International Journal of Early Childhood Environmental Education

ISSN: 2331-0464 (online)

"*You don't wanna teach little kids about climate change*": Beliefs and Barriers to Sustainability Education in Early Childhood

Julia L. Ginsburg
Concordia University, Canada

Shannon Audley
Smith College, USA

Submitted September 9, 2019; accepted July 26, 2020

ABSTRACT

To support a sustainable planet, preschools need to engage young children with sustainability education. In the United States of America (USA), nature-based preschool programs are likely to promote environmental science and nature education, given their outdoor curricula, but very little is known about how these programs might also cultivate sustainability education. The purpose of the present study was to investigate nature-based preschool teachers' craft knowledge (Grimmett & MacKinnon, 1992) about sustainability education within curricula as they presently exist. We interviewed 22 early childhood educators and administrators across nine early childhood nature-based education centers in the Northeastern United States. Following Davis' (2010) differentiation of education *in*, *about,* and *for* the environment, we found that most participants promoted activities *in* the environment, such as children spending time outdoors in the woods. Educators reasoned that they focused on promoting "in-nature" based activities because they believed that caring for and loving nature were foundational to promoting sustainability practices. Also, the educators promoted simple everyday pro-environmental behaviors, such as reusing containers, as they believed such acts lead to lifelong sustainable behaviors. Ultimately, we found that almost all of the teachers who participated in our study *wanted* to include sustainability education within their pedagogical approaches, and they did so by focusing on "every-day sustainability practices," but felt they could not engage in more ethically-driven sustainability practices due to curricular and parental barriers.

***Keywords**:* early childhood education, sustainability education, environmental education, nature-based preschool

Children need exposure to environmental education programs to develop pro-environmental behaviors (Chawla, Keena, Pevec, & Stanley, 2014; Davis, 2010). Yet, given the current climate crisis, are pro-environmental behaviors enough to help future generations support a sustainable Earth? To date, global climate change has progressed to the point that stabilizing the global temperature would require near-complete elimination of all greenhouse gas emissions (Allen et al., 2018; Matthews & Caldeira, 2008). Affecting such a drastic change in emissions would require a sophisticated approach comprising widespread ethically driven pro-environmental behaviors (Varela-Candamio, Novo-Corti, & Garcia-Alvarez, 2018) combined with sustainable development practices and sustainability education (Council of the European Union, 2010). That is, in times of climate crisis, we need to explicitly educate children in both the ethics and practices of sustainability to promote a sustainable Earth. This dual educational approach is especially pertinent in the United States of America (USA)[1], where fewer than 50% of adult citizens who believed in

[1] When referring to the United States of America, throughout the paper, we will use the term USA for both the country, and for things that pertain to the USA, that is, things that are "American," while avoiding the term, "American" because this could also refer to the entirety of North, Central and/or South America.

global warming identified human activity as its cause (Leiserowitz, Mailbach, & Roser-Renouf, 2010) and government responses to the climate crisis have included environmental deregulations and withdrawal from the Paris Climate Accord (Wallach, 2019).

Currently, educators in the USA target sustainability curricula towards older children (i.e., primary and secondary schools; Lombardi, Sinatra & Nussbaum, 2013) rather than younger children (i.e., preschool-aged). Targeting only older children with sustainability curricula is potentially problematic as research identifies consistent associations between early childhood exposure to nature—a common component of sustainability education—and adult pro-environmental behaviors (Chawla & Derr, 2012; Larson, Green, & Castleberry, 2011; Rosa, Profice, & Collado, 2018). Nature-based preschool programs in the USA are an exception; these programs often embed sustainability education into curricula. In addition to the more traditional subjects of language, literacy, mathematics, and social-emotional development, these nature-based preschool programs often spend a significant part of the day outdoors (Larimore, 2016). However, less is known about how sustainability education is cultivated within these nature-based early childhood programs and the barriers teachers may face when incorporating sustainability into curricula (Somerville & Williams, 2015).

Elliott and Davis (2009; 2018) argue that pro-environmental behaviors stemming from environmental science education, such as recycling or spending time in nature, are foundational if young children are to learn to live sustainably. However, these behaviors alone are not sufficient for children to feel that they have agency to enact positive environmental change, which is a major tenet of sustainability education. In addition to spending time *in* the environment, young children also need exposure to and education about sustainable lifestyle practices that will foster their capacities about actions for the environment.

In the present study, we examined the extent to which early childhood educators incorporated sustainability education within their nature-based preschool curricula. We also examined the educators' perceived barriers to engaging in sustainability education. In order to situate our study within the literature, we first present Davis' (2010) distinctions among education *in*, *about*, and *for* the environment[2], before highlighting sustainability practices and barriers noted by participating educators. We then turn to our research study.

Sustainability Education: *In*, *About*, and *For* the Environment

The United Nations' Educational, Scientific, and Cultural Organization (UNESCO) Tbilisi Declaration of 1977, states three imperative goals for environmental education. In particular, the third goal: "to create new patterns of behavior of individuals, groups, and society as a whole, *towards* the environment," (UNESCO, 1977) is most pertinent to the present-day climate crisis and education. Also, the "back to the woods" movement (Louv, 2008) in the USA in the early 21st century was instrumental in promoting outdoor educational experiences. This movement targeted parents and early childhood educators and can be credited in part with encouraging adults to promote young children's love of nature (Chawla, 2009; Chawla & Derr, 2012) and pro-environmental behaviors, such as recycling (Matsuba & Pratt, 2013). However, the "back to the woods" movement largely failed to address issues of sustainability (Elliott & Davis, 2009). Davis' (2010) definition of sustainability education challenges educators to facilitate children's return to nature, that is, more than just spending time *in* the environment. In particular, Davis (2010) argues that in addition to education *in* the environment (e.g., the "Back to the woods" movement), educators must also consider education *about* and *for* the environment in order to promote long-term sustainable lifestyle practices with children. Education *in* the environment employs the outdoors as a setting and learning resource; education *about* the environment, "helps children appreciate the importance and complexity of the natural world and the interconnections between human and natural systems," (Davis, 2010, p. 30); and, education *for* the environment, "adds the sociopolitical dimension that is missing from the above forms and is concerned with social action for change" (Davis, 2010, p. 31). It is education *about,* and *for* the environment that will train future generations to actively engage with and mitigate

[2] For clarity and consistency, we are using sustainability education in place of Davis' (2010) term education for the environment.

the anthropogenic effects of the climate crisis. Although sustainability education promotes lifelong benefits, there are also profound barriers to its cultivation.

Sustainability Education: *In* Nature

Children's nature experiences can have positive, lifelong effects on their physical and mental health (Chawla, 2009, 2015; Chawla et al., 2014; Gill, 2014) as well as their academic achievement (Cheng & Monroe, 2012; Seltenrich, 2015). For example, daily encounters with nature reduced stress and anxiety (Chawla, et al., 2014) and improved test scores and self-regulation among children (Seltenrich, 2015). The benefits of nature-exposure for children can occur beyond the "wilds" of nature, and include urbanized nature, such as green spaces within cities that have undeveloped land with natural vegetation (Centers for Disease Control, 2013) and urban parks and public open spaces (Twohig-Bennett & Jones, 2018). Thus, we argue that nature-based preschools do not have to be situated "in the wilds" in order to fulfill an integral facet of sustainability education but can also be situated in urban environments.

More critical to the climate crisis however, is that the short-term benefits of nature exposure in childhood extend into adulthood and help promote adult pro-environmental behaviors (Asah, Bengston, Westphal, & Gowan, 2018), identities (Matsuba & Pratt, 2013) and positive health outcomes and life satisfaction (Capaldi, Dopko, & Zelenski, 2014). However, nature exposure by itself is not a 'magic bullet' for ensuring pro-environmental behaviors and proclivities among children and adults. It is not solely exposure to nature, but the frequency of exposure (Asah, Bengston, & Westphal, 2012), agency, and self-selection to exposure (Asah et al., 2018) that promoted positive environmental identities and commitment to pro-environmental behaviors. These details are especially true for school-aged children in environmental and sustainability education programs. In educational settings, teachers' own attitudes towards nature, place, and safety (Padilla-Walker & Nelson, 2012) influenced how children interacted with the environment (Audley, Stein, & Ginsburg, 2020), which may in turn influence which benefits children may gain from nature exposure. Thus, it is essential to consider teachers' personal attitudes towards nature, place, and safety and how these attitudes and beliefs about promoting children's agency influence children's exposure to and participation in educational experiences *in* nature. We argue then, that it is essential to understand teachers' beliefs about and pedagogical practices regarding sustainability education in nature-based preschools.

Sustainability Education: Adding the Factors of *About* and *For* Nature

Sustainability education is a relatively recent addition to early childhood education curricula. In its initial emergence in the USA in the 1990s, early childhood environmental education was focused on sharing an appreciation of and caring for the Earth (Wilson, 1994). Since the recent expansion of preschools, early childhood educators have emphasized implementing higher quality innovative nature and sustainability education. This shift has included both structured and unstructured nature experiences and explicit teaching about sustainability through practices such as reusing classroom materials (Meier & Sisk-Hilton, 2017). In contrast, sustainability education that combines traditional environmental education with "children, teachers, and communities working collectively and democratically towards the resolution of environmental questions, issues, and problems" (Davis, 1998, p. 146), is less prominent. Although Somerville and Williams (2015) identified a growing body of literature in the field of sustainability education, it is not considered an integral part of environmental education as the way it currently functions in the USA. Weldemariam and colleagues (2017) examined concepts associated with sustainability in early childhood curricula across five countries, the USA, Australia, England, Norway, and Sweden, and found that only the USA curricula did not explicitly refer to sustainability education concepts or pedagogical approaches. Instead, the curricula highlighted discrete behaviors and concepts that reflected pro-environmental behaviors, such as reusing and recycling. Thus, the current USA curricula positions the environment as a backdrop for children to act upon: to care for, to save, to experience, rather than to more holistically work towards transformational change *for* the environment. In the USA, preschools are primarily academically focused on pre-literacy and numeracy skills (Tobin, Karasawa, & Hsueh, 2009); this focus has been noted as a barrier to the inclusion of sustainability and pro-environmentalism within curricula. Cultivating love and care for the environment, rather than actively involving children in problem-solving about sustainability challenges might be seen as less time consuming or challenging and therefore, more easily included within any given curriculum.

In some instances, USA early childhood educators may be correct in their assessment about the time commitment and difficulty of teaching about sustainability beyond simple tasks such as reusing materials. For example, Bautista, Moreno-Nunez, Ng and Bull (2018) examined teacher talk about sustainability in Singaporean classrooms and found teachers needed to use sophisticated strategies and dialogic pedagogies, rather than more traditional pedagogies to engage children in sustainability. Although sustainability education may take more time, there is evidence that children are capable of comprehending sustainability education principles (Davis & Elliott, 2014). Moreover, as Kahriman-Öztürk, Olgan, and Guler (2012) importantly note, "if education for sustainability is a lifelong process, then it must begin in the earliest years of life during the most significant developmental period. It must not be left until the child begins formal schooling" (p. 2989). Therefore, we advocate for sustainability education to be a part of early childhood education, rather than simply introduced when children reach traditional school-age.

Barriers to Sustainability Education

Though the benefits of sustainability education are numerous, there are barriers as well. In general, barriers previous research identified included a lack of classroom time and money (Ham & Sewing, 2010), content knowledge coupled with teacher "buy-in" (Simmons, 2011), and parental beliefs about the risks associated with spending time outdoors (Knight, 2013; Michek, Nováková, & Menclová, 2015). For example, in examining the advantages and disadvantages of a forest kindergarten in the Czech Republic, Michek and colleagues (2015) found that parents identified outdoor health and safety risks, such as ticks and Lyme disease or getting lost, whereas, teachers believed that the forest kindergartens were safe and recognized the value of risk-taking. Indeed, in the USA, parental beliefs about the risks of outdoor education programs are mostly unfounded. Frenkel, Tandon, Frumkin and Vander Stoep (2018), in a recent study comparing nature-based preschools and traditional preschools, found no difference in illness or severe injuries by preschool type, suggesting that parent-reported risks of being in nature are indeed just perceptions. Moen, Bakke, Bakke and Fors (2007) found similar results regarding health and injury rates for children who attended forest kindergartens in Norway; while, Mygind, Rønne, Søe, Wachmann and Ricks (2003) offered support from Danish studies.

There may, however, be other potential barriers specific to nature-based preschool programs that reflect broader USA cultural assumptions about tenets of sustainability. For example, *for* the environment requires an individual to have agency, individuals should take action to promote environmental change. In early childhood settings, the tenets of *for* the environment would require children to have agency in order to enact environmental change, both at school and in their homes. However, in 1989, the USA did not ratify the United Nations' Convention on the Right of the Child (UNCRC), which gave children fundamental rights, including recognizing that child agency is universal (Abebe, 2019). The USA did not ratify the convention and is the only country to date that has not done so, in part, because of its societal beliefs that children cannot be "true holders of rights" (Lee, 2010, p. 17). This view of children as dependent is also reinforced in USA early childhood education circles were developmentally appropriate practice (DAP) dominates. DAP includes baseline principles, and guidelines of what constitutes best practice for young children (Brendekamp & Copple, 1997) and makes assumptions about what all children, regardless of background, can and cannot do, including what they are cognitively and emotionally capable of (Lubeck, 1998). Without a USA societal agreement that children have the right to agency and that children's cognition and emotional capabilities are individual and not universal, early childhood educators may find it challenging to promote certain tenets of sustainability education successfully.

Nature-Based Preschools

We chose to focus on nature-based preschool programs because, unlike other preschool programs, spending time outdoors "in nature" is already a tenet. We assumed that it was likely that if any preschool programs incorporated sustainability education, it would be programs which already included spending time *in* the environment as part of their mission. By definition and for the purposes of this paper, we considered nature-based preschools to be licensed early childhood programs where nature was the central organizing concept, the curriculum was built on both high-quality practices of early childhood education and environmental education, and the natural world was integral to addressing both child development and conservation values (Natural Start Alliance, 2014). As indicated, although

nature-based-preschools incorporate time in nature throughout the school day, USA nature-based preschool curricula also focus heavily on pre-literacy and numeracy skills in preparation for kindergarten (Larimore, 2016; Sobel, 2014). In fact, in a recent USA study comparing nature-based preschools and traditional preschools, Pikus, Skibbe, Konishi, Larimore and Sobel (2019) found comparable growth of children's early literacy skills across both preschool types. This finding suggests that spending time outdoors is only one component of the program and potentially competes with other curricular items, such as kindergarten-readiness. Considering Weldemariam and colleagues (2017) findings about the seemingly anthropocentric nature of sustainability education and the pressure on preschool programs to promote grade-school readiness, it is unclear how nature-based preschool teachers bring concepts of sustainability into their programs despite increased barriers.

THE PRESENT STUDY

The purpose of this study was to explore how nature-based preschool teachers in a Northeastern region of the USA implemented sustainability education within their everyday pedagogical practices. Early experiences in nature facilitated by adults are important in the development of later environmental activism (Matsuba & Pratt, 2013); and, early childhood education is fundamental to the development of positive ecocultural identities (Audley, Stein, & Ginsburg, 2020). Therefore, we sought to examine nature-based preschool teachers' craft knowledge of sustainability education including perceived barriers, within their nature-based classroom settings. Following Davis' (2010) differentiation of education *in, about,* and *for* the environment, we examined nature-based preschool educators (1) craft knowledge of teaching sustainability to young children; and, (2) facilitators and barriers regarding sustainability education with young children.

METHODOLOGY

How preschool teachers teach sustainability is a question of teachers' craft knowledge. Craft knowledge, as Barth (2001) notes, "is the massive collection of experiences and learnings that those who live and work under the roof of the schoolhouse inevitably accrue during their careers" (p. 56). That is, craft knowledge is not what teachers should do; rather, it is what they actually do in the classroom. We were primarily interested in teachers' craft knowledge about sustainability education content and pedagogy across nature-based preschools, as craft knowledge is location-dependent and develops through repeated experiences.

Teachers' craft knowledge emerges from teacher reflection on pedagogical content knowledge and learner knowledge (Grimmett & MacKinnon, 1992). Therefore, this study was informed by a qualitative, narrative inquiry framework that allowed access to both teachers' experiences and reflections of sustainability pedagogical content and learner knowledge. As such, our data collection method, individual and group semi-structured interviews, aimed at helping teachers make sense of their past experiences, ideas, and lessons about nature-based and sustainability education in order to "restructure the past and the intentions for the future to deal with the exigencies of a present situation" (Connelly & Clandinin, 1990, p. 25). Participating teachers were given the option of sharing lesson plans, but many of the stories that teachers shared were not prefabricated sustainability lesson plans, but spontaneous interactions with young students that addressed issues of sustainability. Participants relaying spontaneous events, rather than traditional lesson plans, was not surprising, as, in the USA, preschool academic time focuses primarily on pre-numeracy and literacy skills (Tobin et al., 2009), rather than sustainability. Where possible, we triangulated the teachers' reports of spontaneous sustainability interactions with classroom observations. However, we did not use observations to determine whether analyses would lead to the same results, but rather to give a comprehensive view of teachers' craft knowledge about sustainability education (Meijer, Verloop, & Beijaard, 2002). We also examined preschool policies and documentation to corroborate teacher discussion of policies and class procedures, such as the importance of time spent outside in all types of weather.

Participants and Preschools

The participants were 20 preschool teachers (85.7% White; 100% female) and two administrators (100% White, 100% Female) from nine different nature-based preschool programs in the Northeastern USA. All participants had at least a bachelor's degree, and 84% had at least six years of teaching experience. The preschool teachers,

administrators, and their programs mostly reflected the USA national demographics for early childhood education. In line with national demographics (Whitebook, McClean, & Austin, 2016), preschool teachers in this study were predominantly white (*n* = 18) and female (*n* = 20), and preschool programs were predominantly private (*n* = 7). However, participants in this study had higher levels of education (baccalaureate degree, *n* = 9; post-baccalaureate degree *n* = 13) in comparison with the general USA preschool teacher workforce (35% baccalaureate degree). The authors' university Institutional Review Board (IRB) approved this study.

Procedure

Following IRB approval, we identified nature-based education centers within a 60-mile radius of our target area in the Northeastern USA via internet searches using the keywords "nature education," "nature-based preschools," and "nature-focused preschools." We then examined the schools' on-line presence to determine whether the program was nature-based; that is, whether nature was an organizing principle for the program (Natural Start Alliance, 2014). We identified 23 schools that had early childhood programs (including both stand-alone preschools and elementary schools with early childhood programs) and contacted the administration about potential participation in our study. Seventeen schools responded and provided the names and email addresses of early childhood educators in their programs. Over a three month period during the winter of 2017-2018, we emailed participants and arranged interviews for those who were interested. Before each interview, participants first provided written consent and then engaged in either individual semi-structured interviews (ten interviews) or group interviews (three interviews ranging from 3-5 participants from the same school; Frey & Fontana, 1991). Individual and group interviews were chosen to highlight teachers' personal and shared views and reflections on their craft knowledge surrounding sustainability education within the early childhood setting.

Individual and group interviews occurred at the participants' schools and ranged between 45 and 95 minutes in length. The interviews were audio-recorded and focused on two main questions: (1) What is nature-based preschool teachers' craft knowledge of sustainability education? And, (2) What are the facilitators and barriers to sustainability education with young children? All interviews and focus groups were audiotaped and transcribed verbatim by the first author. In order to increase the validity of our findings, we triangulated (Denzin, 2015) a subsample of participant interviews with classroom observations made by the first author along with documents from all centers about their policies and classroom procedures. Classroom observations were made by the first author on the same day that the interview occurred. Observations were both passive (observing in a corner) and active (helping to facilitate an activity). Following observations, the first author asked teachers clarifying questions about the observed activities. Finally, in order to ensure credibility and participant validity, we invited all participants via email to member-check our themes and categories (Birt, Scott, Cavers, Campbell, & Walter, 2016) by emailing them tables we had compiled to organize codes, categories, and themes of the data during the beginning phases of the analysis process.

Data Analytic Plan

In order to ensure proper bracketing, both authors corroborated in study design, codebook creation, and interview analyses (Tufford & Newman, 2010). Following Braun & Clarke (2006), we used inductive methods to determine initial codes from participants' interview transcriptions, staying very close to the language that the participants used. After identifying preliminary codes, we organized each initial code into three key analysis areas: education "in," "about," and "for" the environment based on Davis' (2010) differentiation. We coded *in, about,* and *for* the environment using the following criteria for codes or quotations. *In* the environment: a code or quotation that focused on or employed the outdoors as a medium for learning, such as a learning setting or a resource. *About* the environment: a code or quotation focusing on or employing commonly accepted notions of science either in general or for a specific purpose, or activities that connected humans and the natural world, for example, lessons on the water cycles or composting. *For* the environment: a code or quotation focused on a concern for social action for change, such as a discussion of existing practices about water use or food waste followed by problem-solving and/or taking action to change behaviors. Once initial codes were grouped into the three areas of analysis—*in, about*, and *for* the environment–we further analyzed our initial codes into categories and themes (Saldaña, 2015). To ensure both reliability and validity, both researchers coded themes together, and disagreements were resolved by

consensus. To ensure credibility and participant validity, we emailed each participant individually with the codes, categories, and themes and invited them to comment on our findings (Birt et al., 2016). We revised categories and themes following participants' responses.

RESULTS AND DISCUSSION

Our analyses focus on two central questions: (1) What is nature-based preschool teachers' craft knowledge of sustainability education? And, (2) What are the facilitators and barriers to sustainability education with young children? As we were interested in teachers' craft knowledge of sustainability content and pedagogy, we organized the findings utilizing Davis' (2010) differentiation among education *in*, *about*, and *for* the environment, focusing first on the cultivation of sustainability practices within early childhood environmental education followed by the barriers to those practices.

In the Environment: Cultivation and Barriers

In the environment was the most frequently represented category (over 75%) for participants' descriptions of how they cultivated sustainability practices. We identified two major themes: *participants' placement of nature* ("wild environment" and "human-made environment"), and *facilitation of love and care for nature through explicit instruction and unstructured nature play*. This category also included two interrelated themes of barriers: *the culture of child-rearing in the USA* and *top down fears.*

Cultivation. Participants described lessons and spontaneous activities as occurring in two distinct places: the "wild environment," and the "human-made environment." The wild environment comprised outdoor spaces where humans did not primarily reside, such as the woods, rocks, or trees. For example, teachers commonly discussed the importance of "let[ting] children go as far as they feel comfortable in the woods," (Participant 4, School B). The "human-made environment" referred to adult constructed outdoor spaces made to promote children's interactions with the more-than-human world, such as a garden or water play table. For example, one teacher noted that "just having a garden and having that place to grow food and watch food grow from seed to fork" (Participant 9, School F) was instrumental to their sustainability education practices.

The prevalence of "*in* the environment" coding was not surprising, as a core characteristic of nature-based preschools is that children spend time daily outdoors (Larimore, 2016). However, by highlighting the instrumentality of every day "wilds", such as mud play to expose children to nature, these participants inadvertently challenged the "back to the woods" movement (Louv, 2008), by suggesting that nature exposure can readily occur on a school playground. For our participants, the accessibility of everyday "wilds" was vital for promoting sustainability, as participants reinforced the importance of creating positive emotions in, about, and with, the more than human world (Audley et al., 2020; Dickinson, 2013). That is, for our participants, spending time in nature was equated with learning to love nature. One teacher noted,

> You want kids to just go and fall down a hill, or go climb a tree, or get stuck in the mud so that they are having that association and attachment with nature, instead of the fear, which doesn't actually in the long run create environmentally sound practices as an adult. (Participant 4, School B)

Similarly, another teacher stated,

> It's definitely our goal to help kids love the earth, and sunshine, and mud… really getting them outside in all of the seasons, and much of the weather, and having them interacting with whatever's out there… One day, all the girls were just covered in mud, head to toe, just filthy, and just how important that was for them to just be having so much fun and interacting. (Participant 12, School H)

Indeed, the theme of *fostering love and care for nature* emerged across all participant interviews. The fostering of a love for nature so that children would learn to care for and become stewards of the environment was an explicit

educational practice. For example, educators included "nature-play" in their explicit curricula so children would develop a love for the environment. Participants surmised that this love would be the place from which students might then want to care for and protect the environment. In the USA, it is not uncommon for environmental education curricula to focus on loving the Earth as a means of caring for, stewarding, protecting, and sustaining it (Weldemariam et al., 2017). One teacher's story about her students' encounter with what she called a "magic mushroom" highlighted this premise,

> [A]t the end of the path there's this mushroom on the log that the kids found. It's huge, it's like two hands big. So, they found this mushroom in the summer. Of course, it's magical, it looks like it has a face, and of course we made a big deal out of it saying: 'this is a magical mushroom, you have to be really careful.' It was right at the end of the log bridge and so the kids had to go around it in order not to break it. The two times that they came in the summer the magic mushroom was this huge deal. But what was so amazing was that over the winter we had a group of kids come back ... for a couple days, and we didn't know if the mushroom would still be there, but it was. We were playing out in the swamp, and the mushroom was still there, and some of the same kids who saw it in the summer immediately went into protection mode, and they took turns standing guard over the mushroom while the other kids played around so that it wouldn't get broken ... They would yell at each other as they were coming down the hill saying, 'remember the mushroom! Don't break the mushroom!'... think that's a perfect example of being there with them when they found it and taking that moment to help them be so in awe of how beautiful it was ... to have an adult there to be like, 'wait, this is a really special thing, I've never seen this before.' So it's that idea of grasping those moments and creating a story or a narrative for the kids, and I know that some of those kids will remember that for the rest of their lives. And having had that experience of caring for a thing simply because it was uniquely beautiful in nature is really powerful, and nothing we planned for. (Participant 4, School B)

However, this story also exemplifies how our participants' formulations of education *in* the environment, especially when the focus is on care, can translate to education *for* the environment with the right framing (Audley & Stein, 2017; Audley et al., 2020) and curricular additions (Chawla, 2009). The mushroom story highlighted how the teacher's framing of a nature experience as "magical" (a reference to the power of nature rather than fantasy) shaped the children's reactions to the mushroom, creating a reverence for nature. More so, the children took action to change their behaviors for future interactions with the mushroom, protecting it. With this point, we want to reiterate, however, that though education *in* the environment has its benefits, it alone is not enough to promote pro-environmental inclinations nor sustainable behaviors (Ajaps, McLellan, & Gritter, 2015). Children may continue to protect that magic mushroom, but they may not engage in other sustainable behaviors without explicit education (Chawla & Cushing, 2007).

Preschool teachers also facilitated children's love for nature through unstructured free play in nature. As one participant told us, "We really foster as much uninterrupted play time outside as we can, in spaces that are intentionally set up, and also what they think of as wild spaces" (Participant 18, School I). Preschool teachers' re-telling(s) of their unplanned activities highlighted how unstructured outdoor explorations helped children develop empathy with the more than human world. One participant highlighted how unstructured free time provided the space for children to both be agentic and empathetic with the more than human world:

> So, lately there are a few five-year-old's who are really feeling their feelings, and when we go outside, they don't want to run around, they want to be in nature, climbing the tree, and singing songs. It's two specific kids and they'll just sit together in a tree. The other day there was this one kid who was really upset because another kid was splashing him, and he said to me 'Jamie is trying to kill mother nature, and all we're trying to do is talk to her,' and I was like okay, well I'm curious so I walked over, and I told Jamie to 'quit killing mother nature.' I was lingering to see how it was going to play out and Bea says, 'just listen to mother nature,' and they are crouched over a puddle next to a tree and Camille says 'is it [mother nature] gonna talk back to us?' and Bea goes, 'no, it talks to us in our minds, so you have to really listen.' (Participant 2, School B)

This story highlights an essential caveat amongst teachers' descriptions about the importance of spending time outdoors. Education *in* the environment is not by itself the catalyst for children's love for the more than human world; it is the children's agentic and social interactions *in* the environment that cultivate this love. The teachers' use of unscheduled outdoor free play provided children with space to develop their own patterns of nature interaction (in this case, "nature-protector").

Research supports our participants' assertions that agentic outdoor free play in childhood may foster pro-environmental identities and behaviors in adulthood (Asah et al., 2012; Asah et al., 2018). However, our participants also described tensions they experienced from parents and the broader cultural community about their approach to free play. Parental concerns about child safety, especially that children are vulnerable and "at risk" (e.g., Valentine, 1997), are present in the USA. Although research suggests that parental risk concerns are disproportionate to actual risk (e.g., Carver, Timperio, & Crawford, 2008) the very existence of risk and its liability corollary was perceived as a barrier to study participants' educational goals.

Barriers. Of the two barrier themes, *the general culture of child-rearing in the USA* and *mitigating uncertain risk including parent fears,* the former was the most prevalent. Participants focused on the way that the USA culture in general and family culture, in particular, appeared at odds with the very concept of nature-based education. This cultural mismatch was most present in the participants' descriptions of "in-door kids." This term referred to children who spent the majority of their time at home indoors in front of screens and therefore, did not have the temperament or stamina to spend time outdoors, especially in cold or rainy weather. As one teacher noted, "We battle the indoor problem kids … they're cold easily, they complain about not being able to walk a certain distance" (Participant 1, School A). Our participants' perceptions of indoor children reflected how USA preschool-aged children are spending their time. The average preschool-aged child spends about three hours a day in front of a screen (Chen & Adler, 20198), and parents of preschool-aged children report using the screen as a "babysitter" (Hesketh, Hinkley, & Campbell, 2012).

Parents also reinforced the concept of "indoor kids" by telling educators that their children did not like to spend time outdoors. One teacher told us that, "[Parents] would say 'so and so doesn't want to spend as much time in the woods as they are" (Participant 4, School B). It is not necessarily surprising that parents believed that their children did not like to spend time outdoors, as over one-half of USA adults spent five or fewer hours outside in nature weekly (Kellert et al., 2017). In the same study, parents self-reported that their children spent three times as many hours with screens as they did engage in outdoor play. Although the teachers experienced pushback about the amount of time spent outside from both parents and children, they reported that their classes continued to spend time outdoors in all-weather regardless. The teachers reported taking this approach for two reasons. Firstly, the preschool programs were nature-based, and spending time outside was part of the schools' mission. Secondly, contrary to parental communication, teachers reported that children apparently learned to enjoy their time outdoors once they had repeated experiences outdoors. For example, one teacher noted,

> [W]e had a child two years ago who came in, and I remember one of the really rainy days, one of the moms was like, 'good luck, you're not gonna get my daughter out, I promise you, she's not gonna go.' I said, 'oh, we'll see.' And now this is a child who runs out the door, she plays with complete abandon. So, she hadn't had that experience before coming here. (Participant 9, School F)

The second barrier, *mitigating uncertain risk*, explained why "in-door kids" existed. Teachers reported parents were unsure about the harm that could occur outdoors; and, because parents were unsure of the risks, the children stayed indoors and did not have the necessary experience or stamina for playing outdoors. Parental uncertainty about the risks (and subsequent parental fears based on perceived risks) of having children spend time outdoors were then "passed on" to the children. Within this theme of *mitigating uncertain risk,* we identified two categories: *managing parental uncertainty*, and *managing fears and concerns that parents passed on to their children.*

In the United States, fear of parental litigation is a common occurrence for schools and teachers, especially with regards to outdoor risk (Tobin et al., 2009). It was no surprise then that all participants spoke about managing risks and balancing programmatic requirements with parental concerns. For example, one participant commented on her fear about parents suing or removing their child from the program because of an accident occurring outdoors. Although not all participants were worried about this, all participants did recognize the need to mitigate parental perceptions of risk. Participants noted that parental concerns did not necessarily reflect reality, but originated in parental uncertainty; that is parents did not have an accurate understanding of the actual risks of spending time outdoors and felt that the outdoors was 'unpredictable.' As a participant told us, "when you have an indoor classroom, you can be checking for safety, you know what to expect, so there's this idea about reasonable risk." Participants acknowledged that many parental concerns were about aspects of outdoor play, such as ticks, where risk was uncertain (e.g., will my child get a tick?), but clearly manageable (e.g., tick checks) therefore, though ticks are a parental concern, they are not a hazard. The key to uncertain, but manageable risks was to focus on parental education. For example, one participant shared,

> I think [parents] are very concerned. Ticks are a huge thing in this area. So, again, it comes back to managing risks, and deciding what reasonable risks are, and having education and the time and the resources to learn it. (Participant 4, School B)

Teachers took parents' fears in their stride and considered outdoor risks to be reasonable, and when possible, educated parents and children about why spending time outdoors was important. For example, one teacher said, "I front load [to the parents] that kids are gonna be coming home with ticks, kids are gonna get poison ivy, and I just give a rationale behind why that still, that's just a by-product of the philosophy" (Participant 18, School I).

Teachers reported that they responded to adult concerns because they worried that adult fears transferred to the children, which was our second category. Our participants' perceptions that adults' beliefs and behaviors influenced children's pro-environmental behavior is commonly found in the literature on the subject (e.g., Grønhøj, & Thøgersen, 2009, 2012). Although teachers did not note specific instances where children's fears reflected adult fears, teachers did note that "[C]hildren have less fear, although I think they can be affected by the adults." Teachers responded to perceived children's fears by having children spend more time outdoors and by modeling adult risk-taking behavior that the children could copy and partake in, such as playing in the mud alongside children. This approach is reasonable, as pro-environmental values socialization in schools has shown to influence children's pro-environmental behaviors and consciousness (Olsson, Gericke, & Chang Rundgren, 2016; Pauw, Gericke, Olsson, & Berglund, 2015). In sum, the teachers seemed committed to addressing the barriers to education *in* the environment with both children and with the children's parents through active participation and respectfully challenging families' risk-averse values. Teacher willingness to engage with and push-back against parental fears and cultural values was not reported in barriers *about* and *for* the environment.

About **and** ***For*** **the Environment: Cultivation and Barriers**

About and *for* the environment were less commonly categorized responses than *in* the environment, with aspects of *for* the environment intertwined with the more commonly reported *about* the environment. We identified two major entwined themes that addressed how teachers cultivated about and for the environment within their already present science curricula: *incorporating developmentally appropriate questions about sustainability lessons* and *focusing on content that reinforced love of the Earth.* This category also included one barrier for *about* the environment—*paucity of curricular time and abundance of content*—and one barrier *for* the environment—*inadequate family engagement and economic resources necessary to promote sustainability practice*.

About **and** ***For*** **the Environment*: Cultivation.*** Within our study, teachers rarely report teaching stand-alone sustainability lessons; instead, participants embedded the sustainability content within common early childhood science topics, such as the weather or butterfly life cycles. The actual sustainability content the participants chose to present was, in part, based on the developmental appropriateness of the activity and the ease with which an activity or issue could be paired with an already established preschool science lesson. In addition, participants also commonly chose sustainability content that they believed would help children learn to love the Earth.

Almost all participants reported incorporating developmentally appropriate issues, problems, and solutions that encompassed sustainability education. However, what was included within the lesson depended on what the teacher considered developmentally appropriate. For example, when teaching about geography, some teachers talked about land use and occupation of land. A participant whose teaching was founded in social justice and anti-bias education told us about her geography lesson,

> We talk about indigenous land and who was on this land before us, and that really allows us to go further and talk about reservations, and how they are the worst land for people. (Participant 7, School D)

This teacher felt that it was appropriate and integral to talk about land rights and the negative impacts of the reservations on Indigenous peoples. However, this same teacher also noted that within the water cycle study they only talk a little about pollution,

> This year we're doing a lot of talk about the work of water, so, learning about rivers, and how water makes its way to the earth, and how it lays its path. We'll talk a little bit about polluted water too … keeping people aware that Flint still doesn't have water. (Participant 7, School D)

Although the teacher's discussion was limited to the allusion that not everyone has clean water to drink, the lesson did incorporate a concern for others and that concern may be planting a seed for future social action for change.

A common retort among participants for not including traditional sustainability lessons, such as addressing the climate crisis, was that certain environmental phenomena and their framing were not considered developmentally appropriate practice. Developmentally appropriate practice (DAP) is one of the required tenets for high-quality preschool programs in the United States (Copple & Bredekamp, 2009). DAP is a framework that is designed to help early childhood educators promote young children's optimal learning and development, by considering children's development and social and cultural context (National Association for the Education of Young Children, 2019). Thus, teaching to DAP means that lessons should not contain ideas or concepts that may be cognitively or emotionally difficult for young children to process. As one teacher explained, the idea about "time" in relation to climate change was cognitively too difficult for her students to understand,

> It seems like one of the impediments to teaching about sustainability is true for kids as well as adults. It is so hard to get a sense of time, and most of the things that impact sustainability happen over generations, or at least over seasons. So, I know that's a difficulty, even with just doing school gardening … I think it's hard for people to get their heads around the speed of change, and our impact on change. I don't think it's a matter of explaining it better, I think it's a matter of kids, and maybe some adults can't get their heads around time. (Participant 6, School C)

For this teacher, the content was not developmentally appropriate, that is, the children could not cognitively understand the concept of time, ideas related to sustainability are not concrete enough for young children to comprehend, and young children cannot comprehend the concept of time even with teacher scaffolding. In particular, the most common reason teachers gave for not talking explicitly about the climate crisis or sustainability issues, including problem solving, was that the issues were labeled by the teachers as too scary or sad for the children to grapple with. For example, one participant shared that they, "don't do the heavy load of the world is crashing and things are falling apart," similarly, another participant commented about the hopelessness of the climate crisis, "It's that balance of finding where young children are capable of understanding without being overwhelmed. A lot of times, so much of it feels overwhelmingly hopeless." However, teachers did not ignore issues of sustainability, rather they focused instead on what they viewed as developmentally appropriate responses - teaching children sustainable behaviors and lifestyle practices. These behaviors included concrete environmental tasks, such as recycling, and turning off lights, composting food scraps, tending compost to use for school gardens, and other conservation behaviors such as reusable snack containers and reducing water use. Teachers noted that they were teaching the children these behaviors for sustainability purposes; however, they rarely revealed those reasons to the children.

For example, in one classroom the children's water play comes from a rain barrel, rather than plumbing. The teacher explained this policy to the children as such:

> So, we teach them 'you have water when it rains, and water is a precious commodity.' When they ask, 'I need water for something I'm building,' sometimes we have to say, 'we can't it hasn't rained in a while, we should do a rain dance and hope that it rains.' (Participant 9, School F)

In this example there was no explanation that water is critical for socio-economic development or that not everyone has access to running water, therefore, this teacher does not include "the sociopolitical dimension that is missing [nor is this statement] concerned with social action for change" (Davis, 2010, p. 31). However, teachers did report that the children reminded each other to turn off the lights or use less water—evidence that children were focusing on everyday sustainability issues. In these cases, it seemed that even if children do not understand the sociopolitical factors associated with water conservation or composting, they still learn to do these behaviors and that these behaviors, as Miller, Davis, Boyd, and Danby (2014) note, "make a difference for sustainability within [the children's] everyday experiences" (p. 50). Thus, rather than focusing on global sustainability issues, which may be abstract and hard for children to understand, our participants focused on issues that were concrete and could make a difference to children's everyday lives in terms of sustainable practices. As one teacher described,

> When I imagine teaching sustainability, I think of concrete things … I think it's important to include the design cycle because it's about figuring out how to solve problems. We try to use a problem-solving approach … It goes ask, imagine, play, create, improve, ask again, and keep going. It's sustainable in itself. (Participant 6, School C)

Similarly, another teacher reported about how she explained the reason why the classroom engages in certain practices,

> [W]e really try to give the kids an awareness that they are part of this planet, and we really want them to be aware of the things that they do on a daily basis impact our planet. We do simple things such as rinsing out containers that they've used in the classroom, or, using reusable materials … We really want kids to be ambassadors of the planet as they get older and understand that even if it's a small thing, it makes a difference. So, by picking up trash that you find outside, by saving your water bottles to recycle instead of throwing them out… we talk a lot about that stuff in the classroom. I feel like the kids in this area [urban, lower socioeconomic status] are not always given that much of an impression about that. (Participant 10, School G)

Here, we see this teacher speaking about many easily accessible forms of pro-environmental behaviors such as using the other side of the paper that has not yet been used for drawing, picking up trash, and recycling plastic water bottles. This teacher was demonstrating to the children that as Chawla and Derr (2012) note, human action is what creates environmental problems and solutions, and it is human action that is the basis for sustainable lifestyle practices.

Although the teachers in the present study focused on the importance of following DAP, providing developmentally appropriate curriculum within early childhood settings is controversial, as some researchers and teachers question whether it supports experiences for all young children equally (for a review see Brown & Lan, 2015). Thus, although the participating teachers used DAP as a guideline to determine what and how to talk about sustainability issues, this does not mean that issues such as climate change or sustainability problems solving should not be included in sustainability education with young children. Indeed, within the present study participants used DAP to highlight a variety of conflicting practices that ranged from addressing socio-political dimensions of climate change to personal behaviors that can help the Earth. What was considered DAP was not based on an external age-based framework, but rather on the participants' own perspectives about the capabilities of young children. The focus on DAP, and its inherent belief that children are dependent, rather than agentic, may also explain why teachers described sustainability practices *in* the environment much more than *for* the environment, as sustainability practices that are *for* the environment focused require a child's agency.

For most participants, sustainability, however, was not a stand-alone lesson, but was combined with more traditional science content such as lessons on the water cycle, geology, and geography, in addition to environmental science-focused lessons such as tree-studies. In these combined lessons, teachers merged *about* and *for* the environment, that is, when learning about the topic they incorporated aspects of problem solving or enacting change. A common embedded sustainability lesson often accompanied the use of school gardens or the study of butterfly life cycles. For example, one teacher described her lesson on pollinator gardens and the reciprocal relationships that pollinating insects have with humans,

> With the butterfly gardens, what we're talking about essentially is if we don't protect the earth, these insects will not be around anymore, and these pollinators produce one in every three bites of food that we eat. I feel like, even though that's a really big concept for the kids, the truth is that when we're looking at food groups, and nutrition, and environmental practices–I garden a lot, so I bring a lot of farming into the classroom–it impacts the animals, and the air we breathe. (Participant 10, School G)

Many preschool and kindergarten classrooms study the life cycle of monarch butterflies in the fall; however, this curricular example is different because this teacher specifically utilized the study of butterflies to develop conservation behaviors (Chawla & Derr, 2012). Similarly, another teacher remarked on how she connected the study of monarch butterflies to sustainability,

> …in the fall we start off talking about monarchs … I've tried to really enlarge it so that we are talking about monarchs and milkweed so that we can really understand the relationship. Monarchs depend on these particular plants, and these particular plants depend on being their space. So, we're just trying to be more conscious of making sure the children understand how these species are dependent on these particular foods, and how much habitat, and protecting habitat is important. (Participant 11, School H)

Here, this teacher demonstrated the connection between an insect and a plant, therefore, teaching the relationship among different life forms and the interconnectedness of species. Understanding this relationship, as this teacher noted, could form the basis for children's understanding of other relationships on larger scales later in life and therefore, encourage pro-environmental behaviors (Steg & Vlek, 2009).

In addition, many teachers structured their science lessons to reinforce love and wonder about the natural world, a common practice in USA early childhood education curricula (Weldemariam et al., 2017), and one which the preschool teachers believed would foster sustainability practices in the future. In nature-based centers with access to the woods, a common lesson was a tree-study. As one teacher explained,

> We start off our school year studying the forest, and we go to a few local forests. It's been evolving, but really just our main objective is to instill this sense of wonder about nature, and to see earth at its most raw in this local area. We have our own classroom tree that we visit and see changes and see how it sustains natural life. (Participant 11, School H)

Here, the educators touched on environmental themes that they believed connected to their general curriculum and program goals and again, focused on practices that were developmentally appropriate.

In sum, preschool teachers reported teaching children everyday sustainability through conservation and sustainable behaviors, and positive reinforcement of the interconnectedness of living organisms. Teachers did not, however, approach sustainability from a crisis perspective, citing the importance of following developmentally appropriate practice (DAP). Thus, these teachers reported that through their lessons *about* the environment they were able to connect to actions *for* the environment, a form of early childhood sustainability education. However, as much as the preschool educators included in our study did to endorse lessons and practices surrounding environmental and sustainability education, they also faced many barriers to their practices.

***About* and *For*: Barriers.** We identified one barrier for *about* the environment—*paucity of curricular time and abundance of content*, and one barrier *for* the environment—*inadequate family engagement and economic resources necessary to promote sustainability practice*. For the barrier, participants described how they lacked time in the school day and when combined with pressure to teach academic content, it was difficult to engage children in sustainability education every day. For example, some teachers highlighted the length of the preschool programs, where many of the participants taught in half-day programs with larger numbers of students, "we work in schools where we have large numbers and we only see them for an hour sometimes". Other participants felt they had to cover too many "other things," in the school day including standard academic content, such as pre-numeracy and literacy, and socio emotional learning, and thus, sustainability education was often only a few times a week. As one teacher complained,

> We have a lot of things in line that we have to talk about, and this [sustainability education] is just one of them. It doesn't mean that we won't always do things about the environment with the kids, but we don't every day because there are so many other things that we're teaching. We're busy. (Participant 14, School D)

That there is not enough time and too much content to cover was a common complaint of USA preschool teachers across the USA (Tobin et al., 2009). This complaint of time and content was further confounded by the participants' perceptions that students were not able to sustain expected attentional levels, and thus, how content was covered, and the amount of time spent on content was negatively impacted. One teacher outlined how this impacted her thinking about environmental science lessons,

> And then top it off with the attraction of fast-clip programs that the children are watching on television. The children's focus times have decreased a lot. Many years ago, I would bring crickets in and kids would look at them, talk about them, think about them, draw them, for maybe 15 minutes. And now, you're lucky if you can even get one minute of some children that are just so used to faster moving things. (Participant 1, School A)

In the USA, preschool teachers feel pressured by the "pushdown" of academic curriculum, which includes both more complex and faster moving content (Tobin et al., 2009). Broadly speaking, preschool teachers feel the tensions between the importance of play-based pedagogy and academic readiness for kindergarten(Sisson & Kroeger, 2017), which teachers within this study echoed.

The second barrier that limited teachers' ability to promote sustainability practices within their classrooms focused on burdening families with the economic resources necessary to promote sustainability practices. In particular, teachers highlighted their struggle with including zero waste or "waste-in and waste out" lunches as a classroom or school-wide practice. Zero-waste lunches and "waste-in and waste" out lunches connected with and encouraged sustainability practices within the home and allowed parents, children, and teachers to quite literally see the amount of waste generated (Lewis & Pearson, 2010). However, not all families in the respective programs that we examined had the time and or economic resources to use reusable containers or not include pre-packaged foods. In some cases, teachers were worried that by labeling waste as "bad", children would start policing each other's lunch waste, which children had no control over. Hence, some teachers decided not to point out lunch waste, even though identifying amounts of lunch waste ia a pedagogical outcome for sustainability instruction (Stone, 2007). As one teacher noted,

> There are kids who bring in all reusable lunch stuff, and there are kids who bring in all packaged stuff. At this age they don't tend to point out those differences, that I've noticed. It's just, they're so into what they're own stuff is, they don't think about it. I mean, if it was explicitly taught, 'oh, plastic baggies are bad,' then they would definitely start policing each other. (Participant 3, School B)

Another teacher thought that expecting students to participate in sustainable lunch practices was unfair if parents were expected to shoulder the economic burden.

> I don't ask for [no waste lunches]. I don't think it's fair. In my own lunch, or my kids' lunches, sometimes we have packaging, because it's what they like or it's fast and easy… When I look at my students' lunches, the students whose families are all working, or don't have a lot of money, are all packaging. I could either send the trash back home, and I know the parent who's sending all that packaging doesn't have time to clean that out, and it feels really rude I think, or I could ask them to provide a reusable container, but then I am asking them to do extra wash, and buy a container. (Participant 7, School D)

Other teachers told us about their struggle with enforcing their schools' zero-waste lunch or "pack-in, pack out" lunch rules. These rules were created explicitly to encourage parents to use reusable containers and to help families identify the amount of trash and food waste they were generating. However, teachers who endorsed zero waste or "pack-in, pack out" lunch rules also recognized that these rules were not always accessible to their students' families. Re-using and not buying pre-packaged foods required parents to have the disposable income to buy lunch containers and the time to clean them, which was not an assumption that any of the teachers in our study were willing to make. For example, a participant noted,

> Here we aim to have zero waste lunches, but then we have families who send packaged food … And, I know that it is sometimes cheaper and easier to have the packaging because those are the things that are on sale, or they're higher in calories a lot of the time, while we also have kids who have fifty-dollar lunch boxes, and not everyone can afford that. (Participant 7, School D)

The economic burden of sustainability practices in preschools often fell to parents, and the teachers overwhelmingly felt that they could not or should not ask parents to shoulder that burden. In some cases, zero-waste or sustainable lunch programs became an ideal, rather than an actual practice. As one administrator noted about her school's failed attempt,

> It was a feeble attempt, but we tried to get students to take their lunch trash home. Pack in, pack out was the idea. The idea was that you will be more likely to put things in reusable containers if you have to pack it back in and take it home. Kids did not want to put half eaten sandwiches back in their lunch boxes. It was too messy and too gross. Or, a yogurt cup that had yogurt still in it, they really didn't feel like they had the time or space to take care of their dishes properly. So, they would either throw things in the trash can anyway, or be really mad about it. So, that was a school wide attempt that didn't work, but it was an attempt. (Participant 6, School C)

The economic difficulty of zero-waste lunches, and other sustainability practices that require economic resources are not barriers that teachers can control or even influence. Unlike the barriers identified within education *in* the environment, with the barriers to education *for* the environment, the teachers felt that they could not ask families to participate in sustainable practices if those practices were an economic burden. In this way, barriers impacted how teachers and children were able to fully engage in everyday sustainability practices, and at times these barriers ended program-wide sustainability practices.

GENERAL DISCUSSION AND CONCLUSION

In this study, we examined nature-based preschool teachers' cultivation of and barriers to early childhood sustainability education. Although all participating teachers engaged in sustainability education *in* the environment, a built-in component of all programs, most teachers struggled to cultivate sustainability education *for* the environment in ways that "attempt[ed] to redress the perceived 'greenness' of sustainability education and to focus more on the pedagogies of humans as agents of change" (Elliott & Davis, 2009, p.67). In their seminal book, *Research in Early Childhood Education for Sustainability,* Davis and Elliott (2014) note that reviews of sustainability education:

"described young children *in* the environment, experientially-engaged with gardening or playing in/observing nature" (p. 4) which is congruent with our study findings. Thus, nature-based preschool programs are providing a foundation for sustainability education by educating children *in* the environment. The teachers in our study emphasized being outdoors in almost all weather despite parental and cultural barriers that suggested such extended outdoor time was both inaccessible and risky. Given the perceived misalignment of educators' and parents' goals regarding sustainability education across all measures of education *in*, *about,* and *for* the environment, it is not necessarily surprising, then, that teachers reported only pushing back against perceived barriers that prevented children from spending time outdoors, as a requirement of nature-based preschool curricula.

Teachers in this study reported supplementing time outdoors with traditional environmental-focused school topics that integrated pre-literacy and numeracy into the study of the water cycle, trees, animals, and insects. Their inclusion of traditional environmentally focused school topics is congruent with the finding that environmental education has been somewhat integrated into science and geography courses throughout K-12 curricula (Puk & Behm, 2003). The barriers that the participating educators reported to education *about* the environment are barriers that are common across public and private USA preschools—time and developmental appropriateness (Tobin et al., 2009), and broader cultural narratives about what is essential to teach in the preschool classroom (Ham & Sewing, 2010). Thus, our findings pertaining to nature-based programs are reflective of literature on sustainability education in USA preschools.

We would like to note a few limitations of our study. Teachers' craft knowledge and practice of sustainability education is uniquely influenced by their own training, the number of years they have taught, and their physical location, including what type of nature the teachers and children have access to. This is especially pertinent because access to nature, in particular forests and gardens, played a large role in cultivating specific sustainability practices, such as learning to love the Earth. Therefore, we limit the generalizations as to how nature-based preschool teachers cultivate sustainability education to programs that have similar outdoor facilities. Future research should replicate this study in other regions of the United States or in facilities with access to other types of nature (such as urban parks, deserts, lakes) to determine whether the type of nature influences how sustainability practices are cultivated.

We want to also point out that although we included observations, we did not ourselves rate or code the specific sustainability practice, as we were looking for congruence across interview and practice. This present study could have been strengthened by including more systematic and repeated observations in order to further understand how sustainability practices were cultivated on a daily basis within the context of nature-based preschool classrooms and how those practices were built across the school year.

In conclusion, there is wide-spread support for sustainability education, but it is hard to implement in schools in a systematic way without broader changes to the United States educational system, including curricula and pedagogy. However, this idea does not mean that teachers cannot incorporate aspects of sustainability education, such as school wide-policies, that promote everyday sustainability, as experiential and engaging with young children as agentic. As our study suggests, however, without more substantial societal shifts, the sustainable behaviors that children learn in the United States. schools will not translate easily to the children's home and family lives (Grønhøj & Thøgersen, 2009, 2012). Thus, if every day sustainable practices are to play a part in combating the climate crisis, sustainability education must not just be relegated to schools, but also must make its way through broader culture as well.

References

Abebe, T. (2019). Reconceptualising children's agency as continuum and interdependence. *Social Sciences*, *8*(3), 81-97.

Allen, M. Babiker, M., Chen, Y., et al. (2018). Summary for policymakers. In: *Global warning of 1.5°c: An IPC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.* Available online at: http://ipcc.ch/report/sr15/.

Asah, S. T., Bengston, D. N., & Westphal, L. M. (2012). The influence of childhood: Operational pathways to adulthood participation in nature-based activities. *Environment and Behavior*, *44*(4), 545-569.

Asah, S. T., Bengston, D. N., Westphal, L. M., & Gowan, C. H. (2018). Mechanisms of children's exposure to nature: Predicting adulthood environmental citizenship and commitment to nature-based activities. *Environment and Behavior*, *50*(7), 807-836.

Ajaps, S., McLellan, R. & Gritter, K. (2015). "We don't know enough": Environmental education and pro-environmental behaviour perceptions, *Cogent Education, (2)*1 online. Retrieved from https://doi.org/10.1080/2331186X.2015.1124490

Audley, S. R., & Stein, N. R. (2017). Creating an environmental resiliency framework: Changing children's personal and cultural narratives to build environmental resiliency. *Journal of Environmental Studies and Sciences*, *7*(2), 205-215.

Audley, S. Stein, N. R. & Ginsburg, J. L. (2020). Fostering children's ecocultural identities within ecoresiliency. In: T. Milstein. & J. Castro-Sotomayor (Eds.) *Handbook of ecocultural identity.* London, UK: Routledge.

Bautista, A., Moreno-Núñez, A., Ng, S. C., & Bull, R. (2018). Preschool educators' interactions with children about sustainable development: Planned and incidental conversations. *International Journal of Early Childhood*, *50*(1), 15-32.

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, *26*(13), 1802-1811.

Blanchet-Cohen, N. & Nelems, R. (2013). A child-centered evaluation of a psychological program: Promoting children's healing, safety, and well-being in post-disaster contexts. *Children, Youth and Environments, 23*(1), 23-42.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101.

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: a meta-analysis. *Frontiers in Psychology*, *5*, https://doi.org/10.3389/fpsyg.2014.00976

Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighbourhood safety on children's physical activity—A review. *Health & Place*, *14*(2), 217-227.

Centers for Disease Control (2013). Public health terms for planners & planning terms for public health professionals. Retrieved from https://www.cdc.gov/healthyplaces/terminology.htm

Chawla, L. (2009). Growing up green: Becoming an agent of care for the natural world. *The Journal of Developmental Processes, 4*(1), 6-23.

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

Chawla, L. & Cushing, D. F. (2007) Education for strategic environmental behavior. *Environmental Education Research*, *13*(4), pp. 437-452.

Chawla, L. & Derr, V. (2012). The development of conservation behaviors in childhood and youth. In S. Clayton, (Ed.) *Oxford handbook of environmental and conservation psychology* (pp. 527-555). Oxford: Oxford University Press.

Chawla, L., Keena, K., Pevec, I., & Stanley, E. (2014). Green schoolyards as havens from stress and resources for resilience in childhood and adolescence. *Health and Place, 28*(1), 1-13.

Chen, W., & Adler, J.L. (2019). Assessment of screen exposure in young children, 1997 to 2014. *JAMA Pediatrics, 173*(4), 391–393. doi:10.1001/jamapediatrics.2018.5546

Cheng, J. C., & Monroe, M. C. (2012). Connection to nature: Children's affective attitude toward nature. *Environment and Behavior, 44*(1), 31-49.

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher, 79*(5), 2-24.

Copple, C., & Bredekamp, S. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Washington DC: National Association for the Education of Young Children.

Council of the European Union (2010). *Council conclusions on education for sustainable development.* 3046th Education, Youth, Culture, and Sport Council Meeting, Brussels. Retrieved from https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/educ/117855.pdf

Davis, J. (1998). Young children, environmental education, and the future. *Early Childhood Education Journal, 26*(2), 117-123.

Davis, J. M. (2010). What is early childhood education for sustainability? In J. M. Davis (Ed.) *Young children and the environment* (pp. 21-42). Port Melbourne, VIC: Cambridge University Press.

Davis, J. & Elliott, S. (2014). An orientation to early childhood education for sustainability and research – framing the text. In J. Davis, J. & S. Elliott (Eds.) *Research in early childhood education for sustainability* (pp. 1-17). London: Routledge.

Denzin, N. K. (2015). Triangulation. In *The Blackwell encyclopedia of sociology.* Retrieved from https://onlinelibrary.wiley.com/doi/10.1002/9781405165518.wbeost050.pub2

Dickinson, E. (2013). The misdiagnosis: Rethinking "nature-deficit disorder." *Environmental Communication: A Journal of Nature and Culture*, *7*(3), 315-335.

Elliott, S. & Davis, J. (2009). Exploring the resistance: An Australian perspective on educating for sustainability in early childhood. *International Journal of Early Childhood, 41*(2), 65-77.

Elliott S., & Davis J. (2018). Moving forward from the margins: Education for sustainability in Australian early childhood contexts. In G. Reis & J. Scott (Eds.) *International perspectives on the theory and practice of environmental education: A reader* (pp. 163-178). Cham: Springer.

Frenkel, H., Tandon, P., Frumkin, H., & Vander Stoep, A. (2018). Illnesses and injuries at nature preschools. *Environment and Behavior, 58*(8), 936-965.

Frey, J. H., & Fontana, A. (1991). The group interview in social research. *The Social Science Journal*, *28*(2), 175-187.

Gill. T. (2014). The benefits of children's engagement with nature: A systematic literature review. *Children, Youth and Environments, 24*(2), 10-34.

Grimmett, P., & MacKinnon, A. (1992). Craft knowledge and the education of teachers. In G. Grant (Ed.), *Review of research in education* (Vol. 18, pp. 385-456). Washington, DC: American Educational Research Association.

Grønhoøj, A. & Thøgersen, T. (2009). Like father, like son? Intergenerational transmission of values, attitudes, and behaviours in the environmental domain. *Journal of Environmental Psychology, 29*(4), 414 – 421.

Grønhøj, A. & Thøgersen, T. (2012). Action speaks louder than words: The effect of personal attitudes and family norms on adolescents' pro-environmental behaviour. *Journal of Economic Psychology, 33*(1), 292-302.

Ham, S. H. & Sewing, D. R. (2010). Barriers to environmental education. *The Journal of Environmental Education, 12*(2), 17 – 24.

Hesketh, K. D., Hinkley, T., & Campbell, K. J. (2012). Children' s physical activity and screen time: Qualitative comparison of views of parents of infants and preschool children. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), *online*. Retrieved from http://www.ijbnpa.org/content/9/1/152

Kahriman-Öztürk, D., Olgan, R., & Guler, T. (2012). Preschool children's ideas on sustainable development: How preschool children perceive three pillars of sustainability with the regard to 7R. *Educational Sciences: Theory and Practice*, *12*(4), 2987-2995.

Kellert, S. R., Case, D. J., Escher, D., Witter, D. J., Mikels-Carrasco, J., & Seng, P. T. (2017). The nature of Americans: Disconnection and recommendation for reconnection. Mishawaka, IN: DJ Case. Available from https://natureofamericans.org/

Knight, S. (2013). *Risk & adventure in early years' outdoor play: Learning from forest schools*. Oxford: Sage Publications.

Larimore, R. (2016). Defining nature-based preschools. *International Journal of Early Childhood Environmental Education*, *4*(1), 32-36.

Larson, L. R., Green, G. T., & Castleberry, S. B. (2011). Construction and validation of an instrument to measure environmental orientations in a diverse group of children. *Environment and Behavior*, *43*(1), 72-89.

Lee, Y. (2010). The USA and non-ratification of the Convention on the Rights of the Child. *Child Welfare*, *89*(5), 15-21.

Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2010) *Climate change in the American Mind: Americans' global warming beliefs and attitudes in January 2010.* Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change.

Lewis, E., & Pearson, J. (2010). Little green steps: Sustainability practice for early years comes to WA. *SCIOS: Journal of the Science Teachers' Association of Western Australia*, *46*(3), 13-14.

Lombardi, D., Sinatra, G. M., & Nussbaum, E. M. (2013). Plausibility reappraisals and shifts in middle school students' climate change conceptions. *Learning and Instruction*, *27*, 50-62.

Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder.* Chapel Hill, NC: Algonquin Books of Chapel Hill.

Lubeck, S. (1998). Is DAP for everyone? A response. *Childhood Education*, *74*(5), 299-301.

Matsuba, M. K. & Pratt, M. W. (2013). The making of an environmental activist: A developmental psychological perspective. *New Directions for Child and Adolescent Development, 142,* 59 – 74.

Matthews, D. H., & Caldeira, K. (2008). Stabilizing climate requires near-zero emissions. *Geophysical Research Letters 35*(4), 1-5.

Meier, D., & Sisk-Hilton, S. (2017). Nature and environmental education in early childhood. *The New Educator, 13*(3), 191-194.

Meijer, P.C., Verloop, N., & Beijaard, D. (2002). Multi-method triangulation in a qualitative study on teachers' practical knowledge: An attempt to increase internal validity. *Quality and Quantity, 36*(2), 145-167.

Michek, S., Nováková, Z., & Menclová, L. (2015). Advantages and disadvantages of forest kindergarten in Czech Republic. *Procedia-Social and Behavioral Sciences*, *171*, 738-744.

Miller, M. G., Davis, J. M., Boyd, W., & Danby, S. (2014). Learning about and taking action for the environment: Child and teacher experiences in a preschool water education program. *Children, Youth and Environments*, *24*(3), 43-57.

Moen, K. H., Bakke, H. K., Bakke, Ø., & Fors, E. A. (2007). Preschool children's sickness absenteeism from Norwegian regular and outdoor day care centres: A comparative study. *Scandinavian Journal of Public Health*, *35*(5), 490-496.

Mygind, O., Rønne, T., Søe, A. L., Wachmann, C. H., & Ricks, P. (2003). Comparative intervention study among Danish daycare children: The effect on illness of time spent outdoors. *Scandinavian Journal of Public Health*, *31*(6), 439-443.

National Association for the Education of Young Children (2009). *Position statement on developmentally appropriate practice in early childhood programs serving children from birth through Age 8.* Retrieved from https://www.naeyc.org/sites/default/files/globally-shared/downloads/PDFs/resources/position-statements/PSDAP.pdf

Natural Start Alliance. (2014). What is a nature preschool? Retrieved from http://naturalstart.org/tags/naturepreschool/what-is-a-nature-preschool.

Olsson, D., Gericke, N., & Chang Rundgren, S. N. (2016). The effect of implementation of education for sustainable development in Swedish compulsory schools–assessing pupils' sustainability consciousness. *Environmental Education Research*, *22*(2), 176-202.

Padilla-Walker, L. M., & Nelson, L. J. (2012). Black hawk down? Establishing helicopter parenting as a distinct construct from other forms of parental control during emerging adulthood. *Journal of Adolescence*, *35*(5), 1177-1190.

Pauw, J., Gericke, N., Olsson, D., & Berglund, T. (2015). The effectiveness of education for sustainable development. *Sustainability*, *7*(11), 15693-15717.

Pikus, A. E., Skibbe, L., Konishi, H., Larimore, R., & Sobel, D. (2019, March). The effects of nature-based preschool on child development. Poster presented at the bi-annual Society for Research in Child Development conference, Baltimore, MD.

Puk, T. Behm, D. (2003). The diluted curriculum: The role of government in developing ecological literacy as the first imperative in Ontario secondary schools. *Canadian Journal of Environmental Education, (8)*1, 217 – 232.

Rosa, C. D., Profice, C. C., & Collado, S. (2018). Nature experiences and adults' self-reported pro-environmental behaviors: The role of connectedness to nature and childhood nature experiences. *Frontiers in Psychology*, *9*, 1055. doi: 10.3389/fpsyg.2018.01055.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. London: Sage

Seltenrich, N. (2015). Just what the doctor ordered: Using parks to improve children's health. *Environmental Health Perspectives, 123,* A254-A259.

Simmons, B. (2011). Climate change education in the formal k-12 setting: Lessons learned from environmental education. In *Workshop on Climate Change Education in Formal Settings*. Utah-Salt Lake City: The National Academies Board on Science Education Committee on Human Dimensions of Global Change Division of Earth and Life Studies.

Sisson, J. H., & Kroeger, J. (2017). 'They get enough of play at home': A Bakhtinian interpretation of the dialogic space of public school preschool. *Early Child Development and Care*, *187*(5-6), 812-826.

Sobel, D. (2014). Learning to walk between the raindrops: The value of nature preschools and forest kindergartens. *Children, Youth and Environments*, *24*(2), 228-238.

Solomon-Moore, E., Emm-Collison, L., Sebire, S., Toumpakari, Z., Thompson, J., Lawlor, D., & Jago, R. (2018). "In my day…": Parents' views on children's physical activity and screen viewing in relation to their own childhood. *International Journal of Environmental Research and Public Health*, *15*(11), 2547. https://doi.org/10.3390/ijerph15112547.

Somerville, M., & Williams, C. (2015). Sustainability education in early childhood: An updated review of research in the field. *Contemporary Issues in Early Childhood*, *16*(2), 102-117.

Steg, L. & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology, 29*(3), 309-317.

Stone, M. K. (2007). Rethinking school lunch: Education for sustainability in practice. *Canadian Journal of Environmental Education (CJEE)*, *12*(1), 19-32.

Tibilisi Declaration (1977). Retrieved from http://www.gdrc.org/uem/ee/tbilisi.html

Tobin, J., Hsueh, Y., & Karasawa, M. (2009). *Preschool in three cultures revisited: China, Japan, and the United States*. Chicago, IL: University of Chicago Press.

Tufford, L., & Newman, P. (2010). *Designing qualitative research.* London: Sage.

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. *Environmental Research*, *166*, 628-637.

Valentine, G. (1997). "Oh yes I can. "Oh no you can't": Children and parents' understandings of kids' competence to negotiate public space safely. *Antipode*, *29*(1), 65-89.

Valentine, G., & McKendrick, J. (1997). Children's outdoor play: Exploring parental concerns about children's safety and the changing nature of childhood. *Geoforum*, *28*(2), 219-235.

Varela-Candamio, L., Novo-Corti, I., & Garcia-Alvarez, M. T. (2018). The importance of environmental education in the determinants of green behavior: A meta-analysis approach. *Journal of Cleaner Production (170)*1, 1565-1578.

Wallach, P. A. (2019, March 29). Where does US climate policy stand in 2019? Retrieved from https://www.brookings.edu/2019/03/22/where-does-u-s-climate-policy-stand-in-2019/

Weldemariam, K., Boyd, D., Hirst, N., Sageidet, B. M., Browder, J. K., Grogan, L., & Hughes, F. (2017). A critical analysis of concepts associated with sustainability in early childhood curriculum frameworks across five national contexts. *International Journal of Early Childhood*, *49*(3), 333-351.

Westley, T., Kaczynski, A. T., Stanis, S. A. W., & Besenyi, G. M. (2013). Parental neighborhood safety perceptions and their children's health behaviors: Associations by child age, gender and household income. *Children, Youth and Environments*, *23*(3), 118-147.

Wilson, R.A. (Ed.) (1994). *Environmental education at the early childhood level.* Washington, DC: North American Association for Environmental Education.

Whitebook, M., McLean, C., & Austin, L. J.E. (2016). Early childhood workforce index - 2016. Berkeley, CA: Center for the Study of Child Care Employment, University of California, Berkeley.

Julia L. Ginsburg is a doctoral student at Concordia University, Montréal, Québec, Canada. She may be reached at julia.ginsburg@mail.concordia.ca.

Shannon Audley is an Associate Professor of Education and Child Study at Smith College, Northampton, MA, USE. She may be reached at saudley@smith.edu.