread implementation, it would be relatively easy for teachers to foster conversations about what families typically cook, how children help, and what recipes feature seasonal ingredients (Durán & Lopez, 2022). Parents and teachers could share photos taken on cell phones in each context (as already happens in many preschools). In addition to providing teachers with information about children's home experiences, this could also help families connect to the gardening activities in preschools.

Conclusion

The results of this study supported the conclusion that preschool gardens are engaging learning environments that facilitate co-construction of knowledge through shared inquiry and communication processes. Cameras are constructive tools for incorporating young children's voices and perspectives into research, and observing the relational processes through which children take the photos as well as considering the content of their photographs is valuable for shared understanding and meaning-making. Photography, gardening, and cooking are accessible activities through which to foster home-school connections. Our research underscores the important role of gardens in providing unique learning experiences that go beyond traditional classroom settings, fostering holistic development and distinct understandings of the natural world.

References

Aragón, L., Ortega-Cubero, I., & Eugenio-Gozalbo, M. (2023). Are gardens useful for promoting early age science education? Evidence from analysis of children's drawings. *Interdisciplinary Journal of Environmental and Science Education*, *19*(4), e2320.

Bowker, R. & Tearle, P. (2007). Gardening as a learning environment: A study of children's perceptions and understanding of school gardens as part of an international project. *Learning Environment Research*, 10, 83 – 100, DOI 10.1007/s10984-007-9025-0

Calan, I. M. E. (2015). Drawing, photographs, and painting: Learning about the natural world in an urban preschool. *Voices of Practitioners*, *10*(2), 31.

Chesworth, L. (2016). A funds of knowledge approach to examining play interests: listening to children's and parents' perspectives. *International Journal of Early Years Education*, *24*(3), 294-308.

Clark, A. (2005). Ways of seeing: Using the Mosaic approach to listen to young children's perspectives. In A. Clark & P. Moss (Eds.). *Beyond listening. Children's perspectives on early childhood services (pp. 29-49)*. Policy Press.

Clark, A., & Moss, P. (2001). *Listening to young children: The mosaic approach*. London: National Children's Bureau.

Dawson, A., Richards, R., Collins, C., Reeder, A. I., & Gray, A. (2013). Edible gardens in early childhood education settings in Aotearoa, New Zealand. *Health Promotion Journal of Australia*, *24*(3), 214-218.

Durán, L. G., & Lopez, R. L. (2022). Recipes as invitations to read, write, and play in preschool. *The Reading Teacher*, 1-9. doi:10.1002/trtr.2151

Einarsdottir, J. (2005). Playschool in pictures: Children's photographs as a research method. *Early Child Development and Care*, *175*(6), 523-541.

Einarsdóttir, J. (2007). Research with children: Methodological and ethical challenges. *European Early Childhood Education Research Journal*, *15*(2), 197-211.

Forman, G. & Fyfe, B. (2012). Negotiated learning through design, documentation, and discourse. In C. Edwards, L. Gandini, & G. Forman (Eds.), *The hundred languages of children* (pp. 147 – 271). Bloomsbury Publishing USA.

Finn, L. & Vandermaas-Peeler, M. (2013). Young children's engagement and learning opportunities while cooking with parents and older siblings. *Early Childhood Research & Practice*, 15 (1), *http://ecrp.uiuc.edu/v15n1/finn.html*'

González, N., Andrade, R., Civil, M., & Moll, L. (2006). Funds of distributed knowledge. In *Funds of Knowledge* (pp. 257-271). Routledge.

Greathouse, D. (2021). Green minds: An introspective look at gardening curriculum for science skills in preschoolers. *Learning to Teach*, *10*(1).

Green, C. (2017). Four methods for engaging young children as environmental education researchers. *International Journal of Early Childhood Environmental Education*, *5*(1), 6-19.

Hachey, A. C., & Butler, D. L. (2009). Science education through gardening and nature-based play. *Young Children*, *64*(6), 42-48.

Hedges, H. (2014). Young children's 'working theories': Building and connecting understandings. *Journal of Early Childhood Research*, *12*(1), 35-49.

Maietta, R., Mihas, P., Swartout, K., Petruzzelli, J., & Hamilton, A. B. (2021). Sort and sift, think and shift: let the data be your guide, An applied approach to working with, learning from, and privileging qualitative data. *Qualitative Report*, *26*(6).

McVittie, J. (2018). Sensuous and languaged learning: Children's embodied and playful connections to nature. *International Journal of Early Childhood Environmental Education*, *6*(1), 21-34.

Melzi, G., Schick, A., & Scarola, L. (2018). Building bridges between home and school for Latinx families of preschool children. *Occasional Paper Series*, (39), 10.

Murakami, C. D., Su-Russell, C., & Manfra, L. (2018). Analyzing teacher narratives in early childhood garden-based education. *The Journal of Environmental Education*, *49*(1), 18-29.

Muzaffar, H., Guenther, E., Bosse, O., & Nii-Aponsah, H. (2023). Effectiveness of gardening-only, cooking-only and combined cooking and gardening programs in elementary schools to improve fruit and vegetable intake: A systematic review. *Nutrients*, *15*(13), 3008.

Pope, E., Marston, S. A., Thompson, M., & Larson, S. (2023). How learning gardens foster well-being and development through the promotion of purposeful play in early childhood and beyond. *Theory Into Practice*, *62*(2), 193-204.

Rayna, S., & Garnier, P. (2021). Toddlers taking pictures of their preschool life: Towards a reflexive approach of qualitative research with young children. *Early Years*, *41*(2-3), 305-321.

Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.

Rogoff, B., Paradise, R., Arauz, R. M., Correa-Chávez, M., & Angelillo, C. (2003). Firsthand learning through intent participation. *Annual Review of Psychology*, *54*(1), 175-203.

Skelton, K. R., Lowe, C., Zaltz, D. A., & Benjamin-Neelon, S. E. (2020). Garden-based interventions and early childhood health: an umbrella review. *International Journal of Behavioral Nutrition and Physical Activity*, *17*, 1-19.

Soltero, E. G., Parker, N. H., Mama S. .K., Ledoux, T. A. & Lee, R. E. (2021). Lessons learned from implementing of garden education program in early child care. *Health Promotion Practice*, *22*(2), 266-274.

Sturges, M. (2023). Snap: young children share the importance of relationships through child-led photography. *Early Child Development and Care*, *193*(9-10), 1159-1172.

Vandermaas-Peeler, M., Boomgarden, E., Finn, L., & Pittard, C. (2012). Parental support of numeracy during a cooking activity with four-year-olds. *International Journal of Early Years Education*, *20* (1), 78-93.

Vandermaas-Peeler, M. & McClain, C. (2015). *The green bean has to be longer than your thumb*: An observational study of math and science experiences in a preschool garden. *International Journal of Early Childhood Environmental Education*, *3 (1)*, 8-27.

Vandermaas-Peeler, M., Westerberg, L., & Fleishman, H. (2019). Bridging known and new: Inquiry and intersubjectivity in parent-child interactions. *Learning, Culture and Social Interaction*, *21*, 124-135.

Vygotsky, L. S. (1978). *Mind in society*. Harvard University Press.

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Nature Playgardens as Sites for Early Childhood Education in a Tropical City

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ABSTRACT

Educators' perceptions play a crucial role in shaping children's experiences. This exploratory study aimed to gather feedback from preschool educators who had conducted lessons at a natural play space in Singapore. The study site, known as a Nature Playgarden, is a green space within a public park. Created mostly with natural materials, the Nature Playgarden offers a fun and enriching learning environment for children. Six preschool centers located within 10 kilometres radius of the site, consisting of 13 educators and 108 children, had lessons there. During the study period, a total of 22 sessions were carried out and data capturing educators' reflections of the children's outdoor experiences was collected after each session. The educators reported that the natural environment in the Nature Playgarden stimulated children's imaginations and encouraged exploration. The site offered affordances that supported children's wellbeing, social interactions, connection to nature and other aspects of children's learning. Additionally, the educators personally appreciated the site's natural surroundings and sense of calm.

Keywords**:** nature play; affordances; outdoor learning; educators' perceptions; preschool education

Early childhood is a phase of major physical growth and cognitive development. During this period, a typical day for a child comprises sleep, routines, sedentary interests, and physical activities (PA). The World Health Organisation has developed an integrated 24-hour guideline on the duration of these activities: 3 hours of PA, 10–13 hours of sleep including nap time, and a maximum of 1 hour of screen media time (World Health Organisation, 2019). Undeniably, adequate PA in young children is important. It improves bone health (Carson et al., 2017) and helps to maintain a healthy weight (Pate et al., 2019). On the other hand, a high level of sedentary behaviour, particularly screen time, is positively associated with obesity (Ghasemirad et al., 2023).

Extensive research has shown that environmental factors affect a child's PA level, and hence the likelihood of the child becoming overweight. A systematic review of 20 studies conducted in China on children and adolescents showed that residing in higher-density residential areas increases the chance of childhood overweight (An et al., 2019). The same review found that having access to green spaces was associated with increased levels of PA and

reduced sedentary behaviours (ibid.). Other benefits of nature exposure in children have also been reported, such as improved vision when Vitamin D is received in sufficient quantities (Knoop et al., 2020), enhanced immunity due to exposure to natural elements such as biodiverse soil (Deckers, et al., 2021), a more relaxed mental state (Chawla, 2015), higher levels of creative thinking (Wojciehowski and Ernst, 2018), enhanced problem-solving skills, perseverance, and resilience (Elliott and Krusekopf, 2017), as well as improved cognitive, social, and emotional development (Ardoin and Bowers, 2020).

Purpose of Current Study

Notwithstanding the various reported benefits of outdoor or nature play, educators must be willing to take the first step in enabling learning outdoors. Moreover, the perceptions of educators play an important role in affecting children's experience. Hence, an exploratory study was conducted to gather feedback from preschool educators who conducted lessons at a natural play space in Singapore.

The present study was conducted in Singapore, a country that places significant emphasis on human resource development, particularly the social and emotional development of its young children (Alzahrani et al., 2019). While playgrounds are commonly found in residential developments and public parklands, there has been an increase in the number of young children with excessive screen viewing time (SVT), with nearly 50% of children under 3 years of age engaging in SVT for television, games and music at least once a week, as well as for learning and games (Yueng et al., 2020). Relatedly, high SVT may be mitigated by frequent outdoor play (Sugiyama et al., 2023). The Early Childhood Development Agency (ECDA) of Singapore therefore envisions outdoor learning to be an integral part of children's everyday life and advocates for preschool educators to incorporate outdoor learning experiences for young children's development.

Correspondingly, Singapore is slated to be transformed into a "City in Nature" where nature is restored as part of the urban environment (Er, 2021). Fostering people's connections with nature becomes key to laying the foundations for the development of positive people-nature interactions that bring about well-being benefits. National urban horticultural programs such as community and allotment gardens function as platforms for adults to engage with nature through gardening activities (Sia et. al., 2022). An initiative that targets young children is the Nature Playgardens (NPG). Created mostly with natural materials, NPGs are conceptualized based on design principles relating to the provision of play affordances, providing opportunities for a fun and enriching learning environment, and enabling users to connect with nature. Currently, there are 26 such NPGs in Singapore. They are frequently used by preschool centres in the immediate vicinity for outdoor play. The NPG initiative is funded and implemented by the National Parks Board, a government agency overseeing the provisioning and management of green spaces.

STUDY DESIGN

Study Site

The study site was an NPG in a public park established in 2019. Home to nine distinct play spaces – Sand and Gravel Play, Big Fig Adventure, Log Valley, Secret Den, Kitchen Play, Stream, Treasure Trail, Magical Woods and Singing Seeds, each play space was planned for unique play opportunities (Figure 1). The Sand and Gravel Play comprises two large pits filled with natural sediment materials of different textures. The Big Fig Adventure features a set of log cookies arranged in order of height to create an incline of stepping stones. The Log Valley is a drain decked over with wooden logs with planted shrubs on both sides, designed to encourage big physical movements. It leads to the Secret Den, which has a wooden platform shaded by bamboo where a child can sit, rest and contemplate. The Kitchen Play space has a wooden table and loose play materials (such as rice husks, small clay pellets and small wooden sticks for utensils) and is designed to encourage imaginative and interactive play. In the Stream area, a tap and hollowed out wooden planks below it creates a "stream" effect, allowing children to enjoy water play. The Treasure Trail has many fruit trees and resembles a small forest, facilitating nature exploration. It is installed with signages to help children identify different species of fruit trees. The Magical Woods is designed with clusters of trees to form a maze. Last, the Singing Seeds is equipped with instruments made from natural materials to offer a myriad of musical experiences. Visuals of some of the play spaces are presented in Figure 2.

Figure 1. The layout of the study site.

Figure 2. Examples of play spaces at the study site.
Top (Left to Right). Nature Play Garden is set in a natural environment. Log crossings across the Log Valley. A tunnel within the Magical Woods.
Bottom (Left to Right). View towards the Secret Den. The Big Fig Adventure features an incline of stepping stones made with log cookies. The Kitchen area for pretend play

Participants

Six preschool centers located within 10 kilometres of the NPG were invited to conduct lessons at the site. A total of 13 educators and 108 children took part in the field trips. Twenty-two sessions were carried out in total. All the educators, children and their parents provided consent before participating in the study.

Study Procedures

Upon enrolment in the study, the educators were given a briefing on the features at the NPG, along with suggested activities for the lessons. They were invited to pre-visit the NPG before the actual sessions with the children. The educators followed up to develop their own lesson plans, by contextualising indoor lessons for the outdoor space (such as reading a book to children outside), adapting indoor lessons to incorporate natural resources found within the garden (AB patterning exercises to sort artefacts found in the NPG) and using the natural environment as a stimulus for unstructured learning based on children's interests (allowing children to explore the garden and having class discussions based on their questions, interests, or activities as they arise).

The educators carried out the sessions between July to October 2022. All centers held four sessions during the study period except for one center which had two sessions. All the sessions took place on weekday mornings, and our research team provided transport to ferry the children from the respective center to the NPG.

Data collection

The educators provided feedback and reflections after each session through an online survey. The survey questionnaire (Annex 1) was designed to capture their reflections on the children's outdoor experiences. It comprised rating statements that covered different aspects of the NPG, namely its physical environment, potential for supporting learning, and perceived benefits for children. Educators indicated their level of agreement using scores on a scale of 1 to 5 - strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). In addition, we gathered qualitative feedback on educators' experiences by using open-ended questions.

Data analyses

The mean scores of the rating statements were computed. A score of more than 4 were considered strong agreement, 3.5 to 4 considered moderately strong agreement, 3 to 3.5 considered general agreement, and less than 3 considered disagreement. The qualitative data from the open-ended questions were analysed thematically, according to the items in the rating statements.

RESULTS

The mean scores of the rating questions are summarised in Table 1.

Physical environment of the NPG

The educators strongly agreed that its physical environment was conducive for group activities (4.07 ± 0.70) and that the play materials present, such as loose parts like leaves, twigs, pebbles and petals, were appropriate for their lessons (4.03 ± 0.52). There was moderately strong agreement that the site provided a variety of play and learning settings (3.73 ± 0.70), there were adequate features (3.72 ± 0.84), shade (3.62 ± 0.84) and sitting areas (3.58 ± 1.12).

The strong agreement on the appropriateness of the play materials corroborated with the qualitative feedback captured in the open-ended questions, with some examples described below.

"*There are a lot of natural resources around.*"

"*There were plenty of items to be found on the ground, from leaves to twigs to pebbles and petals.*"

"*There was a wide variety of nature items to collect for the lesson.*"

Table 1. Mean rating scores of various aspects of Nature Playgardens by educators

Items	Mean	SD
Physical Environment		
Conducive for small group	4.07	0.70
Appropriate play materials	4.03	0.52
Adequate variety of play and learning settings	3.73	0.70
Adequate features	3.72	0.84
Adequate shade	3.62	0.84
Adequate sitting area	3.58	1.12
Potential in supporting learning		
Supports language and literacy learning	4.40	0.46
Supports learning that leads to discovery of the world	4.38	0.45
Supports motor skills development	4.36	0.60
Contributed to the children's learning	4.26	0.48
The learning objectives of my lesson plan are achieved	4.12	0.58
Supports numeracy learning	4.11	0.61
Provides opportunities for various levels of child's physical activity	3.97	0.86
Supports learning that leads to aesthetics and creativity	3.81	0.63
Benefits for children		
Encourages social interactions between children and educators	4.37	0.56
Contributed to the children's connection to nature	4.36	0.60
Encourages social interactions among children	4.33	0.64
Contributed to the children's connection with one another	4.27	0.45
Contributed to the children's physical wellbeing	4.08	0.52
Supports social and emotional development	4.07	0.53
Contributed to the children's social wellbeing	4.04	0.52
Contributed to the children's mental wellbeing	3.94	0.65

Notes: Educators indicated their level of agreement using scores on a scale of 1 to 5 - strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). A score of >4 represents strong agreement, 3.5 to 4 represents moderately strong agreement, 3 to 3.5 represents general agreement, less than 3 represents disagreement.

Does the NPG support learning?

The educators expressed strong agreement on most of the statements related to the potential of the NPG in supporting learning, from language and literacy (4.40 ± 0.46), discovery of the world (4.38 ± 0.45), a characteristic that relates to children's everyday experiences and interactions with their environment, motor skills development (4.36 ± 0.60) and numeracy (4.11 ± 0.61). Overall, they agreed that the sessions contributed to children's learning (4.26 ± 0.48) and that the learning objectives of their lesson plans at the NPG have been achieved (4.12 ± 0.58). On

the other hand, the agreement that the NPG supported various levels of children's physical activity (3.97 $\pm$ 0.86) as well as aesthetics and creativity (3.81 $\pm$ 0.63) was moderately strong. These findings were also reflected in the qualitative feedback (Table 2).

Table 2. Qualitative data reflecting educators' perceptions on how the NPG supports various aspects of learning

Item	**Data extracts from qualitative feedback**
Language and literacy	"The children were able to describe the differences between each leaf such as 'spots', 'lines' and 'lemon shape'."
	"The NPG creates a different mood and ambience for storytelling time."
Discovery of the world	"The different facilities and different environments in the NPG allow children to have opportunities to explore."
Motor skills development	"The children were able to demonstrate movement styles in every corner of the place."
	"They moved sideways in narrow areas and jumped over big puddles."
	"The children exhibit a good sense of balance and control while performing a combination of locomotor and non-locomotor skills at varying speed and body level."
Children's learning	"The outdoor surrounding encouraged children to observe and enquire."
Numeracy	"The children were able to create repeated AB patterns using natural materials."
Aesthetics and creativity	"The children picked stones, twigs and leaves to recreate the spiral line formation on the wooden platforms."
	"They picked materials from the NPG and created appreciation cards."

Perceived Benefits on Children

In addition to supporting learning, the educators strongly agreed that carrying out lessons in the NPG contributed to their interactions with the children (4.37 $\pm$ 0.56). One educator commented that she enjoyed *"the process of looking for flowers in the park together with my children."*

There was strong agreement on various direct benefits on children, from connection with nature (4.36 $\pm$ 0.60), physical wellbeing (4.08 $\pm$ 0.52), emotional development (4.07 $\pm$ 0.53) and social wellbeing (4.04 $\pm$ 0.52). There was also moderate agreement on the contribution of the NPG to children's mental wellbeing (3.94 $\pm$ 0.65).

Educators observed social interactions (4.33 $\pm$ 0.64) and connections among the children (4.27 $\pm$ 0.45). This is supported by a qualitative comment *"I see a lot of mutual help among the children when they climb the wood frame."*

How did the Educators feel about the NPG?

When asked about whether there were any concerns about conducting outdoor lessons at the NPG, a few educators expressed concerns related to insect bites:

"I was slightly worried about the insect bites; children may get bitten."

"Some parents are particular about insect bites."

Another concern raised was fall risks caused by wet weather:

"Maybe because of the weather, some of parts of the park is wet and muddy, and the ground is a little slippery, resulting in dirty shoes."

"The wet leaves were covering the logs. As children were climbing up and stepping down, the area was slippery."

"I was worried that lesson could not be conducted due to the wet weather."

There was also the concern that the NPG may be unsettling for some children since it is a new environment:

"*My only apprehension was to consider how to support children in a space that is new to them*".

Notwithstanding the concerns, educators' sentiments towards the NPG were positive. They found the environment calming and visually appealing, with abundant variety animal life:

"*The NPG offers a relaxing place and environment."*

"*The natural environment is beautiful."*

"Seeing the living things living around the garden and surprise us: mushroom, snail, ant colony, moth etc."

One educator also stated that the place brought back fond memories of childhood days:

"Watching the children playing with the streams of rainwater reminded me of my favourite moments during my childhood."

DISCUSSION

Despite the research literature providing evidence of the advantages of nature-based play, findings in the global south are limited. This study provides preliminary insights on the perspectives and experiences of educators regarding outdoor learning in the geographical region. Overall, the results corroborated much of the positive findings from studies carried out in other cultures and contexts.

According to the theory of affordances (Gibson, 2014) on child-environment interaction, an affordance is what the environment offers an individual and what it provides or furnishes. The study provided strong evidence that the physical environment of the NPG stimulated children's imaginations and encouraged exploration, through its variety of nature play features that incorporates the use of natural materials. Natural environments can be beneficial for children's learning and development. The findings showed that the educators agreed that the natural environment in the NPG supported various aspects of children's learning. A previous study, which compared the quality of communication between parents and preschoolers in natural and indoor environments, found that children were significantly more talkative in the natural environment, with significantly longer parent-child connected communication episodes (Cameron-Faulkner et al., 2018). In the same vein, educators in the current study found that the children were able to describe what they had observed, and the environment provided a supportive ambience for storytelling.

Larrea et al. (2019) reported the importance of available affordances in the outdoor environment for children's play, learning and social interactions. Overall, the findings from the study demonstrated good affordances in the NPG and

support the conclusions drawn from previous studies, including contribution to children's wellbeing, social and emotional wellbeing, and connection with nature.
The educators in the study expressed appreciation for the beautiful surroundings and the calming atmosphere that encouraged interactions with nature. The open space and abundance of natural materials were also noted as positive features and the outdoor environment provided opportunities for the children to experience different weather conditions that are not possible in an indoor setting. This is a positive outcome considering that educators' perceptions play an important role in affecting children's experience.

One preschool educator reported concerns about how to support children in an outdoor environment. This was consistent with the observation by Van Dijk-Wesselius et al. (2020) and could be addressed by providing educators with adequate training on conducting outdoor lessons. This will help to enhance their confidence to teach in outdoor settings. Notwithstanding that, they would also need to build their own experience conducting lessons outdoors and improve their ability to plan for and facilitate learning outdoors over time. Therefore, the provision of accessible and conducive natural environments such as NPGs, provides the opportunity for educators to start.

Another concern reported by educators was about insect bites. Biodiversity workshops targeting educators may be developed to expand their knowledge, interest, and acceptance of various fauna groups. Educators also expressed concern about wet weather. One possible solution is to provide for sheltered areas or indoor classrooms that could enable children to engage in passive observational learning even during inclement weather.

Limitations of this study

The small sample size of the educators surveyed could limit the results of this study. Notwithstanding this, studies on the efficacy of natural spaces like the NPG on the development of children are rare and difficult to conduct, and more so in the global south where there is less awareness of nature play. Hence, this study provided useful preliminary insights on NPGs for early childhood education, which could form the basis for future research.

Conclusion

The NPGs in Singapore are purposefully designed spaces for children's nature exploration and learning. These spaces are meant to be safe environments with some form of structure, within which children explore unstructured nature play. Such environments offer children ample learning opportunities to achieve the objectives of pre-school education.

The open, unstructured, and dynamic nature of the NPG provided many new learning angles not available in a preset classroom environment and creates conditions for the children to be more engaged in learning. The educators in the study believed that the NPG promoted the children's cooperation, their language and literacy learning, their awareness of different natural materials available at the NPG, and problem-solving and critical thinking.

This study also showed that risky play could be important for building resilience, with anti-phobic effects that could prepare children for encounters with real and probable adversity as adults (Sandseter & Kennair, 2011). A new angle for educators to consider in the future is to tap into NPGs to support children in developing their gross motor skills, such as running, jumping, balancing, and climbing. Along with such activities, educators may assess and incorporate appropriate risky elements.

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References

Alzahrani, M., Alharbi, M., & Alodwani, A. (2019). The effect of social-emotional competence on children academic achievement and Behavioral Development. *International Education Studies*, *12*(12), 141. https://doi.org/10.5539/ies.v12n12p141

An, R., Shen, J., Yang, Q., & Yang, Y. (2019). Impact of built environment on physical activity and obesity among children and adolescents in China: A narrative systematic review. *Journal of Sport and Health Science*, *8*(2), 153–169. https://doi.org/10.1016/j.jshs.2018.11.003

Ardoin, N. M., & Bowers, A. W. (2020). Early childhood environmental education: A systematic review of the research literature. *Educational Research Review*, *31*, 100353. https://doi.org/10.1016/j.edurev.2020.100353

Cameron-Faulkner, T., Melville, J., & Gattis, M. (2018). Responding to nature: Natural environments improve parent-child communication. *Journal of Environmental Psychology*, *59*, 9–15. https://doi.org/10.1016/j.jenvp.2018.08.008

Carson, V., Lee, E.-Y., Hewitt, L., Jennings, C., Hunter, S., Kuzik, N., Stearns, J. A., Unrau, S. P., Poitras, V. J., Gray, C., Adamo, K. B., Janssen, I., Okely, A. D., Spence, J. C., Timmons, B. W., Sampson, M., & Tremblay, M. S. (2017). Correction to: Systematic review of the relationships between physical activity and health indicators in the early years (0-4 years). *BMC Public Health*, *17*(1). https://doi.org/10.1186/s12889-017-4981-5

Chawla, L. (2015). Benefits of nature contact for children. *Journal of Planning Literature*, *30*(4), 433–452. https://doi.org/10.1177/0885412215595441

Deckers, J., Marsland, B. J., & von Mutius, E. (2021). Protection against allergies: Microbes, immunity, and the farming effect. *European Journal of Immunology*, *51*(10), 2387–2398. https://doi.org/10.1002/eji.202048938

Elliot, E., & Krusekopf, F. (2017). Thinking outside the four walls of the classroom: A Canadian nature kindergarten. *International Journal of Early Childhood*, *49*(3), 375–389. https://doi.org/10.1007/s13158-017-0203-7

Er, K. (2021). Transforming Singapore into a City in Nature. *Urban Solutions, 19*, 68–77.

Ghasemirad, M., Ketabi, L., Fayyazishishavan, E., Hojati, A., Maleki, Z. H., Gerami, M. H., Moradzadeh, M., Fernandez, J. H., & Akhavan-Sigari, R. (2023). The association between screen use and central obesity among children and adolescents: A systematic review and meta-analysis. *Journal of Health, Population and Nutrition*, *42*(1). https://doi.org/10.1186/s41043-023-00391-5

Gibson, J. J. (2014). *Ecological approach to visual perception: Classic Edition*. Psychology Press.

Knoop, M., Stefani, O., Bueno, B., Matusiak, B., Hobday, R., Wirz-Justice, A., Martiny, K. (2019). Daylight: What Makes the Difference? *Lighting Research & Technology* 52, no. 3. https://doi.org/10.1177/1477153519869758.

Larrea, I., Muela, A., Miranda, N., & Barandiaran, A. (2019). Children's social play and affordance availability in preschool outdoor environments. *European Early Childhood Education Research Journal*, *27*(2), 185–194. https://doi.org/10.1080/1350293x.2019.1579546

Pate, R. R., Hillman, C. H., Janz, K. F., Katzmarzyk, P. T., Powell, K. E., Torres, A., & Whitt-Glover, M. C. (2019). Physical activity and health in children younger than 6 years: A systematic review. *Medicine & Science in Sports & Exercise*, *51*(6), 1282–1291. https://doi.org/10.1249/mss.0000000000001940

Sandseter, E. B. H., & Kennair, L. E. O. (2011). Children's risky play from an evolutionary perspective: The anti-phobic effects of thrilling experiences. *Evolutionary Psychology, 9*(2), 257–284.

Sia, A., Tan, P. Y., & Er, K. B. (2023a). The contributions of urban horticulture to cities' liveability and resilience: Insights from Singapore. *Plants, People, Planet*, *5*(6), 828–841. https://doi.org/10.1002/ppp3.10377

Sugiyama, M., Tsuchiya, K. J., Okubo, Y., Rahman, M. S., Uchiyama, S., Harada, T., Iwabuchi, T., Okumura, A., Nakayasu, C., Amma, Y., Suzuki, H., Takahashi, N., Kinsella-Kammerer, B., Nomura, Y., Itoh, H., & Nishimura, T. (2023). Outdoor play as a mitigating factor in the association between screen time for young children and Neurodevelopmental Outcomes. *JAMA Pediatrics*, *177*(3), 303. https://doi.org/10.1001/jamapediatrics.2022.5356

van Dijk-Wesselius, J. E., van den Berg, A. E., Maas, J., & Hovinga, D. (2020). Green schoolyards as outdoor learning environments: Barriers and solutions as experienced by primary school teachers. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.02919

World Health Organization (2019). *Guidelines on Physical Activity, Sedentary Behaviour and Sleep for Children under 5 Years of Age*. https://iris.who.int/handle/10665/311664.

Wojciehowski, Mandi, and Julie Ernst. "Investigating the Impact of Nature Preschools on Young Children's Creative Thinking." *International Journal of Early Childhood Environmental Education* 6, no. 1 (2018): 3

Yeung, W. J., Chen, X., Chen, L., Tan, J. (2020). S*ingapore Longitudinal Early Development Study (SG LEADS): Research Update Issue 3*. Centre for Family and Population Research, National University of Singapore.

Ethics Approval

The research design was reviewed and approved by the Singapore's University of Social Science (SUSS) Institutional Review Board (APR-0120-V1.0-27042021).

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Beyond Empathy: *Wiijigaabawitaadidaa Niigaan Izhaayang* (Moving Forward Together) toward Reconciliation through Indigenous Education in Early Childhood Environmental Education

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ABSTRACT

Responding to a growing call for culturally sustaining pedagogy, this article describes a Community of Practice (CoP) project in Minnesota. Guided by two Indigenous mentors, a cohort of 15 Indigenous and Non-Indigenous educators engaged in collective inquiry regarding how Indigenous histories, worldviews, and learning approaches can become part of their work in early childhood environmental education in meaningful, respectful, and equitable ways. Participants and facilitators engaged in the process of knowledge co-creation, which is presented here. We also share our collective reflection on reconciliation through Indigenous education, as well as on the use of the CoP approach for professional learning and capacity-building in the context of more equitable, trauma-informed, and culturally sustaining practices for early childhood care and outdoor learning.

***Keywords*:** reconciliation, Indigenous education, community of practice, capacity-building

Culture is integral to young children's learning and development. As such, national early childhood educator standards include the competency of using "a broad repertoire of developmentally appropriate, culturally and linguistically relevant, anti-bias, evidence-based teaching strategies" (NAEYC, 2019). Similarly, Minnesota (U.S.A.) recognizes this importance, recently revising its *Knowledge and Competency Framework for Early Childhood Professionals* to include cultural responsibility and practice, which they describe as including each family's culture in all aspects of learning (MN Department of Education, 2020). The *Guidelines for Excellence in Early Childhood Environmental Education Programs* also emphasize the need for cultural relevancy (NAAEE, 2016).

In the literature, however, there is a call for moving beyond culturally relevant and responsive pedagogies to culturally sustaining pedagogy. Paris and Alim (2017) describe it as education that sustains the lifeways of communities that have been and continue to be damaged and erased through schooling. While culturally relevant and responsive pedagogies aim to situate learning within the lived experiences of students, culturally sustaining pedagogy frames the outcome of learning as critically enriching strengths rather than replacing deficits, while seeking equity, access, opportunity, and social transformation and revitalization (Paris & Alim, 2017). This is aligned with recommendations from a recently released report, *A New Vision for High-Quality Preschool Curriculum* (National Academies of Sciences, Engineering, & Medicine (2024). This vision is for preschool programming that

fosters holistic and healthy development and learning for every child and affirms their full identities, recognizing and building on strengths, while providing the supports needed for reaching their full potential. Among their recommendations are incorporating the perspectives, experiences, cultures, languages, strengths, and needs of a diverse range of children and including rich and meaningful content that centers child engagement and agency.

While culturally sustaining pedagogy pertains to all cultures, our project centered on Indigenous cultures. According to a 2017, 40% of adult American respondents are unaware that Native Americans still exist (Wood-Krueger, 2022). As described by Minnesota's Mdewakanton Sioux Community,

> Native American peoples largely have lived in the shadows of American society. Their relative invisibility remains an ongoing, serious problem. Indigenous Americans are usually an afterthought in American society if they are thought about at all… Most mainstream sources of information still peddle misinformation, stereotypes, and erasure to dominate students' and educators' perceptions about America's first peoples (Wood-Krueger, 2022, p. 6).

In Minnesota, the *Restoring Our Place* initiative of the Shakopee Mdewakanton Sioux Community (Wood-Krueger, 2022) aims to improve public attitudes and help all Minnesotans have a better understanding of the history, culture, and current experiences of Indigenous peoples by incorporating more accurate information into Minnesota's education system. Their research suggests many educators are eager to integrate Indigenous perspectives into their work but do not know how to do so. Among their recommendations is high-quality professional development for educators that involves Tribal and Native expertise without being burdensome. The Minnesota Department of Education is also calling for improved professional development to support their *Indigenous Education For All* initiative, which aims to integrate the rich cultural, historical, and contemporary contributions of the Anishinaabe and Dakota people into the curriculum of all Minnesota schools, disrupt the cycle of misconceptions perpetuated by gaps in our education system, and reclaim the narrative of Indigenous history and contemporary American Indian people (MN Department of Education, 2024).

Amid these calls for culturally sustaining pedagogy and high-quality professional development is the day-to-day reality for early childhood professionals – low compensation, burn-out, difficulty in finding substitutes, feeling devalued, and the post-pandemic impacts on children in their care. What often unfolds is minimal levels of training to meet requirements or even setting aside professional development altogether. There also is the challenge pointed out by Day (2020): "Making sure that workers understand the importance of culture can be very hard for people, in particular, white workers who don't have much of an affinity with their own culture…it's hard for people who aren't attached to their own culture to understand that culture really is important, in particular to Indigenous people and people of color" (para. 3).

This backdrop of needs and challenges coincided with the work we had underway locally, which entailed implementing a community of practice (CoP) with 15 Indigenous and non-Indigenous professionals working at the intersection of early childhood education and environmental education (Ernst et al., 2023). A CoP is a "group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger et al., 2002, p. 4). CoPs involve situated learning that is socially and culturally constructed, with theoretical groundings in situated cognition (learning occurs in a situated activity that has social, cultural, and physical contexts), social learning (people learn from and with others), and knowledge management theory (knowledge is accessed, created and shared within community) (Blankenship & Ruona, 2007).

A CoP brings educators together around a common domain for collaboration and reflection that is inclusive and ongoing, toward deepening CoP participants' knowledge and skills and improving their teaching practice (Seashore et al., 2003). Beyond growth in knowledge and skills, there is an emphasis on developing an identity as a community member. Learning is viewed not as a process that results in *individuals*' acquisition of knowledge, but as a shared process of becoming a member of a sustained community and what it means to learn as a function of being a part of a community. Becoming knowledgeable and skillful and developing that identity are part of the same process, with the former motivating, shaping, and giving meaning to the latter (Lave, 1991).

During the 2022-2023 school year, these 15 early childhood professionals met monthly to engage with Indigenous perspectives for deepening strategies for fostering young children's empathy. We were intentional with our use of a "Two Worlds" approach (Kapyrka & Dockstator, 2012) for implementing the CoP, as we aimed to expand our collective understanding of practices for fostering empathy by honoring both Indigenous and Western knowledge regarding empathy. Rooted in what was already known from Western science regarding fostering empathy and guided by our Indigenous mentor, the CoP allowed us to work toward a co-created, deepened approach to infusing empathy in early learning settings and the capacity-level outcome of a culture of continuous learning and improvement within our regional early learning community.

While the CoP was effective in co-constructing this approach (Ernst et al., 2023) and translating this learning into changes in their teaching practices (Ernst et al., 2024), two needs have emerged from that work. One was the collective desire for the continuation of the CoP. Secondly, participants recognized the need to undertake steps beyond empathy to engage appropriately and authentically in outdoor learning on and with Indigenous land, as well as with the Indigenous and non-Indigenous children in their care. Empathy was an integral starting point, but more work was needed to build the respectful and reciprocal relationships that ultimately benefit all children in our care and the communities in which they live.

PROGRAM DESCRIPTION

In this unfolding trajectory of work, we recognized the ongoing potential of the CoP approach for altering the conventional linear relationships through which professional learning often occurs (Buysse et al., 2003). Additionally, a CoP is conducive to honoring the Ojibwe approach of shared learning and knowledge, by which each of us knows something, but none of us knows the whole. With the relationships that had been fostered and trust built during the first year of the CoP, we felt continuation of the CoP could provide a safe space to wrestle with challenging questions that emerged in our previous work, such as how we appropriately connect non-Indigenous children to Indigenous land, the difference between embracing Indigenous ways of seeing the world and cultural appropriation in the context of outdoor learning, and identifying what it means to honor historical trauma in early learning and care settings. We also experienced the ability of the CoP approach to elevate Indigenous voices that are often at the margins in early childhood education. As such, we sought funding to support a second year of CoP to continue our work together, on this northern land of *Mni Sota Makoce* (Minnesota), which has been cared for and called home by the Anishinaabe, Dakota, Northern Cheyenne, and other Native peoples from time immemorial. Our aim was oriented toward reconciliation through Indigenous education.

Reconciliation is complex and means different things to different people. To guide our unfolding work, we used this definition: building and sustaining respectful and equitable relationships between non-Indigenous and Indigenous peoples where non-Indigenous historic settlement has had very serious consequences for Indigenous cultures, languages, lands, families, and communities (Hare, 2022). For this type of relationship to happen, there must be awareness of the past, an acknowledgment of the harm that has been inflicted, atonement for the causes, and action to change behavior (Truth and Reconciliation Commission, 2015). In an educational context, reconciliation work includes identifying and working to change the structures, ideologies, and pedagogies that create unequal outcomes (Hare, 2022). Thus, reconciliation challenges us beyond empathy and even beyond a deeper awareness and understanding. Reconciliation is a pathway for moving forward together. It is a first step and one that must be in the direction of concrete actions to address the historic, systemic, and ongoing impacts of colonialism and racism.
As we conceptualized this second iteration of our reconciliation-focused CoP, we framed our work as collective inquiry regarding how Indigenous histories, worldviews, and pedagogies can become part of the work we do in outdoor learning with young children in meaningful, respectful, and equitable ways. Our aim was oriented toward culturally sustaining practices for early childhood care and outdoor learning and forward movement along the ongoing journey of shaping a better future for all children. We developed a theory of change (see Figure 1) and a logic model (see Figure 2) to support this work.

We invited the 15 participants from the previous CoP to continue forward into this second year (2023-2024) of participation in our CoP through our local, grassroots collaborative of nature-based educators and caregivers. One

participant had moved, and we invited a new educator who had expressed interest in the prior round to participate. These educators were working at the intersection of children and outdoor learning, at varying points in their reconciliation education journey, and committed to furthering equity in early childhood outdoor learning. These participants were at varying career stages (from pre-service to very experienced educators; non-Indigenous and Indigenous educators; a range of settings from private nature preschools to public preschool and Head Start programs, to nonformal education settings and family in-home providers). Like the year prior, they received a stipend of $1,000 for their participation, as a reflection of honoring the participants as professionals who have much to contribute and from whom we have much to learn.

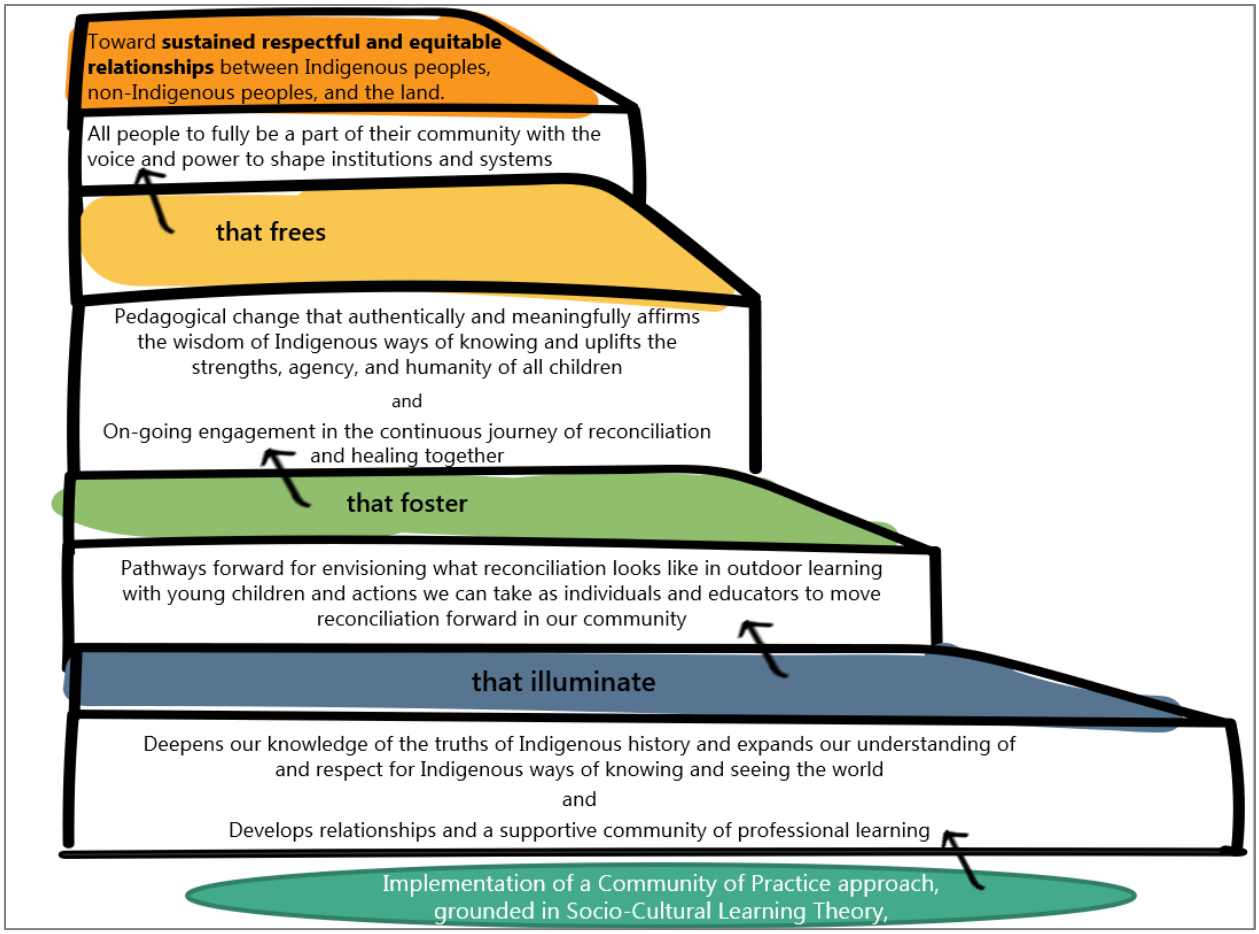

Figure 1. Wiijigaabawitaadidaa Niigaan Izhaayang Theory of Change

Before our first gathering, we invited participants to access the *Reconciliation Through Indigenous Education* course material (a non-credit, open-access online course offered by the Office of Indigenous Education at the University of British Columbia, with development of the course led by Dr. Jan Hare, an Anishinaabe scholar and educator from the M'Chigeeng First Nation in northern Ontario; see https://pdce.educ.ubc.ca/reconciliation-2/). While the course is formally opened three times a year for participation for six weeks, we had sought permission to use this course to ground our CoP and for our 15 participants to engage with and access the materials over the school year, allowing us to engage with each of the course modules for a longer time. The course frames reconciliation as changing institutional structures, practices, policies, and individual beliefs toward strengthening relationships with Indigenous peoples.The course is grounded in the recognition that all learners must be supported in developing their understanding of Indigenous people's worldviews and cultures as a basis for creating equitable and inclusive learning spaces.

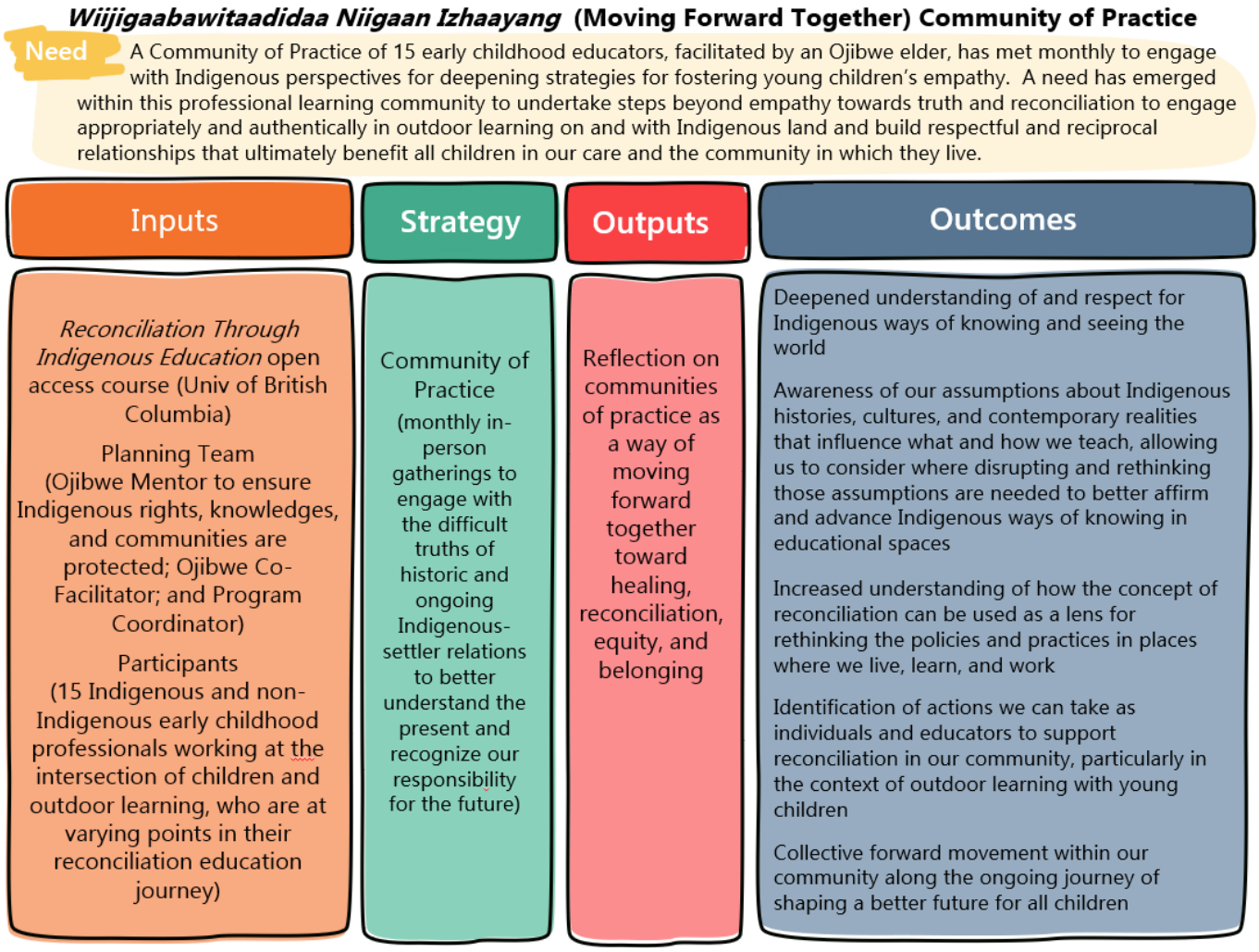

Figure 2. Wiijigaabawitaadidaa Niigaan Izhaayang Logic Model (*Note: The outcomes are grounded in the "Reconciliation through Indigenous Education" course introduction by Dr. Jan Hare)

Our CoP met six times over the 2023-2024 school year. Each session began with one of the Indigenous participants providing the opportunity for smudging. Smudging is a tradition, common to many First Nations, involving burning sage or another medicine gathered from the earth, which helps people pause and center, toward being mindful, connected, and grounded in the event, task, or purpose at hand; smudging allows for a letting go of negative feelings or thoughts and is always voluntary (Indigenous Inclusion Directorate, 2019). We then shared a meal to build community and as a reflection of our grounding in the Two Worlds approach. (Our first session entailed a "working" meal, with discussion questions for participants while they ate; however, our Indigenous mentors guided us away from that practice for the subsequent sessions, as it took away from the Indigenous significance of meal-sharing.) Like our first year of the CoP, each session opened with a Land Acknowledgement and an intentional opening (such as a poem, story, or song), shared by one of the participants, and closed with an intentional closing, also offered by one of the participants.

During our first session, we spent time re-orienting ourselves to the CoP approach and our community agreement from the year prior, which would continue to guide our interactions for this second year of the CoP. We introduced participants to the current project's aims that were shaped by the *Reconciliation through Indigenous Education* course materials. Our aims were as follows:

1. Deepened understanding of and respect for Indigenous ways of knowing and seeing the world;

2. Awareness of our assumptions about Indigenous histories, cultures, and contemporary realities that influence what and how we teach, allowing us to consider where changes in those assumptions are needed to affirm and advance Indigenous ways of knowing in educational spaces;

3. Increased understanding of how the concept of reconciliation can be used as a lens for rethinking the policies and practices in places where we live, learn, work, and play; and

4. Identification of actions we can take personally and professionally, individually and collectively, to support reconciliation in our community, particularly in the context of outdoor learning with young children.

The remainder of our first session centered on the content from the first module, *Introduction to Reconciliation Indigenous Education*, which focused on the range of perspectives associated with the concept of reconciliation and its applications to teaching and learning environments and beyond. This first module also provided opportunities to think about how our understandings of Indigenous peoples (historical and contemporary) have been constructed over time and reflect on our own experiences, values, and assumptions and how they play a role in the ways we, as educators, approach Indigenous content, perspectives, and pedagogies. We also provided participants with suggested resources relating to secondary trauma and self-care, given the weight and difficulty of the topics at hand.

Our second through sixth sessions were guided by course modules two through six. Before each gathering, we invited participants to engage with the course module content. Each module had great depth and extensive breadth. In addition to videos and audio recordings by Indigenous Elders and Indigenous educators and scholars, there were many culturally relevant learning resources to explore on the course module topic at hand; these resources were in support of both informing educational practice as well as moving reconciliation forward and strengthening communities. During our time together each session, and through the guidance of our Indigenous mentors, we engaged with the content further, through small and large group discussions, individual reflection and journalling, storytelling and song, art, and talking circles.

The focus of the second session was course module two, the *History of Indigenous Education*, including ways in which historical experiences have shaped contemporary realities for Indigenous peoples (such as the policies and practices of dispossessing Indigenous people from their lands and eroding their linguistic and cultural links to their identity and livelihood). The module also helped us understand how the forcible removal of Indigenous children from their families and communities, along with residential schooling, has had a profound and ongoing influence on generations of Indigenous families and communities. We also focused on identifying where themes of strength, resiliency, and hope shine through as we intentionally engage with these histories and contemporary realities and as we move forward together. The third session focused on the module, *Learning from Indigenous Worldviews*. Through this module, we explored Indigenous values, such as holistic development, land as a knowledge source, extended family, patience, and the importance of collectiveness, balance, and relationships. The module provided ways that Indigenous worldviews, perspectives, and pedagogies can ground and support curriculum and teaching and examples of Indigenous education frameworks within learning environments, such as the *First Peoples' Principles of Learning* (First Nations Education Steering Committee, 2006/2007), which deeply resonated with the CoP participants and seemed so conducive to the work they do in the context of outdoor learning.

The fourth session drew from module four, *Learning from Story*. We explored how story is a way of knowing; it is how knowledge, history, and memory are shared across the generations. Stories have the power to educate and heal and are an important part of the reconciliation process. The module included stories of residential school survivors that contribute to our understanding of the significance of this history and the intergenerational impacts on families and communities. We also explored protocols associated with Indigenous storytelling and how stories in educational settings can be used by educators to strengthen the identity of Indigenous learners. During this fourth session, we also invited participants to engage in reflection regarding how these stories have implications for responsibility in reshaping a different story of Indigenous and non-Indigenous relationships in the places we live, work, learn, and plan. We invited participants to draw what that new story could be, or what that new relationship could look like, inviting them to think about what role they could play in that new story (see Appendix A for several

examples). The fifth session, grounded in the course module *Learning from the Land*, helped us more deeply understand how land is not only a source of knowledge, but the basis of Indigenous peoples' identities. We learned how Indigenous values and ways of knowing can be brought to the forefront of teaching and learning through experiential, land-based learning. We reflected on land as teacher (source of knowledge), land as a basis of identity, land as pedagogy, and land as a pathway for reconciliation.

The sixth session was grounded in the final course module, *Engaging in Respectful Relationships*. This module focused on how respectful relationships are so necessary for advancing Indigenous education, ensuring the educational success of Indigenous students, and advancing reconciliation. The module guided ways we can develop trusting relationships through working together, listening to and supporting Indigenous priorities, and authentic consultations. We deepened our understanding of the primacy of respect, relevance, reciprocity, and responsibility. We learned more about what respectful engagement of Indigenous family and community members in schools entails, as well as protocols for including Elders in classrooms. This final session also focused on knowledge synthesis, with participants reflecting individually and then collectively on our growth and learning. This synthesis was integral in terms of helping participants realize the learning that had been unfolding. As one participant expressed, "*I was amazed to see the work and tangible action steps emerge in the last session. It was surprising and exciting to see how much there is to offer the movement from such a quiet, reflective experience CoP experience this year*."

Through the dissemination and sharing of our learning from our first year of the CoP, we had been encouraged to think about non-textual ways of representing our learning, to better reflect a Two Worlds approach and honor other forms of knowledge expressions. As such, we invited a graphic recorder (visual notetaker) to attend this final session and listen to our reflections. Before the session, we provided her with a compilation of our reflections and learnings thus far, so she had that context and grounding. During our time together in that final session, she listened to participants' reflections and built upon a drawing she had started from the compilation that had been shared with her. As she added to the mural, she communicated both the content and tone of the participants' reflections. The mural created is shown in Figure 3. The mural intentionally expresses one of the images that became significant to us throughout the CoP; the hands joined together at the center of the mural express the receiving and passing along of knowledge, representing the learning we have received that is inextricable to the sharing and acting upon our learning.

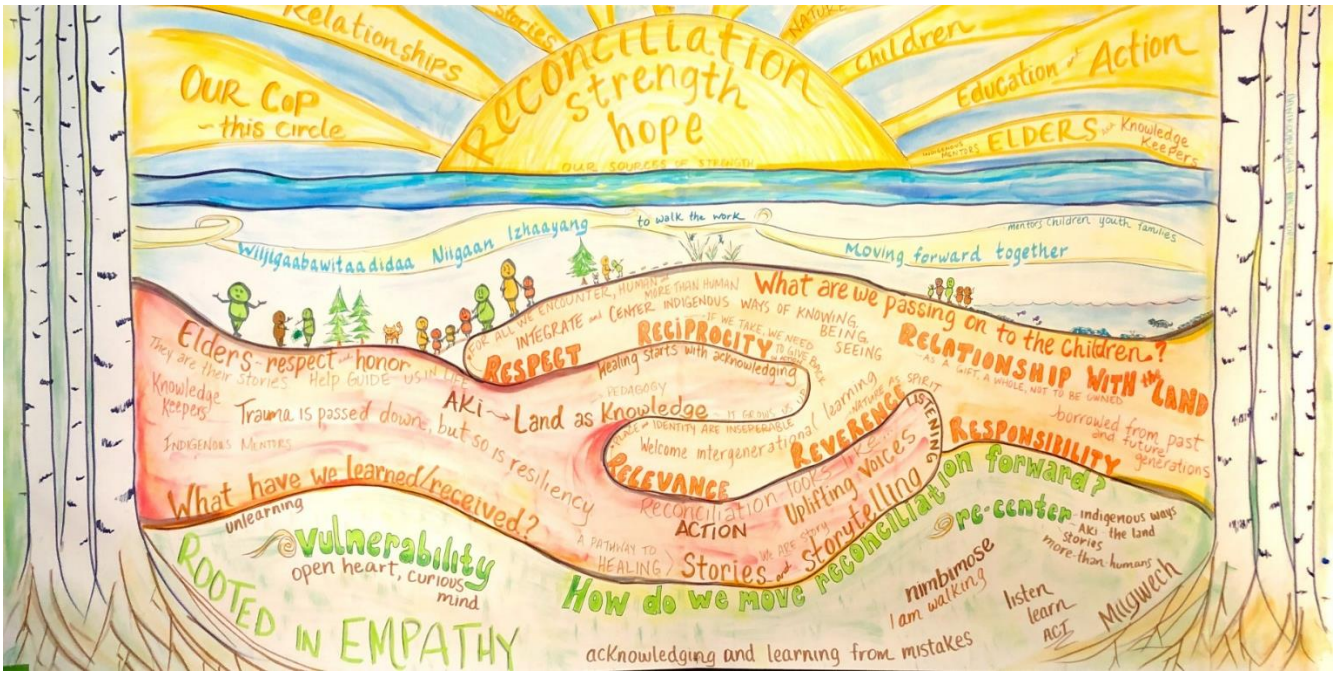

Figure 3. Wiijigaabawitaadidaa Niigaan Izhaayang (Moving Forward Together) Learning Mural
(illustrated by Nelle Rhicard, Reframe Ideas)

Additionally, our learning synthesis is shared in Appendix B; this cumulative synthesis draws from our experiences, reflections, and learning from across the six sessions. It is organized into four sections: What We Learned (Our Growth); How We Can Further Reconciliation in Outdoor Learning with Young Children; How We Can Move Reconciliation Forward in Our Community; and Sources of Strength, Hope, and Resilience as We Move Forward Together. This learning is offered in the spirit of an Indigenous view of knowledge, wherein knowledge flows without end: it is not owned, but shaped by community (Anderson et al., 2017). We offer this work with deep gratitude and respect for the Indigenous traditions we have had the privilege of learning with and from. Our final session concluded with CoP participants presenting our Indigenous mentors with handmade notes and gifts, following the tradition of Indigenous gift-giving to show appreciation for the knowledge exchanged.

REFLECTION ON LEARNING OUTCOMES

Our project evaluation focused on these evaluation questions, which corresponded with our learning outcomes:

- Did our individual and collective understanding of and respect for Indigenous ways of knowing and seeing the world deepen?
- Did our awareness of our assumptions about Indigenous histories, cultures, and contemporary realities influence what and how we teach, allowing us to consider where disrupting and rethinking those assumptions are needed to better affirm and advance Indigenous ways of knowing in educational spaces?
- Do we individually and collectively have an increased understanding of how the concept of reconciliation can be used as a lens for rethinking the policies and practices in places where we live, learn, and work?
- Have we identified actions we can take personally and professionally, individually and collectively, to support reconciliation in our community, particularly in the context of outdoor learning with young children?

The participants' reflections from across the CoP sessions that were compiled and integrated into our learning synthesis (presented in Appendix B) are meaningful indicators of participants' deepened awareness, respect, and understanding, as well as their identification of actions to move reconciliation forward and suggest that our intended outcomes were indeed met. Yet we recognize that this is an ongoing learning journey and that our learning must continue to grow and deepen. There are several points we bring forward here that we have reflected further upon, which may be of interest to others as they consider how a lens of reconciliation might be useful in their work and how Indigenous knowledges, world views, and pedagogies can become part of the work they do in outdoor learning with young children.

One of those areas is regarding our question of how to appropriately and authentically engage non-Indigenous young children in connecting with and caring for land that is not "theirs." Our Indigenous mentors guided us to a place of recognition that, from an Indigenous perspective regarding land (it is not something owned), perhaps of greater concern is land that has and continues to be degraded. They reassured us as to the appropriateness of nurturing Indigenous and non-Indigenous children's connection to nature and helping them develop an ongoing, intimate relationship with the land on which they live, learn, and play. And as part of that, our role can be to help reframe that relationship from one of stewardship (which can feel burdensome or suggest something to be left to experts), to one marked by children's active participation and agency, guided by reciprocity and empathy, and grounded in a deep love and respect for *Aki,* the Anishinaabe word that is often translated to "land" but instead is understood as everything.

Another aspect of our learning we bring forward relates to trauma-informed care in the context of early childhood education. We more deeply recognize that trauma-informed care includes historical trauma, and that historical trauma has the potential to negatively impact a child's long-term health and learning. Particularly through the first-hand accounts of residential school survivors (Native American boarding schools in the U.S. and Canada), we were deeply moved by the profound impact on generations of Indigenous children, families, and communities, including

families in our midst, and especially upon greater understanding of the impact of eroding linguistic links on their cultural identities. We have learned how stories can strengthen the identity of Indigenous children, as can land-based pedagogies. We also recognized the relevance of the *First Peoples Principles of Learning* (First Nations Education Steering Committee, 2006/2007) in the context of historical trauma-informed care: that learning is embedded in memory, history, and story; learning involves patience and time; learning requires exploration of one's identity; and learning supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.

We also have greater clarity regarding embracing Indigenous knowledges, worldviews, and pedagogies, and how that differs from cultural appropriation. We have been guided, through our Indigenous mentors and scholars, that Indigenous education is good for all children, and there is a desire to have non-Indigenous educators meaningfully include Indigenous knowledges and pedagogies in their classrooms. Anishinaabe scholar Jean-Paul Restoule offers "We can't achieve our goals alone. We need non-Aboriginal people to understand our shared histories, perspectives, visions, and goals, and to participate in achieving them together. We need non-Aboriginal teachers respecting and using Indigenous perspectives in our classrooms." He explains the fear of appropriation and a lack of confidence among non-Indigenous educators can be addressed through reciprocal relationships. Further, relationships with Indigenous peoples defuse the appropriation issue because one is not speaking for but speaking *with*; instead of asking, 'Do I have the right to teach this material? we should ask 'What is my responsibility?" Equally important is acknowledging traditional sources of knowledge, like how we cite others when writing or in research. This also includes acknowledging when we are using Indigenous knowledge and pedagogy: Who did we learn this from and when did they share it with us? (Restoule & Chaw-win-is, 2017). Restoule further states:

> Indigenous knowledge and Anishinaabek education are meant for everybody. When Anishinaabek share traditional teachings and stories they are meant to reveal the nature of life and human nature, not just Anishinaabek culture. The stories teach us what it means to be alive and anyone can learn from them if they listen carefully. The building of responsibility to self, relations, community and life has never been more significant than this time of ecological crisis that will require us to shift our consciousness ever more to attending to each other's survival, quality of life, and the protection of endangered species and habitats, including our own. Indigenous education is in line with the movement that many are calling the 'great turning'. The time is right for the strengths and gifts of Indigenous education to be embraced by others. To integrate all learners in relation to one another and all life, in the pursuit of full human development is an inclusive education (Restoule, 2011, para 8).

Additionally, we learned through the course resources and our Indigenous mentors that some knowledge is sacred and only shared with permission and/or in certain situations. They have also guided us toward extending beyond the phrasing of Indigenous ways of knowing, to Indigenous ways of being, knowing, and doing, as the "being" and "doing" are just as important as the "knowing."

REFLECTIONS ON THE COMMUNITY OF PRACTICE APPROACH FOR CAPACITY BUILDING

Participants completed a final questionnaire that was oriented toward reflecting on the use of the CoP approach in this reconciliation context, and for professional learning and capacity-building in the context of more trauma-informed and culturally sustaining practices for early childhood outdoor learning more broadly. Participants' responses underscored our sense as to not only how conducive this professional learning approach had been in this reconciliation-focused context, but also how impactful it was, with participants describing the learning experience as "life-giving" and "transformative." Their responses also provided insight into why this approach was so effective. For example, one participant expressed:

> *The CoP approach was a beautiful way to build a trusting community and share the stories of our own lives and work while doing some deep personal and community introspective work. We were learning about challenging topics and ideas for system-level reform and the care of humans. The CoP approach helped us learn holistically.*

The theme of this community being a safe space, where trust and vulnerability unfolded through active, authentic engagement, was shared within many of the participants' responses. One described the CoP approach as a way for "*everyone in the group to share, be seen and heard*," which "*seldom happens in professional development, particularly for early childhood educators*." The following are two further examples:

> *The CoP approach is such a great way to do this work. The created community makes it a safe space to learn, share, and take risks. This format has led to far deeper learning than I've ever experienced in a typical PD session because it requires you to think deeper, be an active listener, and engage with the community. The community aspect of this experience also makes you want to come and participate because you get to learn among peers who have become trusted friends.*
>
> *The CoP approach has been so deeply nurturing. It has provided a safe place to learn, share, make mistakes, and grow as an educator. It has been invaluable to share and gather knowledge alongside this group of women under the guidance of our Indigenous mentors and facilitators. We have created a community, one in which we can lean on each other, listen to one another, and cultivate ideas and ways of knowing to then implement in our own settings. I have deeply enjoyed learning this way. The slowness in which we have moved to create this knowledge provides for deep thoughtful reflection and connection. It is this type of authentic connection where deeper learning can occur. I feel like I am part of a movement, a group of educators working together, perhaps implementing individually, to be more equitable, trauma-informed, and culturally competent. In doing so, families feel welcomed and validated. This work ripples outwards.*

It seems that this safe space, this community in which their learning deepened provided an important avenue for developing both self-confidence and commitment toward the aims at hand, preparing them and motivating them for applying their learning in their respective settings and programs beyond the CoP space. As one participant expressed, the CoP *"brings focus and intention and gives me direction in where to start and a goal for where I want to go."* This is further articulated in the following two participant responses:

> *The CoP approach seems to prioritize depth and relationship building, which are both values that benefit the group directly, and benefit the groups that the CoP individuals are connected with. Practicing these values in a safe space with others makes it easier to practice them in settings where others may be less familiar with or open to the approach.*
>
> *The value of the CoP lies in the incredible understanding and vulnerability of every member. I feel more confident that I can do this work even though it is hard and scary, and I may stumble because I have an entire community of teachers walking the same journey alongside me. Hearing the experiences and examples from other programs also helps show me how to move in the right direction one step at a time. Also, there is something about doing this work together that feels more motivating. We are all moving toward building a stronger, more beautiful community by acknowledging the truths of the past and present and committing to intentionally doing better.*

And related to this deepening of commitment, or perhaps fueling it, was a recognition of the importance and relevance of this work, as well as there being hope for a better tomorrow. These sentiments are expressed beautifully through the words of the following participant responses:

> *But when we put into practice the knowledge we have gained and share it with colleagues and community members, it helps to cement how critical this work is. But we as participants are redefining our approaches and values, and what it means to be an educator to all children, all relatives. Year after year we have access to these little, amazing, beautiful, capable children. We can help plant the seeds of empathy and understanding. We help them to create a connection to the land, to help see themselves in both the smaller and bigger stories of this world and their own lives and all our relatives.*

> *Being able to hear others' stories of what they experienced in life and how to process the trauma has deepened my motivation and commitment for teaching children how to care for one another through empathy, reconciliation, and understanding that we are all connected to the land and we need to care for her as she cares for us.*
>
> *Through this process, I feel that generations to come have a better future knowing the trauma that happened and how we can heal and learn from it. Yes, trauma is passed down through generations. But so is resilience and hope.*

Through these insights shared by participants, and as we look ahead to future work, what emerges so clearly is the importance of learning as a social process. As stated in the literature:

> We are coming to understand that learning rather than being solely individual as we have taken it to be is actually also social… People learn from and with others… They learn through practice (learning as doing), through meaning (learning as intentional), through community (learning as participating with others), and through identity (learning as changing who we are) (Lieberman & Pointer Mace, 2008, p. 227).

Time and active participation are at the heart of learning in community. Educators were active in their listening, reflecting, sense-making, and sharing. Educators were engaged in collegial inquiry; they had access to expertise in the form of the Indigenous mentors and the course materials, yet there was respect for the internal expertise within the community. As such, we have greater insight into the "inner workings" of this CoP approach, whereby identity, self-confidence, and commitment seem to be important mediators between knowledge and application, and of which time, community, trust, and deep engagement are essential ingredients.

Additionally, as we reflected on this project and the CoP approach, we realized the potential for extending outward to other teachers. For example, one participant described it as so "life-giving" that they wished all teachers could experience it, and another suggested, "*If we could get more educators engaged in deep, trusting conversations, we would all benefit*." One stated her experience in the following way, which suggests the potential for replicating this approach:

> *We shared meals, our own lives, our challenges in our personal journeys, and our educator journeys. We had enough time between sessions to prepare as individuals with the video and other course resources, and then in our group sessions to work through some of the material as a group and tailor that learning to our own community and place. We went from the big picture of how the world history of colonization has affected Aboriginal peoples to how colonization and the Industrial Revolution have changed our local communities (human and more-than-human) and land relationships and worldviews. We were shaping a better future for all children by learning these histories and inspecting the more common (likely predominant) and less common (often systematically erased) views about relationships to land, story, learning, power, trust, family/community, and play.*

Yet at the same time, we recognize how important it was that this reconciliation-focused CoP was not our first learning experience together. Fortunately, this reconciliation-oriented CoP was built upon our prior empathy CoP; thus, we had already developed a foundation of trust, respect, relationship, vulnerability, and safety, from which we could ground repair when mistakes were made. We learned together, but we also unlearned and relearned together. Further, as we reflect on this past year and think about this unfolding trajectory, we are mindful that while the CoP approach can be deeply impactful, it is a professional learning approach that takes time – time for the group to become a community, and time for that trust and deep engagement to unfold. We are also mindful of how deeply place-based this work is, that this work will look different when practiced elsewhere, and how important it is to carry out this work through respectful and reciprocal relationships with the Indigenous peoples where they live, work, learn, and play.

CONCLUSION AND LOOKING AHEAD

Our CoP focused on reconciliation through Indigenous education. Our aim was to *wiijigaabawitaadidaa niigaan izhaayang* (move forward together) toward more equitable, trauma-informed, and culturally sustaining practices in early childhood care and outdoor learning. Both this CoP and our preceding CoP focused on empathy, have been deeply impactful. This past year reflected an "Indigenous pause," a slowing down for intentional listening and reflection; we "sat with" the perspectives, stories (often accompanied by grief), and knowledge shared; and to some degree, action felt premature. By the end of the year, however, participants were expressing readiness to step forward from the foundation built and put our learning into action. One participant expressed it in this way:

> *I thought the CoP approach was effective with this topic in a different way than our first CoP (our Empathy CoP). There was more space for pause, reflection, and listening. It was quieter and held the energy of the group so that we could quiet down and step back rather than gather knowledge and move forward. Because of the shelter of the CoP, I think our community of learners is ready to walk forward with more care, intention, knowledge, and grounding.*

Upon reflection, we realize that just like empathy was integral but insufficient, this work over the past year is also insufficient, and that we must continue forward movement together. An idea that emerged from our final session together, inspired by a concluding talking circle, is the Ojibwe word and concept of *nimbimose*, which roughly translates to "walking." We collectively want and are committed to continuing this slow, intentional learning and forward movement together, toward education that authentically and meaningfully affirms the wisdom of Indigenous ways of being, knowing, and doing, and uplifts the strengths, agency, and humanity of all children. As such, we have submitted a proposal for funding to support this unfolding trajectory. We seek to continue furthering our learning toward planning and implementing site-level projects that deepen young children's relationship with the natural world in ways that integrate reciprocity, agency, Traditional Ecological Knowledge, hope, and a sense of responsibility. With humility, we continue our collective, ongoing journey of shaping a better future for all children through culturally sustaining practices in early childhood learning and care settings.

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REFERENCES

Anderson, D., Comay, J., & Chiarotto, L. (2018). *Natural Curiosity 2nd Edition: The Importance of Indigenous Perspectives in Children's Environmental Inquiry*. Ontario Institute for Studies in Education, University of Toronto: Toronto, Ontario.

Blankenship, S. & Ruona, W. (2007). *Professional learning communities and communities of practice: A comparison of models literature review.* Paper presented at the Academy of Human Resource Development International Research Conference in The Americas, Indianapolis, IN.

Buysse, V., Sparkman, K., & Wesley, P. (2003). Communities of practice: Connecting what we know with what we do. *Council for Exceptional Children, 69*, 263-277. https://doi.org/10.1177/001440290306900301

Day, P. (2020). *University of Minnesota Duluth's Center for Regional and Tribal Child Welfare Studies' Training for Culturally Responsible Services to Native American Families.* https://cehsp.d.umn.edu/departments-centers/departments/social-work/center-regional-tribal-child-welfare-studies-0

Ernst, J., Underwood, C., Mandi Wojciehowski, M., & Nayquanabe, T. (2024). Empathy capacity-bulding through a community of practice approach: Exploring perceived impacts and implications. *Journal of Zoological and Botanical Gardens,* In press.

Ernst, J., Underwood, C., & Nayquanabe, T. (2023). Everyone has a piece of the story: A Community of Practice approach for supporting early childhood educators' capacity for fostering empathy in young children through nature-based early learning. *International Journal of Early Childhood Environmental Education, 11*(1), p. 34-62.

First Nations Education Steering Committee, 2006/2007. *The First Peoples Principles of Learning.* Available from https://www.fnesc.ca/first-peoples-principles-of-learning/

Hare, J. (2022). Foreword. In S. S. Styres & A. Kempf (Eds.), *Troubling truth and reconciliation in Canadian education: Critical perspectives* (pp. vii–xi). University of Alberta Press.

Indigenous Inclusion Directorate (2019). *Smudging protocol and guidelines for school divisions.* Government of Manitoba's Minister of Education and Training: Winnipeg, Manitoba. Available from: https://www.edu.gov.mb.ca/iid/publications/pdf/smudging_guidelines.pdf

Kapyrka, J., & Dockstator, M. (2012). Indigenous knowledges and Western knowledges
in environmental education: Acknowledging the tensions for the benefits of a "two-worlds" approach. *Canadian Journal of Environmental Education (CJEE)*, *17*(0), Article 0.

Lave, J. (1991). Situating learning in communities of practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63–82). American Psychological Association.

Lieberman, A., & Pointer Mace, D. (2008). Teacher learning: The key to educational reform. *Journal of Teacher Education, 59*(3), 226–234. https://doi.org/10.1177/0022487108317020

Minnesota Department of Education (2024). *Indigenous education for all*. Available from https://education.mn.gov/MDE/dse/indian/all/

National Association for the Education of Young Children. (2019). *NAEYC early learning program accreditation standards and assessment items.* Washington, DC: NAEYC.

North American Association for Environmental Education. (2016). *Early childhood environmental education programs: Guidelines for excellence.* Washington, DC: NAAEE.

National Academies of Sciences, Engineering, & Medicine*. (2024). A new vision for high-quality preschool curriculum*. Washington, DC: The National Academies Press. https://doi.org/10.17226/27429.

Paris, D., & Alim, H.S. (2017). *Culturally sustaining pedagogies: Teaching and learning for justice in a changing world.* New York: Teacher's College Press.

Restoule, J. & Chaw-win-is. (2017). *Old ways are the new way forward: How Indigenous pedagogy can benefit everyone.* UNESCO: The Canadian Commission for UNESCO's Idea Lab.

Restoule, J. (2011, January 25*). Everything is alive and everyone is related: Indigenous knowing and inclusive education*. Ottawa, Ontario: Federation for the Humanities and Social Sciences. Available from https://www.federationhss.ca/en/blog/everything-alive-and-everyone-related-indigenous-knowing-and-inclusive-education

Seashore, K., Anderson, A., & Riedel, E. (2003). *Implementing arts for academic achievement: The impact of mental models, professional community and interdisciplinary teaming.*Paper presented at the Seventeenth Conference of the International Congress for School Effectiveness and Improvement, Rotterdam. http://purl.umn.edu/143717

Truth and Reconciliation Commission of Canada. (2015). *Truth and reconciliation of Canada: Calls to action.* Available at https://www2.gov.bc.ca/assets/gov/british-columbians-our-governments/indigenous-people/aboriginal-peoples-documents/calls_to_action_english2.pdf

Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge.* Harvard Business School Press.

Wood-Krueger, O. (2022). *Restoring our place: An analysis of Native American resources used in Minnesota's classrooms.* Prior Lake, Minnesota: Shakopee Mdewakanton Sioux Community.

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Nature Attachment Theory: Exploring the Human-Nature Bond Through an Attachment Theory Lens

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ABSTRACT

Several concepts exist to explain the human-nature relationship, including nature connection. This paper offers a re-conceptualisation of the human-nature bond, based on the infant-parent bond and attachment theory. As such, this paper draws upon research on attachment theory and environmental psychology to draw parallels between the two. Initially it looks at features of attachment theory, such as the critical period, the meeting of needs, proximity seeking, as well as disruption of attachment and explores the human-nature relationship literature for clues as to correspondence. Moreover, it presents practical implications of conceptualising the human-nature relationship as one of attachment, the importance of socialising agents in the building of this attachment and the detrimental effect of disruptions in the human-nature attachment process.

Keywords: nature attachment theory, nature connection, human-nature relationship

Exploring the human-nature relationship has increasingly become the focus of various disciplines, including psychology (Nisbet, Shaw & Lachance, 2020), health (Seymour, 2016) and education (Barrable, 2019a), as well as tourism and environmental research (Ives et al., 2017). Epitomised in the Biophilia Hypothesis (Kellert & Wilson, 1993), which put forward an innate drive that humans have to seek connection with the rest of nature, the human-nature relationship has been expanded upon by research on nature connection (Nisbet, Zelenski & Murphy, 2009). Nature connection research has focused on different types of connection, most prominently mind, place and experience (Ives et al., 2017), as well as inclusion of nature in self (Schultz, 2002). These models and conceptualisations provide a useful platform to explore the human-nature relationship, and have inspired countless research studies on nature connection (Ives et al, 2017).

The slightly separate but related concept of place attachment and place relationships have been a focus of research (Fried, 1963) looking at individual's attachment to a 'meaningful location' (Lewicka, 2011, p.207). Encompassing a variety of places, including the home or place of residence (Beckley et al., 2007), work spaces (Milligan, 1998) and places of recreation and leisure (Charleston, 2009). Attachment to place has been described as a basic human need (Relph, 1976) while Yi-Fung Tuan (1974) put forward the term *Topophilia*, examining distinct ideas such as the individual emotional, cognitive and mental connection to a specific place (Heimer, 2005). Moreover, place attachment has been explored through the lens of attachment theory, but with a very clear focus on experience of place (Giuliani, 2003). The theory presented in this paper goes beyond *place* and connection, and draws upon conceptualisations of Mother Nature to describe the human-nature relationship as an extension of the infant-parent relationship, modelled upon the Bowlby-Ainsworth attachment theory (Ainsworth, 1978). As such, the aim of this paper is to describe more fully this conceptualisation, by examining both attachment theory, on the one hand, and prior research from ecopsychology and environmental psychology in relation to nature connection. By drawing parallels between infant-parent and human-nature relationships, this paper aims to offer further impetus to prevent

disruptions in attachment early in development and highlight the importance of childhood in nurturing a healthy human-nature connection.

Attachment Theory

The Bowlby-Ainsworth Attachment Theory posits that early emotional bonds between infants and their primary caregivers are crucial for psychological development (Ainsworth, 1978). John Bowlby argued that attachment is an innate biological system evolved to enhance survival by ensuring proximity to caregivers during times of stress or danger. He identified four key characteristics of attachment: *proximity maintenance* (staying close to the caregiver*), safe haven* (seeking comfort when distressed), *secure base* (using the caregiver as a base for exploration), and *separation distress* (experiencing anxiety when separated) (Goldberg, Muir & Kerry, 1995).

Bowlby and Ainsworth proposed that these early relationships form an internal working model—a mental framework influencing future relationships and emotional regulation (Ainsworth, 1978). The theory was later supported by empirical research, including Mary Ainsworth's "Strange Situation" study, which identified distinct attachment styles: secure, anxious-ambivalent, and avoidant (Ainsworth, 1978). This work has significantly shaped developmental psychology, attachment-based therapies, and childcare practices across the western world.

Human-nature relationship as infant-parent relationship

A different way to conceptualise human-nature relationships is through a parallelism with the infant-parent relationship, and therefore use human attachment theory (Ainsworth, 1978) to human attachment theory. This conceptualisation was described by Jordan (2009), with a focus on the disruption of attachment and this paper aims to more fully delve into the parallels.

It should be highlighted that many cultures across the history of humankind have conceptualised our relationship with nature or earth as one of infant and mother. Indeed, 'Mother nature' or 'Mother Earth' is a phrase commonly used in a variety of cultures, including many indigenous ones. We often find the personification of nature as the life-giving mother, emphasising the nurturing qualities of the relationship between human and nature, but also a clear 'being part of' that deeply connects human and the rest of the natural world. Such examples can be found in South America, with *Pachamama* (Humphreys, 2017; Sampietro Vattuone et al., 2008) in North America as Mother Earth (Poitras, 2022), in various African cultures (Matholeni, Boateng and Manyonganise, 2020), in Australian Aboriginals and New Zealand Maori (Gallhofer et al., , 2000) but also historically, in European civilizations such as the Greeks and *Gaia* (Cashford, 2021) and *Amalur* in Basque mythology (Ortiz-Osés, 1985).

An innate drive

As per the Bowlby-Ainsworth attachment theory the bond between the infant and their primary caregiver, most commonly the mother, is innate. As such the relationship between the infant and their mother is driven by innate predispositions and behaviours (Hazan & Shaver, 1992). The behaviourist ideas of the cupboard love theory, describes a transactional relationship of mother and infant, whereby the relationship is driven by the fact that the mother feeds the child (Van Der Horst, Van der Veer & Van Ijzendoorn, 2007). Contrary to that, the Bowlby-Ainsworth attachment theory posits that the infant is hardwired and driven to emotionally bond to the mother or other primary caregiver. The innateness of such an attachment drive can be explained in evolutionary terms, and Bowlby highlighted the clear evolutionary advantage of seeking and attaining proximity to the caregiver (Granqvist, 2021). Similarly, the term *Biophilia* (Wilson, 1984) which described this innate drive to feel affinity with the natural world has underpinned a lot of the nature connection literature. More recent research has tried to establish Biophilia as an evolutionary process, with clear adaptation advantages (Barbiero & Berto, 2021), furthering the parallels between attachment to a parental figure and nature attachment.

A sensitive period

There are diverging views as to whether attachment theory includes the idea of a critical period, with some researchers suggesting that it does (McLeod, 2009) while others claiming that it does not (Sroufe, 1988). The existence of such a critical period would suggest that disturbance of attachment at that stage would have life-long effects. Empirical research into the effects of prolonged maternal deprivation in early childhood by Bowlby himself (Bowlby, 1953a) suggest that such a sensitive period exists, while later research presented by Rutter (2002) being more nuanced, with a heterogeneity of outcomes observed. In reality, such research is difficult and unethical to undertake and a lot of previous research is based on natural experiments and unfortunate circumstances such as the study of Romanian orphans (Rutter et al., 2007), with challenges in disentangling the effect of maternal deprivation from other extenuating factors. However, recent research in neuroscience and more specifically studies in developmental neurobiology suggest provides a mechanism of action to explain a *sensitive* rather than a critical period, and suggests there may indeed exist a critical period where an infant's brain is primed to create attachments with caregivers (Schore, 2017), and during which maternal deprivation, or other disturbances can have life-long consequences.

When applying this sensitive period premise to nature attachment theory, a host of indications can be found in the literature to suggest that it may exist. For example, Wells and Lekies (2006) presented strong evidence to suggest that adult's relationship to nature, including pro-environmentalism, had its roots in childhood. Other important studies trace adult relationships to nature to childhood experiences (Chawla, 1999; Ewert et al., 2005), suggesting that whether a sensitive period exists, a strong relationship/attachment to nature in childhood has an impact on the individual's relationship to nature in adulthood. It should be noted that all of these studies rely on adult retrospective self-report, and therefore have some limitations.

Another interesting point when looking and thinking about nature attachment as a developmentally sensitive process is that of adolescence. Adolescence,in general, is identified as a period of intense psychological adjustment (Ilioi & Golombok, 2015; Stocker et al., 2017) as well as the time of identity formation (Phinney et al., 1990). Individuation, the adolescent's need to assert their own identity and separate from the family, is a distinct stage of adolescence (Allison & Sabatelli, 1988). As such, a healthy and desirable separation – based on a strong and enduring connection – can be observed in adolescence (Ponappa et al., 2014). A similar and corresponding separation can be observed in the nature connection literature at this age, commonly referred to as the 'adolescent dip' (Keith et al., 2021; Price et al.,2022). Drawing a parallel between child-parent and human-nature attachment may be able to explain some of this dip.

Disruption – maternal deprivation and nature deprivation

Following from above, maternal deprivation and other disruptions in the building of a healthy attachment bond with their putative long-term effects, can be mirrored in the human-nature relationship too. Nature deprivation, or in Richard Louv's term of 'nature-deficit-disorder' (2008). While not a recognised psychological disorder, separation from nature, both in experiential and affective terms, can have an impact on psychological wellbeing as well as cognitive outcomes (Driessnack, 2009). On the contrary, regular nature exposure in childhood has been linked to a variety of positive developmental outcomes (Islam et al., 2020) with some studies putting forward a sensitive period for such exposure (Engemannet al., 2018). In this latter study the researchers identify that "Accumulated green space from birth to age 10 also showed a stronger association with schizophrenia risk than green space exposure at any given age" (Engemann et al., 2018, p. 146). Nature deprivation, therefore, and the lack of opportunity to develop a relationship with the natural world at an early age, can lead to a variety of adverse psychological outcomes in adulthood (Larson et al., 2010). Nature attachment theory should, therefore, drive early childhood sustained and meaningful engagement with nature, with a focus on building positive attachments (Barrable, 2019b). Accepting nature attachment theory could be the basis of moving our relationship with nature from a transactional one, where we are solely focusing on being the recipients of nature's resources and benefits, to a more relational one, based on reciprocal care and affection. Drawing from literature from nature connection (Lumber, Richardson & Sheffield 2017), ways to achieve a deeper and less transactional relationship can be through contact, emotion, compassion, meaning and beauty. These pathways mirror a closeness and a reciprocity seen in relationships of parent-infant.

More corresponding characteristics of infant-parent and human-nature attachment

Meeting needs

Bowlby (1953b) highlights the need for a 'warm, intimate and continuous relationship' (p. 43). Being responsive to and meeting the infant's needs in a consistent manner is key to the building of a secure infant-parent attachment bond (Schore, 2001) and this can find correspondence in the human-nature attachment bond too. Nature can meet many of the physical and psychological needs of the individual, including physical needs for water and food, shelter and safety, recreation and relaxation. However, nature's ability to provide for our basic needs goes beyond the merely physical and into the psychological realm too (Landon et al., 2021). In this way our relationship to nature moves away from the purely transactional, as described in the cupboard love theory and into a deeper relationship as is described in attachment theory, including one with cognitive, affective and experiential elements. Finally, this deep psychological need to build an attachment to nature, has been put forward by previous literature, where the authors present strong arguments on a nature relationship as a basic psychological need for humans (Baxter & Pelletier, 2018; Hurly & Walker, 2019).

Proximity in attachment theory

Proximity seeking and proximity maintenance are key features of attachment theory (Lamb, 1976). As such, in a securely attached relationship the infant seeks to be close to the parent and exhibits behaviours that promote proximity maintenance. In this instance too we can draw a parallels with human-nature relationships, and examine the effect that different attachment styles, developed in childhood, may have to our adult relationship to nature, and our seeking of proximity to the natural world. For many, feeling a closeness to the natural world (in the cited study operationalised as nature relatedness) is positively associated with seeking to be close to and in natural spaces (Nisbet et al., 2009). Moreover, and rather unsurprisingly we can see that people who are disconnected from the natural world, possibly due to disrupted attachment processes or nature deprivation in childhood, do not enjoy spending time in it (Barrable & Booth, 2022; Barrable et al., 2024).

Implications

Looking at our relationship to nature through the lens of attachment theory is not merely an academic exercise, but should have direct implications as to the importance we place on supporting our own and our children's innate drive to attach to the natural world. It can further motivate policy and practice to realise the potential of all children to build an attachment to nature early on in their lives. We need to further examine, through empirical studies, the mechanisms by which young children can form secure attachments to the natural environment, including through a framework based on attachment theory, proximity and the meeting of needs. Previous research on nature connection in childhood tends to look at leisure or educational activities, occasionally examining specific environments (Barrable & Booth, 2020a). However, through the lens of nature attachment, research needs to go further than examining activities and environments, and look closely at the meeting of needs: physical and psychological. In fact, nature attachment theory may explain why different ways to engage with the natural world may be more effective. For example, forest school, which can support the individual's basic psychological needs (Barrable & Arvanitis, 2019) has been found to be effective in building a closer relationship to nature (McCree et al., 2018). Other types of close interactions and interaction patterns, and their building of attachment should be examined too (Kahn, Weiss & Harrington, 2018). The potential for a critical period in early childhood should also be examined.

The role of the socialising agent in this endeavour for attachment should not be minimised. Parents, guardians and educators are gate-keepers to children's relationship with the natural world, and as such need to realise children's innate potential towards nature attachment. Previous studies recognise the close association between a positive parental relationship to nature and that of the child (Barrable & Booth, 2020b; Passmore et al., 2021; Wu et al. 2023) over and above contact or proximity.

Further to promoting attachment in early childhood, attention should also be focused on disrupted attachment and its impact. As such, studies of disconnected individuals (Barrable & Booth, 2022) can offer insights into different types of attachment, and how the disruption of attachment in childhood can impact the future relationship with the natural world, turning it into a purely transactional relationship, or one of avoidance. Avenues to mitigate such disrupted attachment in childhood should also be explored.

Beyond a transactional relationship with nature to nature attachment

Conceptualising our relationships to nature as one simply predicated on needs that nature meets, such as the benefits of nature contact on our physical and psychological health (Chawla, 2015; Frumkin et al., 2017) misses an opportunity to explore our deeper attachment to the natural world.

Just as challenging the 'cupboard love' theory led to the development of attachment theory (Grossmann et al., (2013) and a deeper connection to our caregiver, this paper urges professionals in psychology, education and beyond, to go beyond a transactional relationship with the natural world, and to seek the formation of a life-long attachment, starting in childhood. Using concepts and tools designed for attachment theory, we can support children's innate drive to attach to the natural world, and promote secure attachments from an early age, thus shaping human-nature relationships into the future. Moreover, going beyond nature connection, as is broadly conceptualised in the literature (Tam, 2013) and re-conceptualising our relationship to nature as that of infant-parent, as well as utilising anthropomorphic elements, especially those associated to the parent or mother, can re-orient our approach to pro-environmental behaviours (Liu et al., 2019) in that of mutual care and respect.

References

Ainsworth, M. D. S. (1978). The Bowlby-Ainsworth attachment theory. *Behavioral and brain sciences*, *1*(3), 436-438.

Allison, M. D., & Sabatelli, R. M. (1988). Differentiation and individuation as mediators of identity and intimacy in adolescence. *Journal of adolescent research*, *3*(1), 1-16.

Barbiero, G., & Berto, R. (2021). Biophilia as evolutionary adaptation: An onto-and phylogenetic framework for biophilic design. *Frontiers in psychology*, *12*.

Barrable, A., & Arvanitis, A. (2019). Flourishing in the forest: looking at Forest School through a self-determination theory lens. *Journal of Outdoor and Environmental Education*, *22*(1), 39-55.

Barrable, A. (2019a). The case for nature connectedness as a distinct goal of early childhood education. *International Journal of Early Childhood Environmental Education*, *6*(2), 59-70.

Barrable, A. (2019b). Refocusing environmental education in the early years: A brief introduction to a pedagogy for connection. *Education sciences*, *9*(1), 61.

Barrable, A., & Booth, D. (2020a). Increasing nature connection in children: A mini review of interventions. *Frontiers in Psychology*, *11*, 492.

Barrable, A., & Booth, D. (2020b). Nature connection in early childhood: a quantitative cross-sectional study. *Sustainability*, *12*(1), 375.

Barrable, A., & Booth, D. (2022). Disconnected: What can we learn from individuals with very low nature connection?. I*nternational Journal of Environmental Research and Public Health, 19*(13), 8021.

Barrable, A., Friedman, S., & Beloyianni, V. (2024). Nature connection in adulthood: The role of childhood nature experiences. *People and Nature*.

Baxter, D.E., Pelletier, L.G., (2018). Is nature relatedness a basic human psychological need? A critical examination of the extant literature. Canadian Psychology, 60(1), 21-34.

Beckley, T. M., Stedman, R. C., Wallace, S. M., & Ambard, M. (2007). Snapshots of what matters most: Using resident-employed photography to articulate attachment to place. Society and Natural Resources, 20, 913e929

Bowlby, J. (1953a). Some pathological processes set in train by early mother-child separation. *Journal of Mental Science*, *99*(415), 265-272.

Bowlby, J. (1953b). Critical phases in the development of social responses in man and other animals. *New biology*. *14,* 25–32.

Cashford, J.(2021) Gaia: Mother Goddess Earth In Ancient Greece http://aras.org/sites/default/files/docs/GAIA.%20MOTHER%20GODDESS%20EARTH%20IN%20ANCIENT%20GREECE%202021-12-04.pdf

Charleston, S. (2009). The English football ground as a representation of home. Journal of Environmental Psychology, 29, 144e150.

Chawla, L. (1999). Life paths into effective environmental action. *The Journal of environmental education*, *31*(1), 15-26.

Chawla, L. (2015). Benefits of nature contact for children. *Journal of planning literature*, *30*(4), 433-452.

Driessnack, M. (2009). Children and nature-deficit disorder. *Journal for Specialists in Pediatric Nursing*, *14*(1), 73.

Engemann, K., Pedersen, C. B., Arge, L., Tsirogiannis, C., Mortensen, P. B., & Svenning, J. C. (2018). Childhood exposure to green space–a novel risk-decreasing mechanism for schizophrenia?. *Schizophrenia research*, *199*, 142-148.

Ewert, A., Place, G., & Sibthorp, J. (2005). Early-life outdoor experiences and an individual's environmental attitudes. *Leisure Sciences*, *27*(3), 225-239.

Fried, M. (1963), 'Grieving for a Lost Home', in L. J. Duhl (ed), *The Urban Condition.* Basic Books, New York, pp. 151-171.

Frumkin, H., Bratman, G. N., Breslow, S. J., Cochran, B., Kahn Jr, P. H., Lawler, J. J., Levin, P. S., Tandon, P. S., Varanasi, U., Wolf, K., & Wood, S. A. (2017). Nature contact and human health: A research agenda. *Environmental health perspectives*, *125*(7), 075001.

Gallhofer, S., Gibson, K., Haslam, J., McNicholas, P., & Takiari, B. (2000). Developing environmental accounting: insights from indigenous cultures. *Accounting, Auditing & Accountability Journal*.

Giuliani, M. V. (2003). Theory of Attachment and Place Attachment. In M. Bonnes, T. Lee, and M. Bonaiuto (Eds.), Psychological theories for environmental issues. New York: Routledge

Granqvist, P. (2021). Attachment, culture, and gene-culture co-evolution: expanding the evolutionary toolbox of attachment theory. *Attachment & Human Development*, *23*(1), 90-113.

Grossmann, K. E., Bretherton, I., Waters, E., & Grossmann, K. (2013). Maternal sensitivity: observational studies honoring Mary Ainsworth's 100th year. *Attachment & Human Development*, *15*(5-6), 443-447.

Hazan, C., & Shaver, P. R. (1992). Broken attachments: Relationship loss from the perspective of attachment theory. In *Close relationship loss* (pp. 90-108). Springer, New York, NY.

Heimer, H. (2005). Topophilia and quality of life: defining the ultimate restorative environment. *Environmental Health Perspectives, 113* (2), 117

Humphreys, D. (2017). Rights of Pachamama: The emergence of an earth jurisprudence in the Americas. *Journal of International Relations and Development*, *20*(3), 459-484.

Hurly, J., & Walker, G. J. (2019). Nature in our lives: Examining the human need for nature relatedness as a basic psychological need. *Journal of Leisure Research*, *50*(4), 290-310.

Ilioi, E. C., & Golombok, S. (2015). Psychological adjustment in adolescents conceived by assisted reproduction techniques: a systematic review. *Human Reproduction Update*, *21*(1), 84-96.

Islam, M. Z., Johnston, J., & Sly, P. D. (2020). Green space and early childhood development: a systematic review. *Reviews on Environmental Health*, *35*(2), 189-200.

Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniecki, K., Dorninger, C., Laudan, J., Barthel, S., Abernethy, P., Martin-Lopez, M., Raymond, C. M., Kendal, D., & Von Wehrden, H. (2017). Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*, *26*, 106-113.

Kahn Jr, P. H., Weiss, T., & Harrington, K. (2018). Modeling child–nature interaction in a nature preschool: A proof of concept. *Frontiers in Psychology*, 835.

Keith, R. J., Given, L. M., Martin, J. M., & Hochuli, D. F. (2021). Urban children's connections to nature and environmental behaviors differ with age and gender. *PloS one*, *16*(7), e0255421.

Kellert, S. R., & Wilson, E. O. (Eds.). (1993). *The biophilia hypothesis*. Island press.

Larson, L. R., Castleberry, S. B., & Green, G. T. (2010). Effects of an Environmental Education Program on the Environmental Orientations of Children from Different Gender, Age, and Ethnic Groups. *Journal of Park & Recreation Administration*, *28*(3).

Lamb, M. E. (1976). Proximity seeking attachment behaviors: A critical review of the literature. *Genetic Psychology Monographs*, *93*(1), 63-89.

Landon, A. C., Woosnam, K. M., Kyle, G. T., & Keith, S. J. (2021). Psychological needs satisfaction and attachment to natural landscapes. *Environment and Behavior*, *53*(6), 661-683.

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years?. *Journal of environmental psychology*, *31*(3), 207-230.

Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder*. Algonquin books.

Liu, T., Geng, L., Ye, L., & Zhou, K. (2019). "Mother Nature" enhances connectedness to nature and pro-environmental behavior. *Journal of Environmental Psychology*, *61*, 37-45.

Lumber, R., Richardson, M., & Sheffield, D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PLoS one, 12(5)*, e0177186.

Matholeni, N. P., Boateng, G. K., & Manyonganise, M. (Eds.). (2020). *Mother earth, mother Africa & African indigenous religions*. African Sun Media.

McCree, M., Cutting, R., & Sherwin, D. (2018). The hare and the tortoise go to forest school: taking the scenic route to academic attainment via emotional wellbeing outdoors. *Early Child Development and Care*, *188*(7), 980-996.

McLeod, S. A. (2009). Attachment theory. *Consultado en www. simplypsychology. org/attachment. html*.

Milligan, M. J. (1998). Interactional past and potential: The social construction of place attachment. Symbolic Interaction, 21, 1e33.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and behavior*, *41*(5), 715-740.

Nisbet, E. K., Shaw, D. W., & Lachance, D. G. (2020). Connectedness With Nearby Nature and Well-Being. *Frontiers in Sustainable Cities*, *2*, 18.

Ortiz-Osés, A. (1985). *Antropología simbólica vasca* (in Spanish). Anthropos Editorial.

Passmore, H. A., Martin, L., Richardson, M., White, M., Hunt, A., & Pahl, S. (2021). Parental/guardians' connection to nature better predicts children's nature connectedness than visits or area-level characteristics. *Ecopsychology*, *13*(2), 103-113.

Phinney, J. S., Lochner, B. T., & Murphy, R. (1990). *Ethnic identity development and psychological adjustment in adolescence*. Sage Publications, Inc.

Poitras, M. (2022). Soil governance: Who is governing who? A North American Indigenous perspective on Mother Earth. *Soil Security*, *6*, 100054.

Ponappa, S., Bartle-Haring, S., & Day, R. (2014). Connection to parents and healthy separation during adolescence: A longitudinal perspective. *Journal of adolescence*, *37*(5), 555-566.

Price, E., Maguire, S., Firth, C., Lumber, R., Richardson, M., & Young, R. (2022). Factors associated with nature connectedness in school-aged children. *Current Research in Ecological and Social Psychology*, *3*, 100037.

Relph, E. (1976), *Place and Placelessness*, Pion, London.

Rutter, M. (2002). *Maternal deprivation*. In Azar, S. T., Chao, R. K., & Bornstein, M. H. Eds. (2002). *Handbook of Parenting: Volume 4 Social Conditions and Applied Parenting*. London: Taylor & Francis Group.

Rutter, M., Beckett, C., Castle, J., Colvert, E., Kreppner, J., Mehta, M., ... & Sonuga-Barke, E. (2007). Effects of profound early institutional deprivation: An overview of findings from a UK longitudinal study of Romanian adoptees. *European Journal of Developmental Psychology, 4*(3), 332-350.

Sampietro Vattuone, M. M., Neder, L., Roldán, J., & Vattuone, M. A. (2008). Mother Earth: soil and people relationships during the prehispanic period (Northwest Argentina). *World Archaeology*, *40*(2), 190-205.

Schore, A. N. (2017). Modern attachment theory. In S. N. Gold (Ed.), *APA handbook of trauma psychology: Foundations in knowledge* (pp. 389–406). American Psychological Association. https://doi.org/10.1037/0000019-020

Schultz, P. (2002). Inclusion with nature: The psychology of human-nature relations. In *Psychology of sustainable development* (pp. 61-78). Springer, Boston, MA.

Seymour, V., 2016. The human–nature relationship and its impact on health: A critical review. *Frontiers in public health*, p.260.

Sroufe, L. A. (1988). Attachment in Development. *Clinical implications of attachment*, 18.

Stocker, C. M., Masarik, A. S., Widaman, K. F., Reeb, B. T., Boardman, J. D., Smolen, A., ... & Conger, K. J. (2017). Parenting and adolescents' psychological adjustment: Longitudinal moderation by adolescents' genetic sensitivity. *Development and psychopathology*, *29*(4), 1289-1304.

Tam, K. P. (2013). Concepts and measures related to connection to nature: Similarities and differences. *Journal of environmental psychology*, *34*, 64-78.

Tuan, Y. (1974), *Topophilia: A Study of Environmental Perception, Attitudes, and Values*. Prentice Hall, Engliewood Cliffs, NJ.

Van Der Horst, F. C., Van der Veer, R., & Van Ijzendoorn, M. H. (2007). John Bowlby and ethology: An annotated interview with Robert Hinde. *Attachment & Human Development*, *9*(4), 321-335.

Wells, N. M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children Youth and Environments*, *16*(1), 1-24.

Wilson, E. O. (1984). *Biophilia.* Cambridge, MA: Harvard University Press.

Wu, H., Ji, R., & Jin, H. (2023). Parental factors affecting children's nature connectedness. *Journal of Environmental Psychology, 87*, 101977.

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CHILDREN'S BOOKS AND RESOURCES REVIEW

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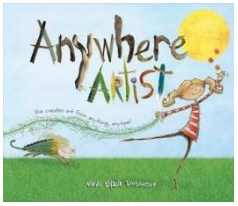
Merry Lea Environmental Learning Center of Goshen College, USA

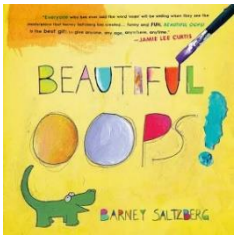
Deconstructive play: Book and Resource List

Whether it is a rage room, the demolition derby, a picking board, chopping up wood, a compost pile, or demolition work in a house, humans have a need to deconstruct things. While we do not want children to destroy things in our settings, perhaps we can lean into providing opportunities for deconstructive play that are safe and with materials that are okay to deconstruct. In an outdoor setting, breaking apart the ice, ripping fallen leaves, cleaning off a decaying stump, or dissecting a fallen flower can help with the natural recycling process, allow children to satiate curiosity, promote fine motor skills, and enhance creativity. Marc Armitage stated, "Being destructive for the child in a play context is just as much about tearing up old ideas and notions as it is about tearing up a leaf into tiny, tiny strips...and both should be encouraged." There is a lack of books in this category around nature inspired books–perhaps we can change that!

The following children's books and resources can help set the stage for deconstructive play in a safe and inspiring manner:



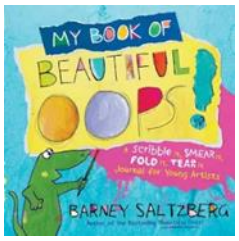
***Anywhere Artist* by Nikki Slade Robinson**
In this book, the girl makes art with found items wherever she may be–the forest, beach, mud, clouds, and rain-puddles. This book focuses more on the reconstruction of art using materials wherever she may be rather than deconstruction. Imagination is key!



***Beautiful Oops!* by Barney Saltzberg**
This book embraces the many mistakes we make like a coffee stain, torn paper, spilled paint, and bent paper as they are transformed into a variety of illustrations. The author encourages imagination and creativity as we explore the beautiful possibilities of a mistake.

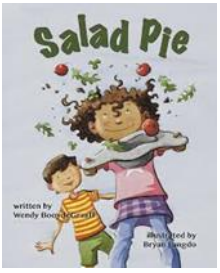
***Going Places* by Peter and Paul Reynolds**
As part of a gocart race, two friends combine forces to think outside the instructions for building a gocart to create a unique vehicle inspired by birds. They deconstruct the intended boundaries and directives for a unique solution.

I Ain't Gonna Paint No More **by Karen Beaumont**
A child's paints are put away, but it doesn't take long before he gets into the paint again. The child starts painting their head, then neck, arms, etc., all the way down to their toes until they run out of paint.



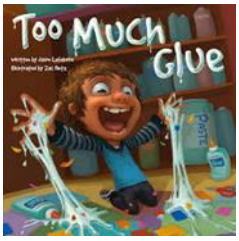
My Book of Beautiful Oops! **by Barney Saltzberg**
While the author encourages writing, scribbling, and crumpling this book, you might reserve this as a read aloud and encourage the behaviors with paper and other recycled materials. The words and illustrations invite participation in deconstructive play/art. Similar to the original book, yet more invitational.

Perfect Square **by Michael Hall**
Throughout a week, a square piece of paper is transformed through cutting, poking, tearing, shredding, snipping, crumpling, and more. With each alteration of the paper, the pieces create a new illustration resulting in a story at the end.

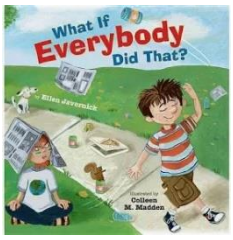


Salad Pie **by Wendy BooydeGraaff**
Two children at a park eventually become friends as they collect materials for their salad pie. This book shows conflicts that children often engage in, nature play, dramatization, and creative use of resources.

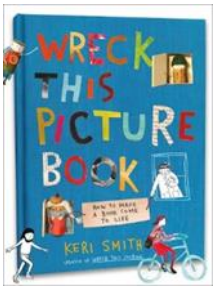
The Most Magnificent Thing **by Ashley Spires**
A girl who likes to make, along with her dog who likes to unmake, collects cast off appliances and such to take apart for pieces to make her most magnificent thing. She works through the many emotions of creation and doubt as she creates many things that her community finds useful. Learning from the things she did right, she eventually makes the most magnificent thing.



Too Much Glue **by Jason Lefebvre**
A boy regularly makes glue projects with his dad and then uses perhaps too much glue in art class, plopping himself in the middle of a huge glue blob and sticking to the desk. His dad celebrates his creativity and work of art.



***What if Everybody Did That?* By Ellen Javernick**
A boy chooses some irresponsible behavior, such as feeding animals at the zoo, splashing in the pool, or tossing trash out of a car, etc. Each nearby adult asks, "What if everybody did that?" It ends with a hug! While not showing the positives of deconstructive play, it helps highlight the consequences of thoughtless behavior. This could be the basis of a conversation around parameters of deconstructive play.



***Wreck this Picture Book* by Keri Smith**
"What some people call wrecking, some people call living." In this read aloud book, Smith encourages thinking outside the normal parameters of a book to be more interactive. The book includes a note to adults about how it may be uncomfortable to some and invites readers to engage the book through making sounds, poking and knocking the pages, smelling the book, touching it with your toes, etc.

Additional Resources

***Artwork* by Chelsey Bahe, Take 'Em Outside**
Through careful tearing, ripping, fluffing, and more, Chelsey Bahe uses scraps of nature for beautiful artwork highlighting children at play. She hosts a nature play group and has insightful blogs about her observations of play. Find her art on social media.

***Wreck this Journal* by Keri Smith**
While geared more for adults or older children, this book provides prompts to literally wreck the journal through mud drips, ripping paper, etc. If you're not ready to embrace deconstructive play, this book provides excellent experiences to try it out yourself. Additionally, the prompts could inspire ideas for deconstructive play with children.

***Loose Parts Alive: Inspiring Child-led Nature Explorations* by Dr. Carla Gull and Dr. Laura Wilhelm**
A whole section is dedicated to deconstructive play, helping imagine the possibilities in an outside setting. This includes lists of natural and manufactured items for use in deconstructive play, along with suggested tools to help with deconstruction.

***Deconstructive Play Handout* by Loose Parts Nature Play**
I compiled this list of resources, parameters, and quotes to assist in deconstructive play training.
https://loosepartsnatureplay.org/2022/07/24/deconstructive-play/

***Destructive Play* podcast episode by Loose Parts Nature Play**
This podcast episode shares various examples from an early childhood nature setting about how children engage in deconstructive play, along with resources and ideas to help guide children to more acceptable forms of deconstructive play.
https://loosepartsnatureplay.libsyn.com/destructive-play

***Why the Power of Destruction is Really Good for Kids* by Tinkergarten**
This article looks at the WHY behind deconstructive, considering the STEM connections; bending, blending and breaking as part of creativity; how this is an engaging play schema; and tips on how to support learning through destruction.
https://tinkergarten.com/blog/why-destroying-stuff-is-good-for-our-kids

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INTERNATIONAL JOURNAL OF EARLY CHILDHOOD ENVIRONMENTAL EDUCATION (IJECEE)
Addressing Issues, Policies, Practices, and Research That Matter

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