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Addressing Policy, Practice, and Research That Matters

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EDITORIAL NOTE

Provocations for the "next big thing" in Early Childhood Education for Sustainability (ECEfS)

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In the previous issue of IJECEE, Ruth Wilson's Editorial Note (2015) offered some salient points that I would like to build on in this issue's Editorial Note. Before identifying these points, as a personal reflection I recall that Ruth Wilson and I first communicated across the Pacific Ocean in the late 1980's. We shared our mutual professional interests in early childhood environmental education and plans for facilitating uptake in our respective countries. I recall letters from Ruth Wilson in the United States of America (yes, we corresponded by hard copy posted letters!) were a source of encouragement and validation for our attempts to introduce early childhood environmental education in Australia. Subsequently, the first practitioner guides for early childhood environmental education, *Fostering the Sense of Wonder During the Early Childhood Years* (Wilson, 1993) and *Snails Live in Houses Too: Environmental Education for the Early Years* (Elliott & Emmett, 1991) were published. As Ruth Wilson recognised in her Editorial Note (2015) there have been many developments in early childhood education since that time about 25 years ago, but advocacy and action for early childhood environmental education, or education for sustainability, is still much needed. The Earth has changed dramatically, human impacts on the Earth's ecosystems have created a new geological epoch, *The Anthropocene* (Steffen, Crutzen & McNeill, 2007) and there is no doubt that global temperatures are increasing (IPCC, 2014). I question whether the early childhood education field has kept pace and wonder how can we move forward with renewed vigour and commitment in these globally precipitous times?

In the latter years of the *Decade of Education for Sustainable Development 2005-2014* (UNESCO, 2005a) the profile of early childhood education for sustainability (ECEfS) increased from something novel to recognition that 'investments to build their [young children's] awareness, values, knowledge and capacity for sustainable development will serve to set the world on more sustainable pathways now and into the future' (UNESCO, 2014a, p. 78). Also, ECEfS research has progressed significantly in recent years, from being described as a research 'hole' by Davis (2009) in her mapping review of published research papers, to a doubling of papers in a subsequent review by Somerville and Williams (2015). The first edited collation of research entitled *Research in early childhood education for sustainability: International perspectives and provocations* (Davis & Elliott, 2014) offers a further starting point for both researchers and practitioners in the field. In particular, Davis and Elliott (2014) alert readers to the predominance of research investigating early childhood curriculum and pedagogy and attribute this to a focus on practitioners and the pragmatics of implementing sustainability in early childhood settings to date. However, they do signal the need for an ongoing broadening of research foci as well as the underpinning theoretical frameworks and methodologies.

While these most recent achievements are to be acknowledged and celebrated, I return to Ruth Wilson's reflective pondering 'Yet, I sometimes sense that there is more to come – that the "next big thing" may be right around the corner if we can keep the momentum going' (Wilson, 2015, p. 6). There is no question in the current global uncertainties and with an ethical commitment to young children and their futures, all early childhood educators must keep the momentum going. But, what might be the "next big thing"? In this Editorial Note I offer three provocations as to what this might be, namely: investigating theoretical discourses underpinning ECEfS, moving

beyond 'nature by default'; and, engaging in critical and transformative pedagogies supported by professional learning for sustainability.

Investigating theoretical discourses underpinning ECEfS

While there are now several reviews and compilations of ECEfS research available (Davis, 2009; Davis & Elliott, 2014; Hedefalk, Almqvist & Östman, 2014), the most recent review by Somerville and Williams (2015) offers interesting insights about current theoretical discourses. They examined 46 early childhood environmental education and education for sustainability research articles published 2009-2013 across 19 early childhood or environmental education focused journals. They identified three main discourse categories: connection to nature, children's rights and post-human frameworks. Not unexpectedly, the connection to nature category predominates; researching the ready tangibles of nature and long-established affinities between children and nature but, they argue this discourse is under theorised (Somerville & Williams, 2015). The next smallest children's rights discourse category aligns with education for sustainability principles including intergenerational equity and the UNCRC (UNICEF, 1989). In Australia, this discourse is highly evident and Davis (2014) has proposed a revisioning of rights to additionally include active/agentic rights, collective rights, intergenerational rights and eco/biocentric rights. The least number of papers in the systemic review were focused on post-human frameworks, a relatively new discourse linked with ECEfS. Taylor (2013) in particular has advocated this discourse as a way forward beyond the romanticised images of the child in nature long-held in the early childhood education field. Further, post-human frameworks invite interrogation of the nature-culture binaries that Plumwood (2003) argues have led to the global sustainability challenges of today.

Overall, Somerville and Williams (2015) state methodologies and theoretical framing varied across the papers examined, but indicate that 'the field is characterized by many unexamined methodological and epistemological assumptions that tend to determine the direction and methods of the research' (p. 111). Could this be the "next big thing" to drive research forward? Interrogating assumptions, while deepening and broadening theoretical and methodological framing and ultimately, thus, shifting pedagogy and practice in the field beyond 'nature by default' (Elliott & Young, 2015).

Moving beyond 'nature by default'

There is much to be celebrated in the publications that have advocated and promoted nature in children's lives over decades ranging from Carson's seminal work (1956 republished 1998), to Chawla's Significant Life Experience research (1998), and the more recent popularisation of the cause by Louv (2008). There is no doubt that there are multiple benefits of play in nature for children (Munoz, 2009; Planet Ark, 2011) and the prioritising of play in nature over the last decade has been timely. Practitioner guides have offered strategies for naturalising playspaces (Nelson, 2012; Rivkin & Schein, 2014) and the forest preschool movement is now an international phenomenon across countries including Australia, Canada, Japan, Korea, New Zealand and the United Kingdom (Knight, 2013). In an era of increasing urbanisation and sedentary technology-based childhood pursuits, playing outdoors in nature is essential on many levels. As Moore and Marcus (2008, p.160) have previously stated play in nature is 'the cure for the lifestyle maladies of contemporary childhood'.

However, there is a concern that the romantic antecedents of the child in nature in early childhood education (Taylor, 2013) compounded by the recent popularisation of outdoor play in nature is interpreted by practitioners as how they should address education for sustainability. Somewhat simplistically stated, take children outdoors to experience nature and they will readily adopt sustainable worldviews and ethics and be active citizens for sustainability. Elliott and Davis (in press) refer to a sustainability-nature nexus, recognising the confluence of factors that have contributed over time to this interpretation. I suggest play in nature is a comfortable and familiar space for early childhood educators and there is a risk of 'nature by default' being the approach universally adopted, without critical examination of all the dimensions of sustainability (Elliott & Young, 2015). The conceptualisation of sustainability as multi-dimensional across natural, cultural, political and social dimensions is well acknowledged (UNESCO, 2010) and in early childhood education we must actively explore all dimensions with children. Potentially, developing programs through a more inclusive eco-socio-cultural lens for sustainability as

proposed in response to *Belonging Being Becoming: The Early Years Learning Framework for Australia* (DEEWR, 2009; Elliott, 2014). There are now examples of how this can be achieved in various Australian publications including Davis (2015), Sneddon and Pettit (2016) and Young and Elliott (2014), and; thus, children doing far more than 'caring for nature' is advocated.

Further sources of support for this rethinking are drawn from the work of Dickinson (2013) and Ernst (2015). In particular, Dickinson has critiqued the 'nature deficit disorder' diagnosis (Louv, 2008) and invites deeper investigation of the pathology. Also, Ernst (2015, p. 163) has questioned 'green centric' approaches and suggests that in an accountability-driven policy context there is potentially 'little room for viewing them [children] as visible and engaged decision-makers in their communities'. Lastly, in moving forward Ruhs and Jones (2016) outline strong approaches to sustainability underpinned by environmental preservation, the interdependencies of human capital and natural capital, balanced development within ecological boundaries and ethically strong positions. Embedding strong sustainability approaches in early childhood education is feasible, if educators critically rethink 'nature by default' and recognize that play in nature alone is just not enough to address the complexities of sustainability in the current epoch of the Anthropocene.

Engaging in critical and transformative pedagogies supported by professional learning

While education has long been touted as the vehicle for addressing global sustainability issues, from a critical theory stance it is acknowledged that more of the same education will not facilitate change. In early childhood education, there is an opportunity to shift beyond the comfortable pedagogies of role modelling and scaffolding caring for nature and engage in more challenging and responsive dialogic pedagogies exploring worldviews, ethics and values for sustainability. As Moss and Petrie (2002, p. 136) have previously stated pedagogy is not neutral, it is 'a political and ethical minefield in which choices are to be made'. Early childhood educators can participate with children in decision-making about choices for sustainable futures. Inevitably in decision-making processes there will be value conflicts, but 'conflicts allow for negotiations and open up possibilities for change' (Hagglund & Johannsson, 2014, p. 44). This is not about burdening young children with the challenges of sustainability, but engaging them in a supportive setting where dissentions and consensus can be constructively negotiated with others. An illustrative example is creating an ethic of picking plants for play: Which plants can be picked for play, when and how often, or do we only collect fallen plant materials from the ground for play? To invite all children to pick as many plants as they like from a natural playspace may lead to a denuded landscape, what limits can be negotiated with and by children and educators underpinned by an ethic of sustainability? Arlemalm-Hagser (2013) has identified the importance of such critical discussions about human relationships with nature where children are vocal participants.

A number of recent ECEfS research studies have advocated changes in early childhood education pedagogy to be more proactive for sustainability. For example, Cincera et al (2015) support emancipatory approaches informed by critical pedagogy, while Kelly and White (2013, p. 38) advocate active pedagogical roles and propose pedagogy as problem-posing with children. Further, Robinson and Vaealiki (2015, p. 113) argue 'it is essential to consider a shift towards more critical and transformative pedagogies that not only lift consciousness of sustainability issues, but also involve children and their families in advocacy and action'. These proposed pedagogical shifts for sustainability require educators to examine the theoretical discourses and assumptions as previously described, explore their understandings of sustainability and to critically reflect on their own worldviews and ethics, a significant and ongoing task.

Professional learning to address this task, both inservice and preservice, is an imperative at this juncture. UNESCO (2005b) has promoted reorientating teacher education for sustainability initiatives since 2005, but to date anecdotal evidence suggests few early childhood tertiary courses explicitly include sustainability. More recently, the *Global Action Programme for ESD* (GAP) (UNESCO, 2014b) has identified training educators as a key strategy for progressing education for sustainability; and, I argue there is nowhere more pressing for this to occur than in the early childhood field. The GAP (UNESCO, 2014b) offers leverage for professional learning providers including universities, vocational colleges and professional organisations to prioritise sustainability in their professional learning offerings. In Australia, early childhood education vocational training now requires completion of a

sustainability unit, but university offerings are limited. A recent Australian report has identified the need for ongoing professional learning to both 'demystify sustainability' and support educators to translate sustainability knowledge into pedagogical practice (Elliott, McCrea, Gaul & Newsome, 2016). Similarly, an international dialogue involving researchers from Australia, Korea, Sweden and the United States of America supports professional learning for practitioners as core to shifting pedagogy and world views for sustainability (Elliott, Carr, Arlemalm-Hagser & Park, in press). Timely reflection by various training providers about sustainability as integral to professional learning in the early childhood education field is long overdue and urgently required to facilitate broad and systemic change internationally.

In essence, more of the same type of education, whether with young children or as professional learning with adults will not facilitate global sustainability. There is a provocation here for critically rethinking pedagogy and how we progress sustainable futures for all, this is another 'big thing' to grapple with in the early childhood education field.

In concluding, I respond to Ruth Wilson's invitation in the last Editorial Note to complete the unfinished sentence 'We're a network of people who . . .' (Wilson, 2015, p.7). I argue we urgently need to be an international network of early childhood educators, academics and service or training providers who actively challenge and extend ECEfS research to more fully inform practice; seek to explore all the dimensions of sustainability with children, colleagues and families; engage with and advocate critical pedagogies for shifting worldviews; and, identify professional learning for sustainability as core to being an early childhood educator in these globally challenging times. And, yes Ruth, there definitely are 'dimensions below the surface that we're only beginning to understand' (Wilson, 2015, p. 7).

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A Nature-Based Social-Emotional Approach to Supporting Young Children's Holistic Development in Classrooms With and Without Walls: The Social-Emotional and Environmental Education Development (SEED) Framework

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ABSTRACT

This paper describes a nature-based social-emotional approach to supporting young children's holistic development that can be applied in a range of early childhood settings from forest kindergartens and nature-based preschools to more traditional center-based early childhood programs. *The Social-Emotional and Environmental Education Development (SEED) Framework* blends early childhood education, environmental education, and social-emotional development through the integration of best practice recommendations from (a) *National Association for the Education of Young Children Early Childhood Program Standards*, (b) *Early Childhood Environmental Education Programs: Guidelines for Excellence*, and (c) *Pyramid Model for Supporting Social-Emotional Competence in Infants and Young Children*. The *SEED Framework* provides early childhood programs a guide for integrating and infusing a nature-based social-emotional approach throughout all aspects of their program.

Keywords: Early childhood education, environmental education, social-emotional development

In an article addressing the essence of early childhood environmental education (ECEE), Ruth Wilson (2015) emphasized the importance of working for both an environmentally sustainable future and for the wellbeing of young children. A range of programmatic approaches exist that support ECEE's blended focus on early childhood and environmental education from forest kindergartens and nature-based preschools to more traditional early childhood programs that emphasize connecting with nature. One could look at a range of early childhood programs on a continuum from a sole focus on the social/emotional and/or academic education of young children to a sole focus on nature and the environment, with ECEE programs falling in the middle representing a focus on both areas.

In Wilson's discussion of the essence of ECEE she went on to explore whether the field goes beyond this blending of disciplines and has to do with "the making of beautiful people – that is people who live with a sense of wonder, sensitivity to beauty, respect and compassion for others, a deep appreciation of the natural world, and an interest in creating a more peaceful, just, and sustainable world" (2015, p. 7). She posed the question of how we would like children to finish the statement, "I am a person who . . ." (2015, p. 7) as a guiding question to define the essence of the field.

As a parent and an educator, this is a question that I have thought about often. The list that Wilson and her colleagues identified included "empathy, respect, attention, quiet reflecting, appreciation of diversity, and the ability to adapt to different situations" (Wilson, 2015, p. 7). The answer I have come to regarding Wilson's question centers on the importance of caring and supporting young children to become citizens who care for themselves, care for others, and care for the world around them. This perspective is aligned with Nel Noddings' work on the ethics of care that emphasizes the significance of caring as a fundamental aspect of education (Noddings, 2005). Noddings identifies

multiple domains of caring, including: (a) caring for self, (b) caring for intimate others, (c) caring for strangers and distant others, (d) caring for animals, plants, and the earth, (e) caring for the human-made world, and (f) caring for ideas (Noddings, 1984; 2005). In her discussion of a caring pedagogy, Noddings' has gone so far as to suggest that "caring is the very bedrock of all successful education and that contemporary schooling can be revitalized in its light" (Noddings, 2005, p. 27). Nature provides an incredible resource for teaching and learning about caring and I propose that emphasizing caring through children's social-emotional development in ECEE enhances our ability to do work that is both good for the earth and for the children and that supports "the making of beautiful people" (Wilson, 2015).

The Social-Emotional and Environmental Education Development (SEED) Framework

The *SEED Framework* is a nature-based social-emotional approach to early childhood education that seamlessly blends early childhood education, environmental education, and social-emotional development through the integration of best practice recommendations from (a) *National Association for the Education of Young Children (NAEYC) Early Childhood Program Standards (*NAEYC, 2008), (b) *Early Childhood Environmental Education Programs: Guidelines for Excellence (*NAAEE, 2010), and (c) *Pyramid Model for Supporting Social-Emotional Competence in Infants and Young Children (*Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003). The *SEED Framework* is not a new intervention package or curriculum, but a systematic framework for establishing a nature- and connection-based culture and for supporting effective teaching and learning environments that promote "caring and relationship both as an educational goal and as a fundamental aspect of education" (Smith, 2004, 2016, para. 1).

The *SEED Framework* provides early childhood programs a guide for integrating and infusing a nature-based social-emotional approach throughout all aspects of a program, striking a balance between an emphasis on child development, an emphasis on environmental sustainability, and an emphasis on social and emotional competence. Figure 1 provides a visual representation of the three-way continuum addressed in the *SEED Framework*. Programs of any type from forest kindergartens and nature-based preschools to more traditional childcare programs can identify where their program currently sits on this three-way continuum and utilize the *SEED Framework* to enhance their integration of early childhood education, environmental education, and social-emotional development.

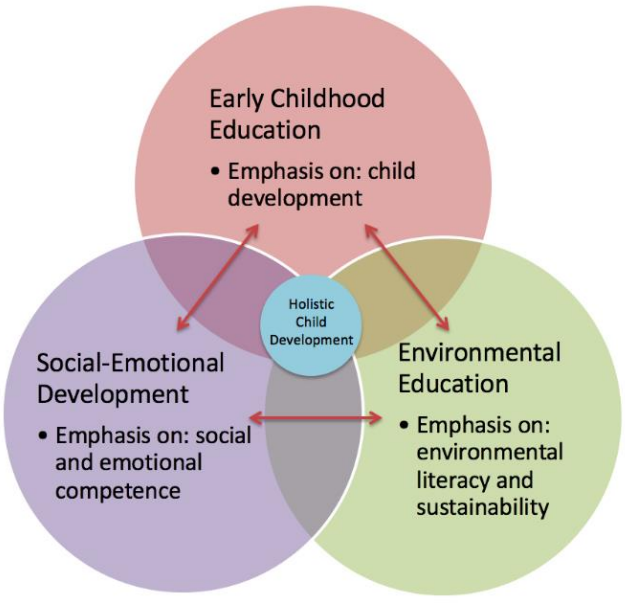

Figure 1. Integrated Disciplines in the *SEED Framework*: Three-Way Continuum.

Theoretical Foundations of the SEED Framework

Early childhood education. A primary goal of early childhood education is to support all areas of child development including social-emotional, physical, cognitive, and language development (Head Start, 2016). Child development in the early years is incredibly important as it establishes the basic architecture and function of the brain and provides a foundation for children's future wellbeing and learning (McCain, Mustard & Shanker, 2007; UNICEF, 2016). Several key principles of child development and learning inform the relationship-driven, individualized and comprehensive approach of the *SEED Framework*.

Early development and learning occurs in and is influenced by multiple social and cultural contexts including a child's family, educational setting, and community, as well as within the broader society (Bronfenbrenner, 1979). Providing responsive, stable and nurturing relationships and rich learning experiences in the earliest years provides lifelong benefits for learning, behavior and both physical and mental health (National Scientific Council on the Developing Child, 2004). In fact, nurturing relationships with responsive adults are necessary for several key areas of children's development, including language and communication, empathy and cooperation, peer relationships, and self-regulation (Shonkoff & Phillips, 2000). It is through these nurturing and responsive relationships that children experience being cared for, a necessary first step to developing their own caring behavior (Noddings, 2005).

While many aspects of child development follow relatively predictable sequences there is substantial variation within and across children that impacts decisions about curriculum and teaching (NAEYC, 2009). Developing caring relationships with children allows educators to get to know individual children's interests, strengths and needs, to provide a range of teaching strategies that meet children's different learning needs, and to challenge children to achieve what is just beyond their current understanding. It is through this skilled individualization of instruction and support that educators encourage young children to try and master new and progressively more advanced challenges (NAEYC, 2009).

Effective educators are also acutely aware of the integrated nature of child development as development in one domain influences and is influenced by development in other domains. This interrelatedness can lead to learning in one domain fostering or limiting development in other areas (Shonkoff & Phillips, 2000). Social-emotional development, for example, is influenced by children's language development and communication skills which is, in turn, impacted by children's participation in social interactions with others (Dickinson & Tabors, 2001). Teaching children well means providing comprehensive educational opportunities that support development and learning across domains (Shonkoff & Phillips, 2000). The *SEED Framework* addresses the interrelated nature of child development through the integration of early childhood education, environmental education and social-emotional development.

National Association for the Education of Young Children Early Childhood Program Standards. NAEYC is "the foremost professional organization of the early childhood field" that "works to promote high-quality early learning for all young children, birth through age eight, by connecting early childhood practice, policy, and research." (NAEYC, 2016, para. 1). NAEYC offers accreditation to early childhood programs that "deliver the highest quality early care and education" aligned with developmentally appropriate practice (DAP) and principles of child development (NAEYC, 2016, para. 4). NAEYC accreditation focuses on ten program standards (hence known as *NAEYC Standards)*: (a) relationships, (b) curriculum, (c) teaching, (d) assessment of child progress, (e) health, (f) teachers, (g) families, (h) community relationships, (i) physical environment, and (j) leadership and management (NAEYC, 2008). These program standards can be addressed within a range of programmatic approaches and philosophies and have been integrated into the *Early Childhood Environmental Education Programs: Guidelines for Excellence* developed by the North American Association for Environmental Education, (2010).

Early childhood environmental education. While the goal of the environmental education field as a whole focuses on developing an environmentally literate society who is motivated and committed to prevent and solve environmental challenges (UNESCO, 1976), the task of environmental education for young children focuses on emotional attachment to the natural world and the need "to forge the bond between children and nature" (NAAEE, 2010, p. 4). As this emotional connection and love for the natural world grows, environmental literacy and

commitment to work toward environmental sustainability follow (NAAEE, 2010). Experiences with the environment early in life markedly impact life-long attitudes, values and interactions with the natural world and children who do not develop an emotional connection with the natural world early in life are at risk for never doing so (Tilbury, 1994; Wilson, 1994).

With a focus on respect and emotional attachment with the natural world, Ruth Wilson (1994) identified the following as key components of early childhood environmental education: (a) the development of a sense of wonder, (b) appreciation for the beauty and mystery of the natural world, (c) opportunities to experience the joy and closeness to nature, (d) respect for other creatures, (e) the development of problem-solving skills, and (f) the development of interest and appreciation in the world around us. This focus aligns with *NAEYC Standards* and principles of child development that lead us to provide relationship-driven, individualized and comprehensive early childhood education.

The natural world provides rich opportunities for children to develop relationships and to learn about and experience caring – for themselves, for others and for plants and animals. In a comparison of school play spaces, researchers found that children play more cooperatively and engage in more creative forms of play in green spaces (Bell & Dyment, 2006). Children who had regular opportunities for unstructured free play outdoors were healthier, happier and better able to get along with others (Burdette & Whitaker, 2005). As educators develop relationships with children and identify their strengths, needs and interests, the natural environment can provide unlimited opportunities for individualizing and adapting educational experiences. Nature is dynamic and ever-changing with constant new sensory stimuli to support learning. For example, the natural environment provides uneven terrain and variable conditions that enhance motor development (Hanscom, 2016). With rain comes heavy mud and slippery surfaces, with snow comes cold textures that children's feet sink into and across the seasons there are obstacles to climb, secret spaces to explore and animals to discover and investigate. These changing conditions also provide dynamic opportunities for social interactions and problem-solving, for the use of new descriptive language and for the development of curiosity, questioning and experimenting (Hanscom, 2016; Kellert, 2005). The natural world provides an ideal environment for supporting comprehensive development across domains and the *SEED Framework* supports this comprehensive approach by integrating early childhood education, environmental education and social-emotional development. As we seek to promote children's emotional connection with the natural world, incorporating a central focus on social-emotional competence and the importance of caring is a logical and important complement.

Early Childhood Environmental Education Programs: Guidelines for Excellence. The *Early Childhood Environmental Education Programs: Guidelines for Excellence* (hence known as the *ECEE Guidelines*) provides "recommendations for developing and administering high-quality environmental education programs for young children from birth to age eight, with a focus on ages three to six" (NAAEE, 2010, p. 2-3). ECEE guidelines identify six key characteristics of high-quality early childhood environmental education programs that are well-aligned with developmentally appropriate practices and NAEYC program standards: (a) program philosophy, purpose, and development, (b) developmentally appropriate practices, (c) play and exploration, (d) curriculum framework for environmental learning, (e) places and spaces, and (f) educator preparation (NAAEE, 2010).

Social-emotional development. Social-emotional development for young children includes the developing capacity to (a) form close and secure adult and peer relationships, (b) experience, manage, and express a full range of emotions, and (c) explore the environment and learn – all in the context of family, community, and culture (Cohen, Oser, & Quigley, 2012). Social-emotional development includes skills that support school readiness and prepare children for lifelong learning such as confidence, curiosity, intentionality, self-control, relatedness, capacity to communicate, and cooperativeness (Waltz, 2013). Social and emotional competence plays an important role in preparing young children to engage in cognitive tasks (Perry, Holland, Darling-Kuria & Nadiv, 2011) and has been shown to more accurately predict academic performance in 1st grade than cognitive skills and family backgrounds (Fox & Smith, 2007). Social-emotional development is also clearly linked to caring and to traits identified by Wilson (2015) and her colleagues such as empathy, respect, and appreciation of diversity.

Children who do not have strong social-emotional skills often engage in challenging behaviors such as aggression, defiance, tantrums, and destruction of property and are frequently identified by teachers as "not ready to learn" (Perry et al., 2011). Teachers consistently report children's behavior as their single greatest concern (Alkon, Ramler, & MacLennan, 2003; Joseph & Strain, 2003) and identify behavior management and ways to promote social and emotional competence as the top areas in which they need training (Yoshikawa & Zigler, 2000). These concerns are not surprising given that rates of diagnosed Autism and Attention-Deficit/Hyperactivity Disorder as well as rates of challenging behaviors among young children are rising (Brauner & Stephens, 2006; Centers for Disease Control and Prevention, 2016a, 2016b).

The need for effective and efficient social-emotional supports is apparent and the connection between social-emotional development and the potential goal of ECEE of making "beautiful people" is clear (Wilson, 2015, p. 7). The *SEED Framework* seeks to support Wilson's depiction of the essence of ECEE by blending the fields of early childhood education and environmental education with research and recommendations focused on supporting social-emotional development in young children.

Pyramid Model for Supporting Social-Emotional Competence in Infants and Young Children. The *Pyramid Model for Supporting Social-Emotional Competence in Infants and Young Children* (hence known as the *Pyramid Model)* is a proactive prevention program that provides assessment driven, comprehensive support that focuses on redesigning environments to reduce problem behaviors and increase adaptive, pro-social behaviors (Fox et al., 2003; Horner, 2000; Powell & Dunlap, 2006). The *Pyramid Model* focuses on creating consistent, predictable, positive and safe environments for all children through the implementation of three tiers of intervention practice: universal promotion for all children; secondary preventions to address the intervention needs of children at risk of social emotional delays, and tertiary interventions needed for children with persistent challenges (Fox et al., 2003; see Figure 2). The primary focus within the *SEED Framework* is at the universal promotion level where effective prevention practices are put in place for all children in a program, including (a) building nurturing and responsive relationships, (b) careful planning of the physical environment, schedule, and materials, (c) teaching students about routines and expectations, and (d) acknowledging children for engaging in appropriate behavior (Fox et al., 2003). These practices are important, but they represent just one element of the *Pyramid Model*.

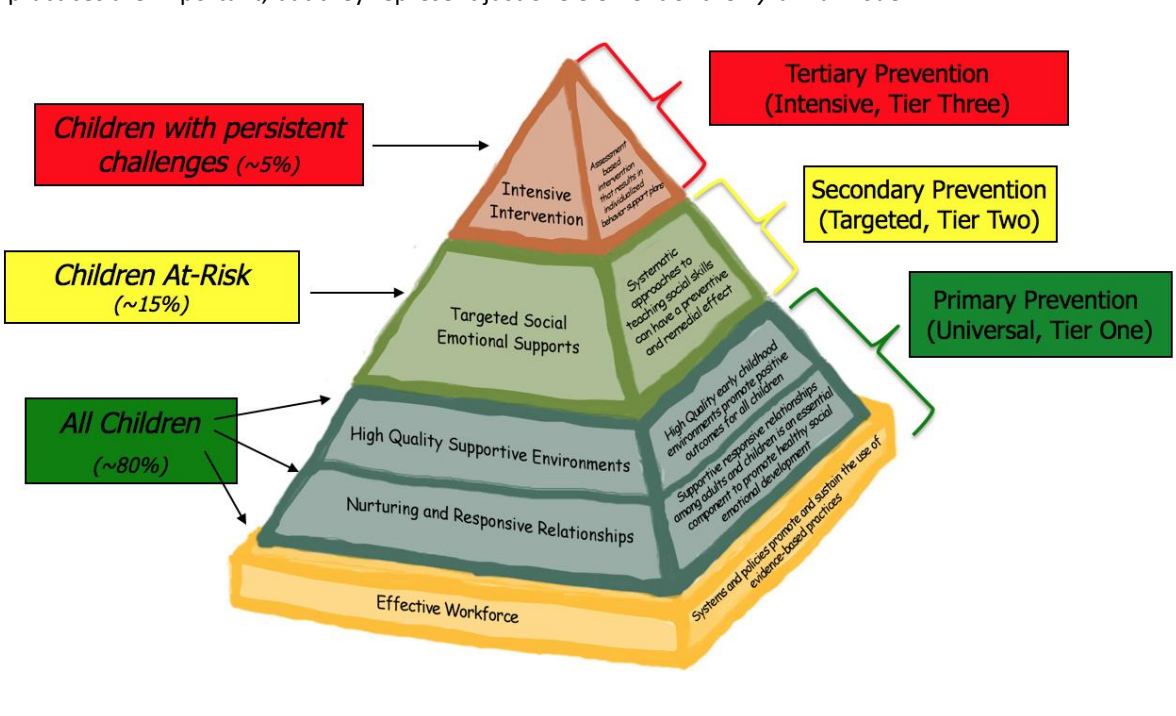

Figure 2. The Pyramid Model for Supporting Social Emotional Competence in Infants and Young Children.

The *Pyramid Model* is an adaptation of Positive Behavioral Interventions and Supports (PBIS: Horner, 2000), which is frequently applied on a school-wide level in K-12 schools. Literature on school-wide PBIS emphasizes the importance of effective practices to support valued outcomes for students but also goes further to emphasize the importance of collecting and using data to support effective decision-making as well as the importance of implementing efficient systems to support teachers and staff (Sugai & Horner, 2009). Figure 3 provides a visual representation of the four elements that serve as the core operating features of PBIS: (a) outcomes, (b) practices, (c) data and (d) systems. PBIS encourages programs to identify, define and acknowledge *outcomes* that are valued by students, families, and community members. As a whole, PBIS focuses on *outcomes* related to supporting social competence and academic achievement in children (Sugai & Horner, 2009). In order to achieve those desired outcomes, the PBIS model includes three additional elements. First, PBIS focuses on the identification and sustained use of evidence based *practices* to support student behavior (Sugai & Horner, 2009). Practices include the interventions and supports we put in place for students such as building positive relationships, clearly defining and teaching expectations and routines, and acknowledging children's appropriate behavior. In addition to effective, evidence-based practices, PBIS calls for the use of *data* to support decision-making (Sugai & Horner, 2009). Utilizing data and observation allows teachers to narrow down problems and identify simpler and more effective solutions. It is akin to applying the scientific process to teaching and it is applicable with challenging behavior as well as with social and educational goals. Finally, the PBIS model addresses the need for developing efficient *systems* to support teachers in implementing effective practices and data collection or observation procedures (Sugai & Horner, 2009). Systems support sustainability of practices through proactive planning and design.

Following the *NAEYC Standards*, the *ECEE Guidelines*, and the *Pyramid Model*, the *SEED Framework* utilizes the systemic approach of PBIS to address valued outcomes and includes considerations for practical interventions, informative observation and data collection methods, and a systems perspective (see Figure 4). Guided by the emphases of the three integrated disciplines that inform the model, the *SEED Framework* focuses on *outcomes* related to promoting social competence, child development and environmental sustainability. Priority is given to the identification, adoption, adaptation, and sustained use of evidence-based and developmentally appropriate *practices* that are linked to these desired outcomes for children. Desired outcomes are also used to establish *observation and data* systems to evaluate implementation efforts and practices and to inform educators' decision-making. Before any practice is put in place, *systems* for supporting implementers of the practice, such as professional development, resources, coaching, and coordination, are established.

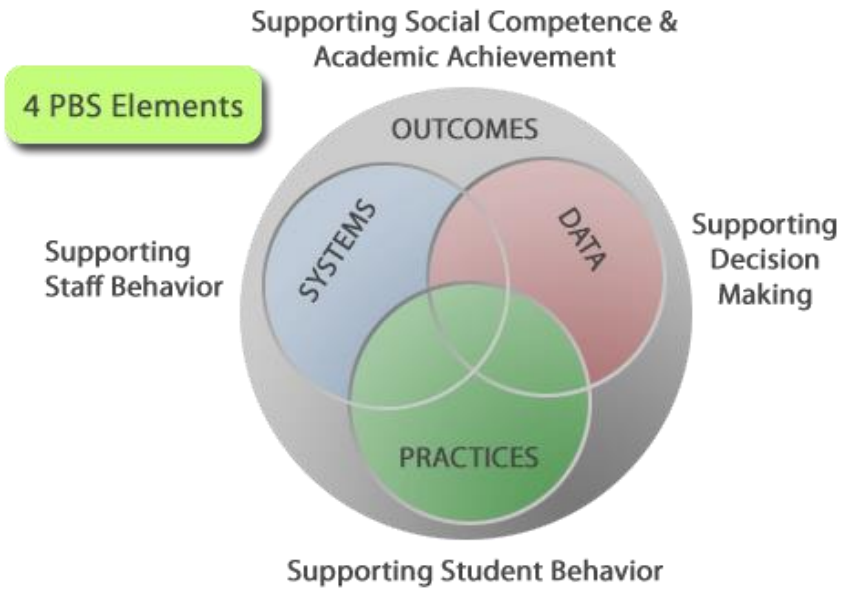

Figure 3. Four Elements of Positive Behavior Support: Outcomes, Practices, Data and Systems.

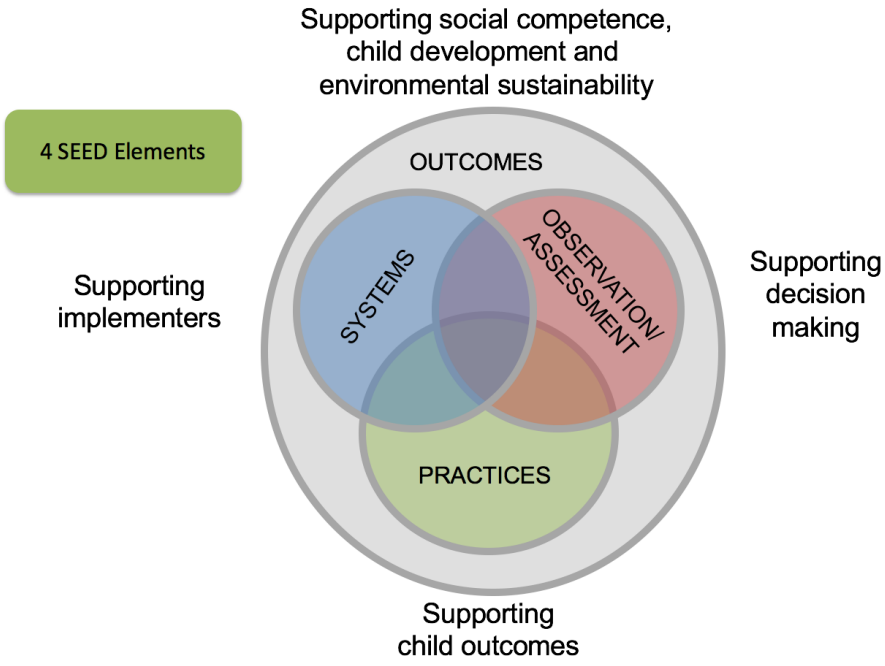

Figure 4. Four Elements of the *SEED Framework*: Outcomes, Practices, Data/Observation, and Systems.

SEED Framework Components

The following sections discuss the *SEED Framework* components and approach. Figure 5 provides a visual depiction of the key features of the *SEED Framework* in a flower diagram. At the center of the flower are essential program aspects that guide the work with children and establish the culture and environment of the learning space. The petals of the flower represent the curriculum areas that support children's growth. Finally, the teaching approach, observation protocols, and systems of staff support are represented by the rain, sun, and soil as each are necessary and valued features of the system that support growth and development. Table 1 provides an overview of how key features from the *NAEYC Standards*, the *ECEE Guidelines*, and the *Pyramid Model* are incorporated into the *SEED Framework*.

Defining program philosophy, values, and expectations. At the center of the *SEED Framework* (Figure 5), lies an early childhood program's philosophy, values, and expectations. Utilizing a nature-based social-emotional approach leads to a connection-based philosophy that recognizes our place within the world and our connections to ourselves, to one another, and to nature. The philosophy, values, and expectations for an early childhood program applying the *SEED Framework* includes a focus on (a) nature and the environment, (b) developmentally appropriate education of young children, and (c) creating a positive social culture. In addition to reflecting these priorities in a mission and vision statement, the *SEED Framework* calls for programs to define clear expectations and teaching practices that support children in developing and using caring, pro-social behavior and provide a common language that teachers, children, and families can use in the learning environment. These program expectations can almost be described as overarching character traits that we want all children to demonstrate. They give us the language of our learning community and help to shape specific rules that we expect across settings and routines (Carter & Pool, 2012).

In the *Pyramid Model*, common examples of program expectations focus on safety, respect, and responsibility. Incorporating a nature-based perspective guided by ethics of care (Noddings, 2005), the *SEED Framework* encourages early childhood programs to focus expectations on caring for oneself, for others, and for the

environment. Through this perspective early childhood programs can address important skills centered on safety, respect, and responsibility but they do so from a perspective of caring and connection – with one another and with the environment. For example, when children care for themselves by dressing appropriately for the weather and always staying where a teacher can see them, they engage in behaviors that are responsible and safe. When they care for others by taking turns or helping someone who is struggling, they are respectful in their interactions. When they care for their place by handling plants and animals gently and with respect or by asking permission before collecting natural items, they are again safe, respectful, and responsible. Adding this layer of clearly defined expectations aligned with a nature-based social-emotional approach, translates a program's philosophy into hands-on practice for children, teachers, and families throughout the program.

Fostering nurturing and responsive relationships. Nurturing and responsive relationships represent another key feature for establishing an effective culture and environment in the learning space. Positive relationships for young children "are essential for the development of personal responsibility, capacity for self-regulation, for constructive interactions with others, and for fostering academic functioning and mastery" (NAEYC, 2008, Relationships section). The *SEED Framework* emphasizes the importance of supporting nurturing and positive relationships with children, families, and the community as well as with the natural environment. This comprehensive view of relationships supports children in recognizing that they are a part of the world of nature and enhances their learning from the natural world. As an example, David Sobel emphasizes the importance of developing relationships with animals stating that "cultivating relationships with animals, both real and imagined, is one of the best ways to foster empathy during early childhood" (1996, p. 13). It is important for us to consider the opportunities we are providing children to develop relationships with the environment as well as the relationships that we ourselves are developing and modeling with the environment.

Clearly defining and articulating program expectations that provide a common language and vision for the learning community that is focused on caring and connection (as described in the previous section) is a powerful first step in promoting nurturing and responsive relationships. As we use language and both model and support behaviors that emphasize caring, we support children's connections and relationships and create a learning community where children feel safe and valued. Reaching out to families and the community further supports nurturing and responsive relationships and can lead to meaningful and productive collaborations.

Programs utilizing the *SEED Framework* are encouraged to examine their efforts to build positive relationships with children, families, the community, and the environment. Many programs will find that they have a lot to celebrate in the positive examples of relationship-building in their programs such as positive and respectful interactions with children, collaborative projects with families and the community, and clear and consistent examples of building connections with the environment. Programs may also find that they are strong in some areas of relationship building but that they have not intentionally focused on relationships with the community or the environment. Through evaluating and reflecting on their practices, programs may identify creative ways to improve relationships and connect their relationship-building efforts to the central philosophy of their program.

Developing high quality supportive environments. The last feature at the center of the *SEED Framework* (Figure 5) focused on establishing an effective culture and learning space is designing high quality supportive environments. *NAEYC* program standards require that programs have "a safe and healthful environment that provides appropriate and well-maintained indoor and outdoor physical environments" (NAEYC, 2008, Physical Environment section). They further specify that the environment include "facilities, equipment, and materials to facilitate child and staff learning and development" (NAEYC, 2008, Physical Environment section). ECEE guidelines provide similar and expanded recommendations for both indoor and outdoor places and spaces and include considerations for environmental sustainability with the following guidelines: (a) spaces and places enhance development across all learning domains, (b) natural components are integrated throughout places and spaces, (c) spaces and places are comfortable and inviting, (d) spaces and places are well-maintained, safe and accessible, (e) health, safety and risk are addressed through assessment, training, clear understanding of responsibilities and established emergency plans, and (f) programs and facilities model positive examples of environmental sustainability (NAAEE, 2010). High quality supportive environments in the *Pyramid Model* extend further beyond physical environments and focus on creating consistent, predictable, positive, and safe environments that include considerations for: (a) physical arrangement

Table 1
Alignment of SEED Framework with NAEYC Standards, ECEE Guidelines, and Pyramid Model

	SEED Framework	**NAEYC Program Standards**	**ECEE Guidelines Key Characteristics**	**Pyramid Model Key Features**
SEED Framework Component	Program philosophy, values and expectations	1. Relationships 2. Curriculum 3. Teaching	1. Program philosophy, purpose, and development	• High quality supportive environments
	Nurturing and responsive relationships	1. Relationships 7. Families 8. Community relationships	1. Program philosophy, purpose, and development	• Nurturing and responsive relationships
	High quality supportive environments	5. Health 9. Physical environment	5. Places and spaces	• High quality supportive environments
	Curriculum design	2. Curriculum 5. Health	4. Curriculum framework for environmental learning	• High quality supportive environments
SEED Systems Approach	Teaching practices	3. Teaching	2. Developmentally appropriate practices 3. Play and exploration	• Practices to support child outcomes
	Observation and assessment	4. Assessment	6. Educator preparation	• Data to support decision-making
	Systems	6. Teachers 10. Leadership and management	6. Educator preparation	• Systems to support implementers

Note: The numbers listed under *NAEYC Program Standards* and *ECEE Guidelines* are the standard or guideline numbers directly from those sources.

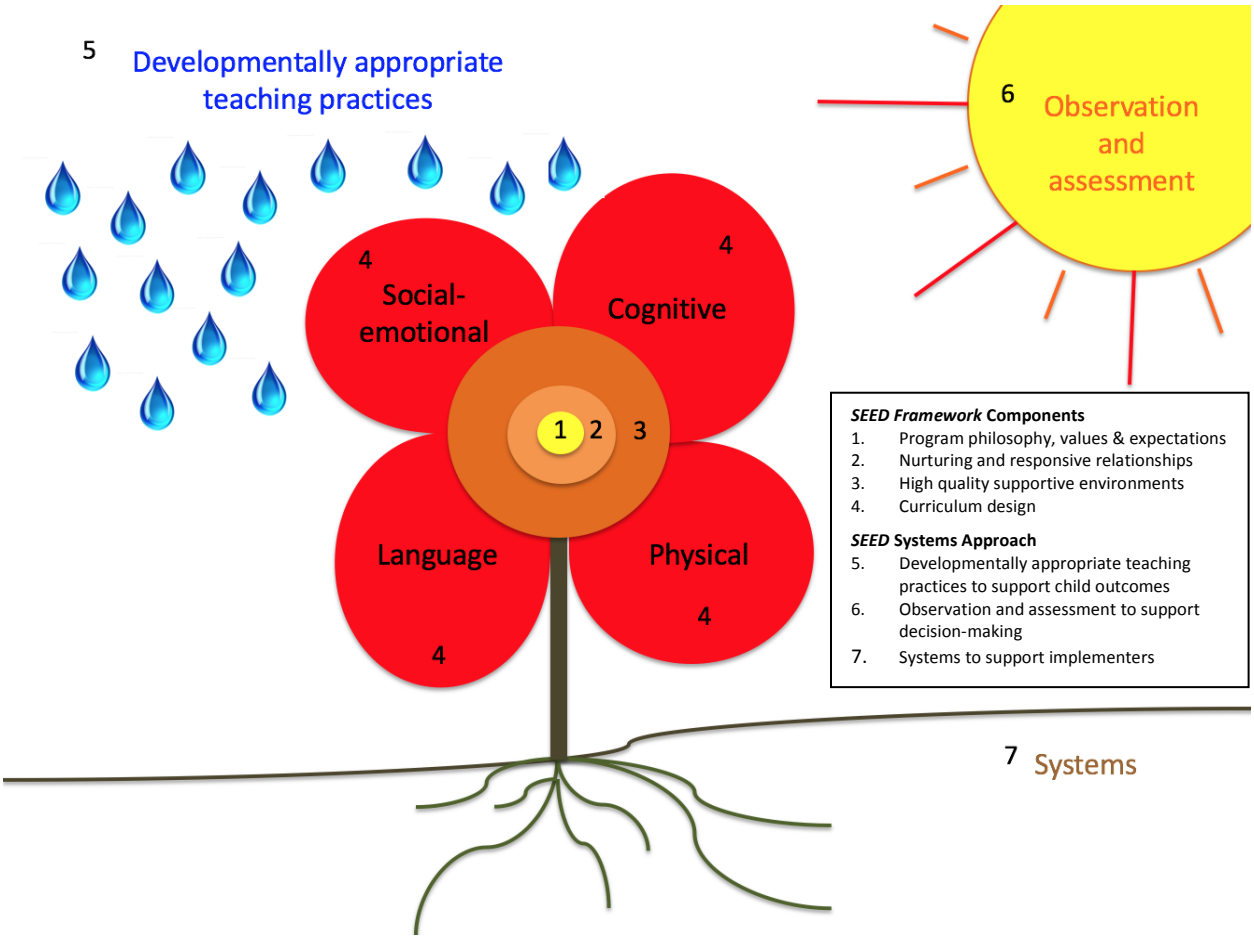

Figure 5. *SEED Framework* Diagram

and design of learning spaces, (b) consistent schedules and routines, (c) effective transitions, (d) defining and teaching expectations, (e) acknowledging appropriate behavior, and (f) responding consistently to challenging behavior (Fox et al., 2003). The *SEED Framework* incorporates recommendations from the *NAEYC Standards*, the *ECEE Guidelines* and the *Pyramid Model* for creating high quality indoor and outdoor physical spaces that encourage and support children's learning across domains, that provide positive examples of sustainability and connection to place, that promote positive social interactions, and that enhance consistency and predictability.

In the design of high quality supportive environments, the *SEED Framework* encourages educators to make connections between physical arrangement and design of indoor and outdoor spaces, and important learning opportunities for environmental sustainability and social-emotional development. Expanding the typical definition of environment to go beyond physical arrangement and design to include considerations for modeling and supporting sustainability practices and attitudes and for promoting children's independence and positive social interactions enhances the learning experience for children and adults and supports holistic child development. As an example, in order to effectively compost and recycle in an early childhood program, the physical environment needs to be arranged to make it easy for children and teachers to remember and carry out the steps. This may be accomplished by placing compost and recycle bins in proximity to the spaces where they will be needed, for example where children and adults eat or use recyclable materials such as paper. This may also be accomplished by teaching consistent routines around composting food scraps after snacks and meals and by connecting the process of composting and recycling to program expectations of caring for oneself, for others, and for the environment.

Through composting and recycling we create a high quality supportive environment that models positive examples of environmental sustainability and connects them to social values and expectations. This connection between physical environment, environmental sustainability, and social-emotional development can be made in other areas as well such as how we set up garden and play spaces outside, how children learn where to tread lightly, and the type of expectations we set around the collection of natural materials.

Designing effective curriculum. NAEYC program standards require that a program "implement a curriculum that is consistent with its goals for children and promotes learning and development in each of the following areas: social, emotional, physical, language, and cognitive" (NAEYC, 2008, Curriculum section). These curriculum areas are represented in the *SEED Framework* (Figure 5) in the petals of the flower, as these are areas where children's development grows. It is clear how each of these areas is addressed through environmental learning within the *ECEE Guidelines for Excellence*. ECEE Guidelines focused on social and emotional growth and on developing a personal sense of responsibility and caring target social-emotional development. Physical development is addressed in the guideline focused on physical health and development. Finally, cognitive and language development are clearly addressed in guidelines focused on curiosity and questioning, development of environmental understandings, and skills for understanding the environment as well as being embedded across the other ECEE guidelines with the natural environment providing a wealth of opportunity to capitalize on young children's inherent fascination with learning about the world around them (French, 2004).

Designing curriculum via the *SEED* lens inherently addresses learning across domains and simplifies the inclusion of social-emotional supports for programs less apt to do so in an integrated and comprehensive manner. Utilizing program expectations gives us a common language for teaching and supporting children to care for themselves, for others, and for the world around them across all settings and routines from outside exploration to meal times, group times, arrival, and even bathroom breaks. It also provides a foundation upon which to build more complex social-emotional skills such as identifying and understanding emotions, controlling anger and impulse, and problem-solving. Research and best practice recommendations from the *Pyramid Model* support educators in understanding what skills to teach young children in their programs, why those skills are important and also when and how to teach them. Without a proactive approach to teaching social-emotional skills, educators can fall into the trap of only focusing on these valuable skills during crisis situations when children have heightened anxiety and emotions. In reality, social skills can be embedded into almost any part of the daily schedule including intentional, planned teaching moments as well as taking advantage of naturally occurring opportunities throughout the day.

The SEED Systems Approach

Implementing developmentally appropriate teaching practices to support child outcomes. In the *SEED Framework* diagram (Figure 5), the teaching approach is represented by rain that nourishes the flower to grow and support children's holistic development. The teaching approach utilized within the *SEED Framework* integrates best practice recommendations from early childhood education, environmental education, and social-emotional learning. NAEYC program standards require that "the program use developmentally, culturally, and linguistically appropriate and effective teaching approaches that enhance each child's learning and development in the context of the program's curriculum goals" (NAEYC, 2008, Teaching section). With programmatic goals centered on a nature-based social-emotional approach to supporting holistic child development and promoting environmental sustainability, the *SEED Framework* focuses on providing authentic experiences in natural environments where children have the opportunity to follow their interests and explore the natural world with all of their senses. The intent of this approach is to provide children with an opportunity to develop connections to people and place, to experience caring, and to develop a sense of wonder and curiosity that will inspire learning. It is guided by Rachel Carson's depiction of the early years as a time to "prepare the soil" and a time to arouse children's emotions and "pave the way for the child to want to know" (Carson, 1998, p. 56).

Play and exploration. In the *SEED Framework*, learning is supported through authentic, inquiry-based opportunities and children are provided with ample opportunities for play and exploration. The *ECEE Programs: Guidelines for Excellence* provides guidelines for developmentally appropriate practice as well as for play and exploration that inform the teaching approach in the *SEED Framework* (NAAEE, 2010). The natural world provides unlimited

opportunities for children to explore and learn through play from providing whole body, multisensory experiences to providing a rich context for curiosity, questioning and experimenting (Tovey, 2007). Play is "essential to development" as it "allows children to use their creativity while developing their imagination, dexterity and physical, cognitive and emotional strength" (Ginsburg, 2007, pp. 182-183). Play in the natural world also provides children with opportunities to develop an emotional connection with the environment which is an important precursor to children's interest in learning about and wanting to protect it (NAAEE, 2010).

Caring. With caring as a central tenet of the *SEED Framework*, it is also integral in guiding the teaching approach used. Nel Noddings provides recommendations for teaching caring including: (a) modeling, (b) dialogue, (c) practice and (d) confirmation. As we seek to teach children to care for themselves, for others and for the world around them, we must first start with providing them opportunities to learn what it means to be cared for (Noddings, 1984). *Modeling* nurtures children, provides them with the experience of being cared for and provides an example of how to care. Engaging in *dialogue* about caring allows educators and students to become familiar with one another, to arrive at well-informed decisions about caring behaviors, and to permit educators to talk with students about what they are trying to show (Noddings, 2005). *Practice* is essential for authentic experience and can be intentionally planned for in early childhood settings by providing opportunities for students to engage in collaborative learning and exploration and by ensuring that each child has interactions with those that are good at caring for others in order to ensure high quality, positive practice opportunities. *Confirmation* is a powerful way of nurturing children by seeing and encouraging the best in them. In order to confirm, we must get to know children individually and be receptive to their individual strengths and needs. This allows us to "identify something admirable, or at least acceptable, struggling to emerge in each person we encounter" (Noddings, 1995, p 192).

The strategies outlined by Noddings for teaching caring, align with NAEYC program standards that call for using multiple instructional approaches when teaching young children (NAEYC, 2008). NAEYC standards state that the use of multiple instructional approaches includes "strategies that range from structured to unstructured and from adult directed to child directed" (NAEYC, 2008, Teaching section). This further aligns with recommendations from the *Pyramid Model* and from activity-based intervention for embedding social-emotional learning opportunities in planned, routine, and child-initiated activities (Fox et al., 2003; Johnson, Rahn, & Bricker, 2015). For example, in order to support young children in identifying and understanding emotions in the *Pyramid Model*, educators play games, sing songs, and read stories about feelings as part of planned activities in their program. Educators also incorporate opportunities to model and have children to identify and label their emotions as routine parts of the day such as checking in and labeling their feelings during arrival routines. Finally, educators also take advantage of naturally occurring and child-led opportunities to explore emotions by engaging in dialogue with children, labeling their feelings, modeling expression of their own emotions, and providing opportunities to discuss the feelings of other children or animals during child play and exploration (Joseph, Strain & Ostrosky, 2005). All of these experiences provide opportunity for practice and for teachers to provide confirmation to individual students as they develop caring behaviors. The *SEED Framework* encourages educators to intentionally plan for and evaluate how they are providing authentic, child-led, inquiry-based experiences as well as intentional, planned and routine learning opportunities across target outcomes of supporting child development, social competence and environmental sustainability.

Conducting observation and assessment to support decision-making. NAEYC program standards focus on assessment of child progress through ongoing systematic, formal, and informal approaches (NAEYC, 2008). ECEE guidelines require that "educators possess the knowledge and skills to assess learner progress and evaluate the effectiveness of their own programs" (NAAEE, 2010, p. 56). The *Pyramid Model* emphasizes collecting and using data for decision-making (Fox et al., 2003). In each case, the focus on assessment and evaluation emphasizes objective observation using a variety of strategies in natural contexts for the purpose of informing effective decision-making and planning.

The *SEED Framework* uses the term observation to provide a comprehensive and flexible approach to both modeling important skills for young children and to observing the dynamic interactions between children and their environment that can guide program curriculum and activities. In the *SEED Framework* diagram (Figure 5), observation is represented by the sun as it illuminates children's learning and development and lights the way for

educators to support each individual child. Programmatic observation also provides feedback on how well a program is meeting its' goals of supporting social-emotional competence, child development and environmental sustainability. In the *SEED Framework*, observation and assessment include objective evaluation of implementation and program outcomes in each area of the framework. Observation or data systems are established to define outcomes and guide evaluation of implementation efforts and practices. Within the *SEED Framework*, the careful selection, definition, and acknowledgement of valued program-specific outcomes (e.g., social competence, child development, and environmental sustainability) are used to guide curriculum and interactions with children as well as to measure progress.

Designing systems to support program implementers. Beyond effective practices to support children's behavior and observation and assessment to support decision-making, the *SEED Framework* also emphasizes the importance of developing systems to support teachers and staff – both for initial implementation and for sustainability of practices over time. NAEYC program standards address systems in their standards for teachers and for leadership and management. NAEYC standards state that teaching staff "has the educational qualifications, knowledge, and professional commitment necessary to promote children's learning and development and to support families' diverse needs and interests" (NAEYC, 2008, Teachers section). In regards to leadership and management, NAEYC requires that programs "effectively implement policies, procedures, and systems that support stable staff and strong personnel, fiscal, and program management so all children, families, and staff have high quality experiences" (NAEYC, 2008, Leadership and Management section).

The *ECEE Guidelines* provide standards for the planning and implementation of educator preparation. They include: (a) foundations of ECEE, (b) professional responsibilities of the educator, (c) environmental literacy, (d) planning and implementing environmental education, (e) fostering learning, and (f) assessment and evaluation (NAAEE, 2010). The *Pyramid Model* includes educator preparation and management and provides a valuable example for developing systems that target: (a) establishing commitment from administrator's and staff, (b) developing a team dedicated to development and implementation of the framework, (c) conducting regular assessment of program implementation, (d) utilizing data to inform decision-making, and (e) supporting family involvement (Carter, 2011).

Within the *Pyramid Model*, several tools have been developed to support programs in implementing effective practices, data, and systems. The tools themselves, such as the *Pre-Team Implementation Checklist* (Pre-TIC; Carter, 2011), a self-assessment tool that guides program planning and implementation, are a component of developing effective systems. A similar tool is in development for the *SEED Framework*. With or without a tool, the message remains the same. Programs need to consider the systems they are putting in place to make implementation of effective practices and informative data collection easy and efficient for teachers and staff. By supporting implementers, programs are more likely to achieve goals and develop sustainable practices. In the *SEED Framework* diagram, systems are represented by the soil as they provide important nutrients to the flower and provide a foundation to support teachers and staff.

Conclusion

Integrating early childhood education, environmental education, and social-emotional supports within and throughout the entirety of an early childhood program helps to enhance holistic child development. A nature-based approach, whether through an entirely outdoor program or through a balance of outside time and bringing nature inside, lends itself to providing rich opportunities for social-emotional development as well as cognitive, physical, and language learning. Nature is dynamic, providing an evolving landscape for children to explore physically, emotionally, and cognitively and lending itself to engage children in scientific processes such as observing, questioning, predicting experimenting, summarizing, and sharing results (Gerde, Schachter, & Wasik, 2013). These scientific processes that are often discussed in relation to exploring the world around us, are not dissimilar from the processes and skills required to explore our own emotions and solve social problems. Learning in and through nature opens a valuable lens for social and emotional development and for teaching and learning about caring.

Programs of any type from forest kindergartens and nature-based preschools to more traditional center-based early childhood programs can utilize the systemic approach of the *SEED Framework* to identify their strengths and

challenges in each area and enhance their balanced integration of early childhood education, environmental education, and social-emotional supports through practical interventions, informative observation methods, and a systems perspective.

Programs that provide wonderful, in-depth environmental literacy experiences with less focus on social-emotional development may find that enhancing their integration of social-emotional supports engages children emotionally in what they are learning, improves children's ability to communicate about their own and others' feelings, and enhances children's social interactions and support of one another (Bovey & Strain, n.d.; Joseph & Strain, 2003, 2006, 2010). Programs that emphasize child development with less focus on environmental literacy and connection to nature may find that enhancing nature-based experiences stimulates children to explore physically, cognitively, and emotionally (Kellert, 2002, 2005). The *SEED Framework* provides a guide for early childhood programs to support holistic child development through harmonious, balanced integration of early childhood education, environmental education, and social-emotional supports. With valued outcomes of social competence, child development and environmental sustainability in mind, the *SEED Framework* integrates disciplines in order to support a caring pedagogy and Ruth Wilson's depiction of ECEE as a field focused on doing work that is both good for the earth and good for the children and contributes to "the making of beautiful people".

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Play as Place:
A Safe Space for Young Children to Learn about the World

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ABSTRACT

This theoretical discussion frames play as a "place" consistent with the tenets of place-based education. We adopt a broad definition of place-based education to include both the environment around the child and the place within the child, their "world of play." We will apply theories of place-based education to demonstrate that play is indeed a place - a safe space where children learn about the world and about themselves. We discuss the challenges that the field of early childhood faces in the era of accountability and argue that play, like places in our natural environment, should be nurtured and protected.

Keywords: Early childhood education, place-based education, play

The world is a big, unknown and sometimes scary place for young children. They need a safe place, a space where they can be comfortable learning about their surroundings. That place is the child's world of play. When considering the nature of this "safe place," a non-threatening, comfortable environment in which a child is free to learn, it is useful to apply the principles of place-based education. This paper will discuss the importance of play in a child's development, how the ideas of place-based education support the notion of play as a place, and how the child's world of play must be protected.

Play in Early Childhood Education

Play, a critical component of a young child's development, has well-known benefits that span all aspects of development – cognitive, physical, social, and emotional (Bodrova & Leong, 2003; Gleave & Cole-Hamilton, 2012; Elkind, 2008; Marjanovic-Umek & Lesnik-Musek, 2001; Miller & Almon, 2009; Paley, 2004; Piaget 1952, 1962; Smilansky, 1968; Vygotsky, 1978). "Play is a biological, psychological and social necessity, and is fundamental to the healthy development and well-being of individuals and communities" (Playwork Principles Scrutiny Group, 2005). Play has a unique role in learning and provides an opportunity for children to resist pre-determined goals and ends, learn to tolerate uncertainty, and welcome diversity. Play is holistic and provides children an appreciation of freedom and creativity, often fortified by the process of inquiry and alternative logic. Play is freely chosen, personally directed and intrinsically motivated. Learning at this age almost always emerges from a place of play. When children play, they are engaged in discovery about the natural, real world, which is the foundation for learning in early childhood.

Not only does play have developmental benefits, but it allows children to explore and demystify some of the scary and unknown aspects of world. Through play, a child balances the unknown in the real physical world with the safety of their imaginative world. How often have we seen children play with scary ideas, like villains, danger, and even violence? Play is a safe way to explore and come to terms with their greatest fears. Piaget describes "assimilation" as the process by which the child transforms the world to meet his or her personal needs (Piaget, 1962). The child

identifies and transforms their imaginative world of play to meet their need for security and balance reality with imagination. For example, preschoolers will often find everyday objects to meet their need for play and face scary ideas. A stick becomes a sword to fight the villain. The tree becomes a brick wall to hide behind. Negotiating these roles and scary situations teach social skills and resilience, which are critical later in childhood and adulthood. These numerous benefits of play, which have lifelong effects, must be protected. We will apply theories of place-based education to demonstrate that play is indeed a place - a safe place - where children learn about the world and about themselves.

Considering the "places" of young children: Places around and within a child

The principles of place-based education align remarkably well with the foundations of early childhood education. Place-based education is an umbrella term for many closely related fields of education: environmental education, experiential education, pedagogy of place, community-based education, and education for sustainability (Woodhouse & Knapp, 2000). The foundations of place-based education include Sobel's work (1993, 1994) studying children's process of building a self-identity through special places, essentially linking the child's environment to social and emotional development. Theories of place-based education (Gruenwald 2003; Smith & Williams 1999; Sobel, 1994; Theobald 1997; Theobald & Curtiss 1999; Thomashaw 1995; Woodhouse & Knapp 2000) are rooted in the natural, built and human world and value the environment, which young children are eager to discover. Place-based education is connected to a variety of approaches that emphasize the central role of specific places or communities on a child's education (Gruenwald 2003; Jennings, Swidler & Koliba, 2005; Smith & Williams 1999; Sobel 1993, 1994; Theobald 1997; Theobald & Curtiss 1999; Thomashaw 1995; Woodhouse & Knapp 2000). All of these models and variations of place-based education share one common idea: The place in which learning occurs is important and should be nurtured, protected, and built upon.

Places around the child

Let us examine the particular attributes of the "place" of a young child. There are two places to consider: the physical and social world *around* the child and the imaginative, developmental world *within* the child. The external physical and social world shapes the child's experiences – and ultimately, their learning. Vygotsky (1978) describes a constructivist learning environment in which the diversity of individual experiences shape the child's cognitive processes. Interactions with others and the environment result in scaffolding and unique cognitive development. Piaget (1952) concurs that a child's learning is impacted by experiences and contact with the outside world. Play has a unique role in learning, resulting in refining schema and cognitive processes over time (Piaget, 1952). Experiences with nature provide unique opportunities for the child to explore their environment, learn about it, and care about it. Thomashow (1995) wrote about the goal of achieving "ecological identity" through the examination of basic questions such as: "What do I know about the place where I live? Where do things come from? How do I connect to the earth?" (p. xvii). These questions focus curriculum and instruction on understanding and appreciating students' immediate surroundings, including the outdoor environment and nature. Certainly for young children between the ages of 0 and 6, there is a curiosity and questioning about their surroundings, which can be easily explored through the child's natural desire to play.

Places within the child

Another important "place" of a child is the imaginative, developmental world *within* the child. Although place-based education is grounded in ecological ideas, "place" can be conceptualized as more comprehensive, to be applicable to early development and learning that occurs *within* the child. Gruenewald (2000) synthesizes the theories of critical education and place-based education, thereby articulating a broader conception for the promise of place-based education. Gruenewald (2000) states that his "critical pedagogy of place aims to evaluate the appropriateness of our relationships to each other, and to our *socio-ecological* places" (p. 7). If we consider "socio-ecological places," then perhaps we should consider the child's world based on their social and internal development – a place of play and imagination – as a "place." After all, Wilson (1997) explains that place does not refer simply to a geographic location, but also to the opportunities that are available to create meaning within a place. What better opportunity than play exists to create meaning within a place? Physical places, like a tree fort or unexplored forest path, offer tremendous

potential to be transformed into imaginary places, like the fort being transformed into a castle or the forest path changing into an expedition to an unknown, magical world. Place-based education "emerges from the particular attributes of a place" (Woodhouse & Knapp, 2000, p. 4). Both Piaget (1952) and Vygotsky (1978) value play as not only a means to learn about the surrounding environment, but also as a powerful vehicle for internal development. The powerful attributes of play as a safe place in a child's mind cannot be ignored.

Protecting the child's world of play

Considering our review of the importance of play and how it includes both physical and psychological spaces, we must acknowledge that child's world of play, like the natural world, must be nurtured and protected. Children spend a significant portion of their day in school, which is currently diminishing opportunities for imagination and play. Given the rising expectations of young children for academic readiness and standards-based assessment, preschool and kindergarten programs are sacrificing play for more formalized methods of teaching, which in many cases are developmentally inappropriate (Elkind, 2008; Miller & Almon, 2009). The argument that child-initiated play must be restored to early childhood education is "dismissed and even ridiculed in some quarters. In spite of the fact that the vital importance of play has been shown in study after study, many people believe that play is a waste of time in school" (Miller & Almon, 2009, p. 1). Despite the benefits of play, including development of cognitive, social, language and emotional domains, imagination, problem solving, empathy, and self-control to name a few, a tension still exists between developmentally appropriate play-based methods and a standardized math and literacy-based curriculum.

This documented tension between play-based learning and a more rigorous academic approach to early childhood education is harmful to children (Elkind, 2008; Gleave & Cole-Hamilton, 2012; Miller & Almon, 2009). David Elkind (2008) claims that the role of free play in physical and psychological well-being has been overlooked in many areas. He states: "School administrators and teachers – often backed by goal-orientated politicians and parents – broadcast the not-so-suitable message that these days, play seems superfluous, that…play is for slackers, that if kids must play, they should at least learn something while they are doing it" (Elkind 2008, p. 1). If children's opportunities for play are restricted, there are likely to be "profound effects on their life experience in general and more specifically on their physical and mental health" (Gleave & Cole-Hamilton, 2012). Indeed, by restricting play, adults are restricting access to the child's critical place – the world of imagination and play.

The pressures of accountability in many schools today have resulted in more direct instruction, even in preschool and kindergarten, without respecting a child's place of play. This "placeless" education, which includes abstract explanations and no connection to the real world, is sadly part of the standardized curricula employed by most schools today (Gruenwald, 2003). Many state standards for kindergarten and preschool, as well as some teachers' and parents' expectations, are in conflict with a developmentally appropriate, play-based approach. Too many preschool and kindergarten classrooms spend time on word or letter drills, recitations, chanting or reviewing letters and sounds over and over. Emphasis on narrow procedural skills results in children learning how to mimic or memorize without any meaning. Outdoor time and recess, which present infinite opportunities for imaginative play, have also been sacrificed for more direct teaching time. This approach is counterproductive and does not respect the child's place, which should be imaginative, free thinking, experiential, and built on warm, caring connections with adults and other children.

Applying place-based education in early childhood classrooms to protect play

In this era of accountability that sometimes spawns developmentally inappropriate instruction, how can we defend play, the child's safe and necessary place? Considering play as a "place" that must be respected and nurtured calls for an effort to preserve opportunities for play for young children. According to Ruth Wilson (1994), place-based education in early childhood includes the development of a sense of wonder; appreciation for the beauty and mystery of the natural world; opportunities to experience the joy of closeness to nature; and respect for other creatures. It also includes the development of problem-solving skills and the development of interest and

appreciation in the world around us. These goals acknowledge that learning is more than a cognitive process that can be accessed through direct instruction and that emotions play a particularly important role. These goals are remarkably similar to those of the field of Early Childhood Education, which is holistic and focuses on all aspects of social, emotional, physical, and cognitive development (Bredekamp & Copple, 1997). Examining the child's place of play through the lens of place-based education is a useful perspective that supports and prioritizes the need for play in the lives of young children, which can be achieved by rethinking curriculum, time, and space.

Curriculum

Although the curriculum of early childhood education is being shaped by many interests, there is room to provide what a child really needs. Sobel (1993) recognizes the need for "special places" in the development of children's self-identities and offers suggestions for integrating opportunities for the development of these "special places" within curriculum. These should include free time, adequate place, and engaging materials to explore ideas freely through social and imaginative play. The curriculum should encourage play, exploration, imagination, and individual pursuit of interests. Even within the constraints of prescribed curricula, teachers can find ways to integrate content in a play-based way. Teachers should allow for free play, closely observe the children, and look for themes or topics of interest. A variety of learning opportunities, many of which match what is contained in the prescribed curriculum, can then be built around these topics of interest. For example, children may be engrossed in a spider web they discovered in the corner of the playground, which develops into a game of pretending to be spiders. The teacher observes this interest in spiders and develops some learning opportunities based around their play, including observation of and discussing the spiders, reading stories with spiders, counting the spiders' legs, etc. Surely, these activities will include many of the cognitive, language and social goals included in the curriculum. Starting where the child is – in their world of play – is how teachers will gain and hold the child's interest in the curriculum.

Time

Equally important is time - a schedule with large blocks of unstructured free exploration time. This is not wasted time but an essential part of a child's growth. If the environment includes rich materials and the teacher is a source of individualized support, then this large block of unstructured free play time can be quite productive, more so than trying to get children at different developmental levels to conform to a structured whole group lesson. Teachers can observe students, work with them individually at their own pace, and seek out teachable moments, or opportunities to build common topics of interest into a larger class learning opportunity. For example, older children may notice that the spider has 8 legs, compared to insects with 6 legs. Numbers and observational differences could be the focus of a lesson with these students, while younger children may simply observe and use developing language skills to describe what they see. Using these large blocks of free play time allow for more meaningful, individually-tailored discussions and learning opportunities.

Space

Place-based education reminds us that the environment is of utmost importance, so we should consider both the indoor and outdoor configurations. The classroom arrangement should allow for social places and shared centers, such as a circle meeting rug or common working tables, as well as places for privacy, such as small reading corners or nooks. A variety of materials aligned with every aspect of development, ranging from gross motor play to fine motor development to social dramatic play to cognitive, should be displayed in an organized manner and labeled so that children feel in control of their environment. In fact, the first few weeks of school should be spent introducing the child to the new environment and all of the materials. Children should "own" their space, with their names and work displayed.

Of equal importance is the outdoor environment and time to explore nature outdoors. NAAEE (2010) views outdoor education as a critical component of early education that "should incorporate exploring woodlands, getting wet feet, climbing rocks, building with sticks, running on grass, turning over rocks, following insects, stomping in puddles, and so forth. Children are developing a relationship with the natural world" (p. 9). Nature and the outdoor environment not only provide a wealth of possibilities for imaginative play and exploration, but have the potential to lay the

foundation of a positive and caring attitude toward the environment. Positive interactions with nature are "essential to a young child's holistic development...[and] offer tremendous opportunities to foster the child's understanding and appreciation of the natural environment" (Wilson, 2015, p. 7). Spending time exploring the natural lessons offered by the outdoor environment through simple observation is critical. If adults would tune in to the child's playful world, they would see that there are many opportunities to build on what the children are already doing to incorporate more advanced skills. A child fascinated with how a worm moves, two children taking turns climbing a tree, or a group of children discussing a new and strange insect – these are all learning opportunities. We should recognize and capitalize on these natural learning opportunities. As Gleave and Cole-Hamilton (2012) recognize, we are at risk for creating a world without play, "a world where play is placed at the bottom of adult agendas and the value of play in children's lives is not fully acknowledged." Although children will always find a way to play, adults should provide children with the opportunity, time, and space for play as part of the normal routine, if they are to get the full benefits.

Concluding Words

Place-based education reminds us to respect and build upon the child's "place," their world of play. We must consider the ecology of the child by looking into where the child is. We can acknowledge their mind is rapidly developing with every new experience. Their external and internal places must allow children to be playful and imaginative. Children are developing their identities, learning social patterns, and building a foundation of learning and socialization that will shape the rest of their lives. Adults should respect both the places within and around the child, in terms of allowing opportunity for play, imagination, and socialization. When adults reduce the time and place for play and display hostile attitudes towards children playing, the result is "damaging implications for children's health and happiness" (Gleave & Cole-Hamilton, 2012). Just as we must defend and treasure the natural environment, so too should we include play as a place that needs our protection. This broader conception of "place" – this world of play - is a natural fit with the ideals of place-based education and fosters an opportunity for early childhood teachers to celebrate and build upon the strengths of play and the uniqueness of the early childhood years. Piaget (1962) reminds adults, "If you want to be creative, stay in part a child, with the creativity and invention that characterizes children before they are deformed by adult society." In this era of rigidity and accountability in education, we urge early childhood teachers to "stay in part a child" and be creative in teaching young children, starting with their world of play.

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Defining Nature-Based Preschools

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ABSTRACT

Nature-based early childhood education. Nature-based preschool. Nature preschool. Forest kindergarten. Nature kindergarten. Waldkindergarten. Forest school.

These are a few of the program terms currently being discussed among early childhood environmental education professionals in the United States. Why is there so much discussion about the names now? Do the names mean the same thing? Why should early childhood environmental educators be concerned about defining the similarities and differences among these programs? The paper focuses in answering these questions, and also in reflecting what can be learned from other program definitions to enhance the current definition of nature-based preschools.

Keywords: forest kindergarten, nature-based early childhood education, nature-based preschool, nature preschool, preschool programs

History of Nature-Based Preschools

A review of the history might help to frame the discussion on defining nature-based preschools. The first nature-based preschool in the United States started at the New Canaan Nature Center in Connecticut in 1967, the second just nine years later was the Massachusetts Audubon Arcadia Preschool, and the third at Nature's Way Preschool at the Kalamazoo Nature Center in 1982 (Bailie, 2014). However, there has been a boom in numbers since 2000 that illustrates a growing interest in this educational approach. In 2012, there were approximately 20 nature-based preschools in the country (Bailie, 2012). Today there are 30 licensed nature-based preschool programs listed on the Natural Start Alliance website (2014) in addition to several nature-based early childhood programs that are not licensed (some referred to as forest kindergartens or forest schools). Cedarsong, which opened in 2007 in the state of Washington, claims to be the first Forest Kindergarten in the United States (Kenny, 2013). Considering forest kindergarten programs have been operating throughout Europe since the early 1990s, Cedarsong may be represent a new development in the U.S. (Sobel, 2014). As new programs are established, it's important to have a clear understanding of what programs fall under the nature-based early childhood education umbrella and the characteristics of each of those programs. Having a common language will help early childhood educators establish best practices, professional development needs, and research questions that need to be answered.

Recent Definitions of Nature-Based Preschools

Nature-based preschools have typically been defined as a licensed early childhood program for 3-5 year olds, with 25-50% of the class day held outside each day, nature as the driving theme of the curriculum, and nature being infused into the indoor spaces (Bailie, 2010; Green Hearts, 2014; Larimore, 2011a, 2011b; Moore, 2014). For clarification, it should be noted that "nature-based preschool" and "nature preschool" are used interchangeably in the literature. Recently, Bailie and Finch provided a definition of nature-based preschools on the Natural Start Alliance website. A detailed and expanded version on the definition is provided in Figure 1. Notice there is no

mention of specific ages or time spent outdoors, unlike the definitions of other early childhood environmental education programs.

What is a Nature Preschool?

1. Nature is the central organizing concept of the program. That is, nature is the integrating thread that intentionally ties together the preschool's philosophy, methodologies, classroom design, outdoor spaces, and public identity.

2. A nature preschool's program is based on high-quality practices of both early childhood education (developmentally appropriate practices) and environmental education (principles of interpretation and the North American Association for Environmental Education's "Guidelines for Excellence in Environmental Education"), requiring its teaching staff to have skills and experience in both early childhood education and environmental education.

3. A nature preschool program uses the natural world to support dual goals that address both child development and conservation values. These include the development of the world of the child (in all domains – cognitive, physical, social, emotional, aesthetic, and spiritual) and the development of an ecological identity or environmental ethic. (Natural Start Alliance, 2014)

Figure 1. *Bailie & Finch's Definition of Nature Preschools (Natural Start Alliance, 2014).*

Comparing Nature-Based Preschools to Forest Kindergartens and Forest Schools

Forest kindergartens have been defined as educational programs which provide daily outdoor experiences for children 3-6 year olds, with limited or no indoor facilities. Children in such programs tend to spend 70-100% of their time outdoors, in a nature immersion experience, in which the curriculum emerges from the daily activities (Fritz, Smyrni, & Roberts, 2014; Kenny, 2013; Moore, 2014; Sobel, 2014; Warden, 2012). Forest kindergartens are sometimes known by other names including "waldkindergartens" or "nature kindergartens" (Fritz et al., 2014; Sobel, 2014; Warden, 2012).

Forest schools, yet another early childhood environmental education program type, take children to a nearby natural area on a regular basis for half to a whole day at a time, are more broad in the ages they serve with some even extending beyond early childhood, involve public schools, and have the goal of building a relationship with a particular natural space through regular visits over time (Andrachuk et al., 2014; Maceachren, 2013; Moore, 2014; Warden, 2012). How long these visits occur varies among programs, but Knight (2013) suggests six weeks minimum and adds that many forest school practitioners recommend a minimum of 10 weeks. Either way the emphasis is clearly on several weeks of regular visits not just once or twice a school year, or even a visit once each season.

Noting the similarities among the programs, Sobel (2014) proposed that nature preschools and forest kindergartens are the same genus, but different species. Keeping with this notion of taxonomy and adding forest schools to the mix, perhaps *early childhood environmental education* is the taxonomic "family," where nature-based early childhood education is the "genus" for the two separate "species" of nature-based preschools and forest kindergartens, and forest schools are another genus—nature-enhanced early childhood education (Figure 2.). "Enhanced" indicates that forest schools use the outdoors in some regular fashion, while daily use of the outdoors is a core characteristic of nature-based schools. All three programs, however, focus on connecting children to the natural world at the early childhood level (0-8 years old) using pedagogy that is developmentally appropriate. Whether a nature-based preschool, forest kindergarten, or forest school there is no question they share a common

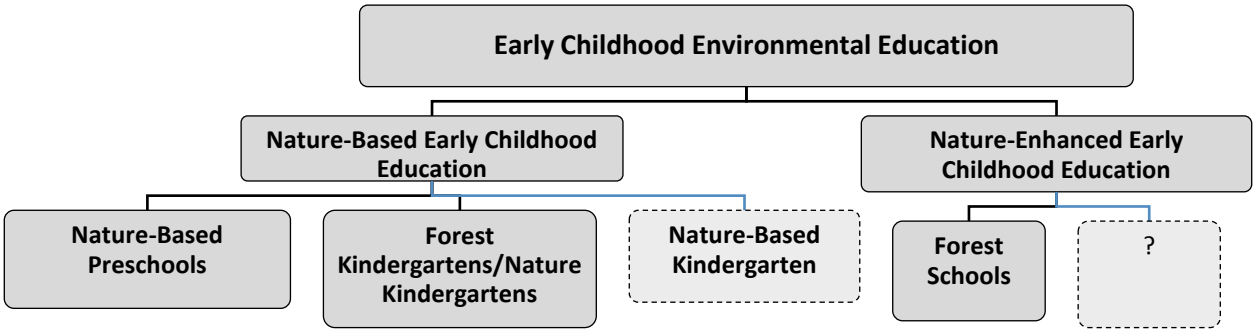

Figure 2. Taxonomy of nature-based preschools which builds on Sobel's (2014) notion that nature-based preschools and forest kindergartens are two species of the same genus.

belief in the value of children having frequent outdoor experiences as part of their high quality education in order to support their development, as well as build a lifelong connection with the natural world.

Clarifying the Nature-Based Preschool Definition - Some Examples & Variations

Notice the new definition presented by Bailie and Finch does not mention specific ages, does not outline parameters regarding outdoor time, and does not say indoor facilities are required. That raises the question, is this new definition too inclusive in its approach? A farm-based preschool program such as the Aullwood Farm Discovery Center in Dayton, Ohio, a Head Start program operated on the nature center property, would fall under this definition. After all, it uses nature education (in a farming context) as its organizing theme and uses high quality early childhood practices to meet developmental goals under the framework of Head Start requirements. However, so would the Natick Community Organic Farm's Forest Gnomes program, which also uses nature as the overall organizing concept, and self-describes on their website as emphasizing "physical and social development and personal growth" (2014). Yet on the same website they call themselves a waldkindergarten.

There are significant differences between these two programs. The Aullwood program is licensed where Natick is not. The Natick program also has very limited indoor facilities and the students spend almost the entire time outdoors. So it seems the new definition may be too inclusive and there are critical elements from the original definitions of nature-based preschools that may be important to keep. These missing items include being a licensed early childhood program, 25-50% of the class day held outside each day, and nature being infused into the indoor spaces (which implies there is a significant classroom facility space). Being licensed may not be necessary, but it does mean the program meets a minimum set of standards related to developmentally appropriate practice (e.g., student to teacher ratios, teacher education levels). The time range and presence of an indoor facility helps distinguish programs from the immersive, almost entirely outdoors forest kindergarten model. Would the definition Bailie and Finch provided be more appropriate as the definition of the broader umbrella of nature-based early childhood education rather than nature-based preschools specifically?

A Solid Definition Provides a Professional Foundation

All of this discussion clarifying the definition of nature-based preschools may seem like an exercise in splitting hairs and leave many people asking what value there is in establishing a solid definition. Nature-based preschools are a relatively new school model and yet growing quickly. An established definition will provide the foundation to help guide the establishment of a professional association, professional development needs for program teachers and administrators, research needs, and the establishment of best practices.

Some of these professional efforts are already underway, and understanding what is and is not a nature-based preschool will help guide those initiatives. Related to a professional association, Natural Start Alliance has been the

home in the United States for connecting nature-based preschools since 2013. However, its mission is broader with a focus on being a coalition of parents and educators who connect young children to nature and care for the environment. Should there be a professional association specific to nature-based preschools? Or perhaps one that serves both nature-based preschools and forest kindergartens? Antioch University now offers a graduate certificate program for nature-based early childhood education including both nature preschools and forest kindergartens (2014). There are a host of potential research questions related to nature-based preschools and/or forest kindergartens. For example, when discussing the differences of nature-based preschools and forest kindergartens David Sobel referred to a cognitive readiness mindset and the initiative/resiliency mindset that distinguish the two programs (2014). He explains cognitive readiness mindset as focusing on formal literacy and numeracy, where initiative/resiliency mindset focuses on allowing children to solve problems on their own. Are these two mindsets mutually exclusive? How much outdoor time creates the initiative and resiliency he mentions?

Having a clear definition that strikes a balance between being inclusive, but not too inclusive is critical in establishing a foundation for moving the nature-based preschool profession forward. Yet it seems there is still some work needed to refine that definition. Perhaps the three components of the Bailie and Finch definition listed above could serve as the start of professional principles—which expand on the basic definition and further guide the professional needs just mentioned. Forest kindergartens and forest schools both have very basic program definitions and yet most of the literature also provides expanded principles and guiding elements (Andrachuk et al., 2014; Kenny, 2013; Knight, 2013; Warden, 2012; Forest School Association, 2014). These definitions and principles could serve as a framework for establishing best practices of nature-based preschools.

Refining Definitions While Acknowledging Common Ground

Coming to agreement on program definitions and acknowledging differences among programs is useful in improving our professional techniques and guiding our professional supports such as training and research. As was illustrated above, there are clear differences between nature-based preschools, forest kindergartens, and forest schools. That being said, the strength of early childhood environmental education as a whole will come from finding common ground in the elements that unite the various “species” discussed here. There is common ground in the belief that outdoor exploration time is valuable and all have similar approaches and philosophical foundations. Recognizing the significant program differences while at the same time finding common ground allows programs to learn from each other, to help each other in overcoming shared challenges, and perhaps most importantly—spread the word about the shared belief on the need to connect children to the natural world. After all, a young child jumping in a puddle is magical no matter the name of the program that provided them with that experience.

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Outdoor explorations with preschoolers: An observational study of young children's developing relationship with the natural world

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ABSTRACT

In a longitudinal investigation of young children's developing relationship with and understanding of the natural world, eleven preschoolers and their teacher were filmed for 50 hours during weekly explorations at a local state park. Findings indicated that while outdoors children showed self-awareness with regard to environmental features, generated complex scientific theories around discoveries, and engaged in environmental stewardship. The teacher provided sensitive guidance for children's individual and collaborative explorations and for their appreciation of nature. The findings provide support for the premise that children's understanding of the natural world develops through direct, engaging experiences, supported by adult guidance and encouragement

Keywords: nature, outdoor play, stewardship, preschoolers, teacher guidance

Research shows that children's direct experiences with nature have decreased dramatically, and today's children are growing increasingly isolated from the natural environment and increasingly dependent on technology and time spent indoors (Kahn, 2002; Kellert, 2002; Louv, 2008). Many key environmental scholars argue that this trend is associated with negative outcomes for children's physical and psychological well-being. Because "people are unlikely to value what they cannot name," the separation of children from nature could easily lead to a generation where a passion for environmental protection is lacking or absent (Louv, 2008, p. 41). Sobel (1995) argues that children must bond with the natural world before learning about environmental degradation or taking on stewardship roles. Furthermore, it is problematic if children spend time learning about faraway rainforests but do not get to know their own backyards or local flora and fauna. The purpose of the present study was to examine young children's developing relationships with the natural world with a focus on the importance of social relationships with peers and teachers as well as their own responses during outdoor explorations.

Young children need unstructured opportunities for play in environments that "put them in touch with beauty, arouse their curiosity, and excite their imaginations" because children learn about themselves and the world through this type of authentic play (Wilson, 2012, p. 18). Diverse environmental affordances provide myriad opportunities for nature play and also facilitate children's physical, social, and cognitive development (Fjørtoft, 2001; Gibson, 1979; Heft, 1988; Sandseter, 2009; Wilson, 2012). Affordances are functional features of the environment characterized by particular physical attributes (e.g., water puddles on a muddy trail) and the unique response of the individuals who encounter them (e.g., one preschooler may take the opportunity to splash in each puddle while another child hops over them). The novelty of environmental affordances, such as trees for climbing and creeks for splashing, is

enhanced by the changing seasonal and climactic conditions encountered by children who have sustained, engaging experiences in natural outdoor spaces. Research has shown that through such experiences, children develop enhanced motor fitness and coordination, creativity, imaginative play, and prosocial behaviors (such as cooperation) along with a reduction in aggression (Fjørtoft, 2001; McClain & Vandermaas-Peeler, 2015; Sandseter, 2009; Wilson, 2012).

Adults who work in environmental education and/or protection often cite two types of experiences – playing in nature as a child and having a family role model who highly valued the natural world – as influential for their own commitment (Chawla, 2007). This attribution indicates the importance of nature play in childhood for developing a bond with the natural world and the value of both community and adult focus on youth connections with nature. In her interviews with 56 environmentalists in Norway and Kentucky, for example, Chawla (1999; 2007) found that nearly all adults in both countries recalled places they played as children or hiked as adolescents, and the vast majority of respondents also connected these experiences with memories of a special relative who "confirmed nature's value" (Chawla, 2007, p. 146). Large-scale survey research conducted with adults in different countries also links positive environmental attitudes and behaviors with early nature experiences (see review by Chawla, 2007).

What makes early nature experiences so compelling? Place-based memories and affiliations are enhanced by the physical attributes of natural environments as well as the social relationships fostered through the shared experiences. Adults play a critical role in supporting the types of nature experiences that allow children to play and explore freely, develop positive social and emotional connections, and learn from their experiences (Chawla, 2007; Sobel, 1995; Wilson, 2012). When children and adults share positive nature experiences, "with appreciation for other things' own way of being rather than fear or destructiveness, it lays a foundation for finding intrinsic value in nature" (Chawla, 2009, p. 14). Through children's direct encounters in nature with adults, they develop an environmental identity that incorporates empathy, perspective-taking, concern for nature, and motivation to take care of the natural world (Chawla, 2009).

Through their experiences in the natural world, children not only learn to enjoy their time outdoors but also prepare for creative and informed participation in society and in environmental preservation (Chawla, 2002; Chawla & Cushing, 2007; Moore & Young, 1978). Authentic participation by children, where they clearly understand what they are doing and why, is closely linked to development of environmental stewardship (Chawla, 2002; Davis & Elliot, 2003; Hart, 1997; Heft & Chawla, 2006; Moore & Young, 1978). These authentic nature experiences are critical for shaping life-long values, attitudes, and behavior patterns toward the natural environment (Wilson, 1996).

Although early childhood is widely acknowledged as an important time for developing positive relationships with the natural world, surprisingly few longitudinal and observational studies have been conducted with preschoolers in unstructured natural environments (Davis, 2009; Kellert, 2002; Louv, 2008). Longitudinal studies with young children focused on experiences built into the curriculum and through unstructured play are particularly needed (Chawla, 2007). Furthermore, extant research evaluating children's responses to the environment is often limited to children's declarations of intent (e.g., plans to recycle) or reported feelings about the environment, as opposed to actual observations of their interactions in the natural world (Chawla, 2009). According to Chawla (2009), research on children's environmental behaviors also has been limited to assessing simple actions such as recycling paper or turning off a light. She argues that children's responses to nature move from simple to increasingly complex actions and that learning to care for nature proceeds within a social network of collective, collaborative interactions with peers and adults. The present study aims to explore this claim and to contribute to the field of early childhood environmental education by examining young children's complex, developing relationship with the natural world over the course of one year. This research is an in-depth, exploratory study of a small group of preschoolers interacting with each other and their teacher in weekly outings to a local state park.

The current research was a case study of a preschool with an environmentally focused pedagogy inspired by the Reggio Emilia approach. The Reggio Emilia pedagogical approach was developed in Italy after WWII as part of a post-war reconstruction effort and is characterized by a social-constructivist approach to teaching and learning (Edwards, Gandini, & Forman, 1998, 2012; Hewett, 2001; Inan, Trundle, & Kantor, 2010). Reggio Emilia philosophy states that

"all knowledge emerges in the process of self- and social construction" and, therefore, the emphasis is placed on "each child in relation to other children, teachers, parents, his or her own history, and the societal and cultural surroundings" (Rinaldi, 1993, p. 105). The pedagogical focus is on play, inquiry, creativity, and discovery.

Reggio Emilia schools were originally developed with purposeful connections to the environment through intentional planning for interactions between the preschools and the municipal communities in which they were located (Edwards et al., 2012; Torquati & Ernst, 2013). A central tenet of this pedagogical approach is that the environment is a "third educator," and the indoor and outdoor environments are carefully designed to provide opportunities for children to engage in stimulating and meaningful work in spaces that support developmentally appropriate learning and social interactions, are aesthetically pleasing, reflect the culture of the children and the community, and afford flexibility and creativity (Edwards et al., 1998; Torquati & Ernst, 2013). As Edwards et al. (1998) write, "the structures, choice of materials, and attractive ways in which educators set [spaces] up for the children become an open invitation to explore" (p. 163). Reggio-inspired preschool environments are designed to create interactions and cooperation between parents, teachers, and especially between children because social exchange is considered essential for learning. The preschools utilize outdoor spaces to increase children's awareness of the natural world as they play outside and participate in ongoing projects where teachers encourage students to investigate the complexity of the natural environment.

The emphasis on exploration and collaborative learning in Reggio Emilia-inspired environments fosters children's inquiry and discovery. By participating in everyday experiences in both indoor and outdoor environments, children co-construct knowledge through social exchanges with peers and teachers. Vandermaas-Peeler and McClain (2015) found that children who worked with a teacher in a garden at a Reggio Emilia-inspired preschool utilized inquiry skills such as observing, predicting, evaluating, and comparing as they prepared the garden beds and planted and harvested crops throughout the school year. Their social interactions with their teacher fostered mathematical and scientific inquiries as well as ecological awareness and positive affective responses to the natural world. In a qualitative study of natural sciences education in a Reggio Emilia-inspired preschool, Inan et al. (2010) found that the science projects involved themes that the preschoolers were excited about, and many topics emerged from shared science questions, such as, "How does a rainbow happen?" The teachers expanded the children's questions into the curriculum and facilitated in-depth, sustained exploration of the topics through socially constructed inquiry and shared enthusiasm. The children were encouraged to use science process skills and actively engage in scientific reasoning. The present study builds on this prior research to examine children's understanding of and reasoning about the natural world through exploration and discovery.

The present study was an investigation of children's developing relationship with and understanding of the natural world over the course of one year in a Reggio-inspired preschool. Utilizing a longitudinal design, the children's interactions with peers and their teacher were observed in the context of their on-going explorations at a local state park. The study focuses on three aspects of children's developing relationship with the environment: emergent stewardship and appreciation of nature, their discoveries and reasoning about the natural world, and their awareness of themselves in relation to the environment. In addition, their shared experiences with peers and preschool teachers who modeled respect, curiosity, and valuing of nature were examined.

Methods

Context and Participants

The present research was a case study of a non-profit, Reggio Emilia-inspired and environmentally-focused preschool serving 12 children with mixed-aged grouping. The school is located in a mid-sized city in the Southeast and is part-time, open four days a week from 8:30 a.m. until 1:30 p.m. Children attend the school for two or three years.

A central tenet of the school is that children are capable individuals who are most likely to thrive when they engage in challenging, enjoyable, and meaningful activities in the context of a mutually respectful, consistent, and loving relationship with an adult. Teachers give children the opportunity to choose their own activities on a daily basis and provide support and guidance to foster independent and collaborative explorations. A key ethos of the school is structuring the day so that children have free movement between the indoor and outdoor classroom environments.

The pedagogical approach includes the following goals for children's development in nature: a respectful relationship with nature, a feeling of being at home in wild places, an appreciation for natural cycles, an ability to enjoy the beauty of the outdoors, and a feeling of empowerment through knowledge about ways to protect the natural world.

The school has an extensive outdoor environment with a playground, garden, and creek located on site. Five children also go to a local river with a teacher once a week to explore and play (see Figure 1 for images). The present study focused on the outdoor context of the river, which is a wild, naturally-provisioned environment with a trail. It is part of a state park located 15 minutes away from the school and includes a one-mile loop trail, large rocks, steep banks, and moving water.

The outdoor experiences at the river are designed to give children significant freedom while still keeping enough structure to make it manageable for them. The children have the freedom to walk and run along the trail at their

Figure 1. Children exploring the river and the natural environment at a state park.

own pace, but there are rules around stopping points. The teacher and children follow a one-mile loop trail divided into ten or so "rendezvous" spots selected by past preschoolers for some unique or interesting feature (e.g., the potty tree, which looks like a toilet seat) (see Figure 2 for a map of the rendezvous). The children can go ahead of the teacher but must stop when they get to the next rendezvous. In interviews, the teachers identified the rendezvous structure as the critical piece that makes the river experience work. Children's ability to travel independently or in small groups ahead of the teacher between rendezvous enables freedom and exploration.

The participants included the school's two teachers, Lisa (age 51) and Sharon (age 43), both Caucasian and female. Lisa founded the school and had worked there for 22 years while Sharon had taught there for 6 years. Lisa was the teacher who took some of the children to the river while Sharon stayed at school with the rest of the group. Additionally, eleven mixed-aged preschoolers (6 females and 5 males) who ranged in age from 33 to 59 months at the beginning of the study participated. Of the 11 children, 6 were Caucasian, 2 were African-American, 2 were Asian, and 1 was Latino. Average family income was in the $60,000 to $100,000 range.

Initials	Rendezvous
FS	Flower Sign
FM	First Mountain
CL	Canoe Launch
RI	Rocky Island
CR	Climbing Rock
HT	Hiding Tree
PT	Potty Tree
SS	Snake Step
RT	Rocky Town
JB	Joe's Bridge
LNL	Long Neck Log
EM	Eno Mountain
LR	Lumpy Rock
TS	Trail Sign
BC	Bench Café
2B	Second Bridge
PPV	Prickle Pickle Valley
TT	Tick Tree
NB	Nap Bridge

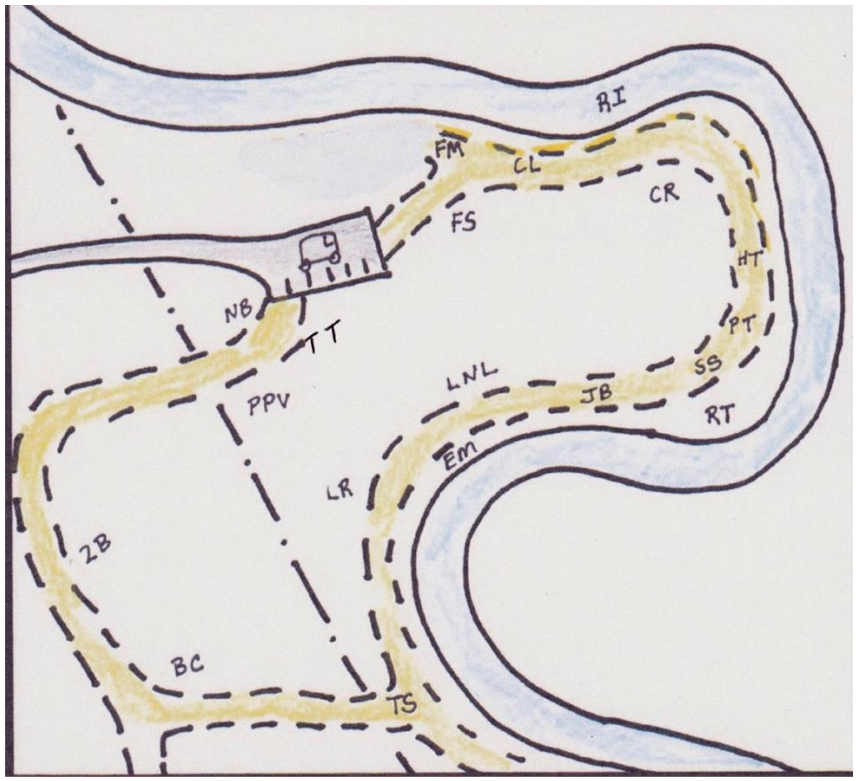

Figure 2. Map drawn by teachers at the school detailing the rendezvous spots. Teachers carry this map with them while at the river and show it to children at each rendezvous.

The Researchers

The primary researcher (Cara) was a female, Caucasian American, in her third year at the university. Cara collected all video observations and conducted both teacher and child interviews. She was an unobtrusive participant observer, participating only if a teacher or child spoke directly to her or if a dangerous situation arose. The children appeared comfortable engaging with her, but mostly ignored her. Cara attended the preschool as a child, grew up in the community, and is related to one of the teachers. This connection meant the children were already familiar with her and remained unbothered by her presence. Furthermore, any potential for bias was reduced by using continuous filming when collecting video data and preparing teacher interview questions ahead of time. The second

author, Maureen, was the faculty advisor and co-investigator. She was a second participant observer on one of the data collection days at the river, and helped conduct the teacher interviews in May. This project represented the beginning of a continuing research partnership with the teachers and the school community.

Data Collection

The researchers utilized data triangulation and between-method methodological triangulation (Flick, 1998; Flick, 2006) with video-recorded observations, child interviews, and teacher interviews. Data collection began in August 2012 and ended in May 2013. The children and accompanying teacher were video-recorded continuously for the 16 days they went to the river that year (some weeks the teachers decided not to go due to weather or scheduling conflicts). Because the teachers completed extensive documentation daily (Edwards, et al., 1998), the children were accustomed to having their language recorded and their pictures taken. In conjunction with video data, the children were interviewed at the end of each river trip in a group interview. The following questions were asked: (1) "What was fun today?" (2) "What was hard today?" (3) "What did you learn at the river today?" (4) "What is good about going to the river?" and (5) "What do we do to keep the river a nice place for everyone to come and for the things that live here?"

Teachers were interviewed by the first author in August, and by both authors in May, using a semi-structured approach. For the teacher interviews, sample questions included: (1) "Why is nature important for children's development?", (2) "If you were to list the top three reasons to take kids outside, what would they be?", (3) "List a couple of easy and/or creative ways to implement nature experiences that you can think of or that have been used at this school", (4) "What kind of nature experiences did you have as a kid?", and (5) "What role does community support and community involvement play in preschoolers' development, both in general and at this school?" The interviews were audio-recorded and transcribed verbatim.

Data Analysis

The first hour (or entire video if less than 1 hour) was coded for the 16 video-recorded river days. The first hour at the river contained a relatively balanced mixture of hiking, settled pretend play, and settled snack time. Coding was completed using the Observer XT 11.5, a software package that was used to code the frequencies of various behaviors layered with the time spent in each environmental affordance. The coded environmental affordances were flat surfaces, water (and the area immediately adjacent to the water), climbable surfaces (e.g. rocks), sloped surfaces (e.g. river bank), and rough, bumpy, or slippery surfaces (e.g. tree roots). Frequencies of behaviors were measured as "instances" with one instance coded for each time a behavior occurred. Behaviors were only double-coded if the child or teacher stopped the target behavior, moved on to a new behavior, and then returned to the initial behavior. To establish inter-rater reliability, two raters independently coded 20 percent of the data, and the calculated percent agreement was 80 percent. The researchers coded for children's awareness of themselves in relation to the environment, stewardship and appreciation of nature, and scientific discoveries and hypothesizing.

Children's awareness of themselves in relation to the environment was defined as children's talk or games about environmental affordances or challenges that involved a child linking or connecting what s/he was doing or seeing with her/his own awareness of what was happening. Examples of awareness include "I slipped into the water," "My boots are filling up with water," "You couldn't see us; we were hiding in the forest," and "This is sort of like a mountain." Awareness could be paired with stewardship (e.g. a child saying, "I don't want to move the flowers" because she does not want to hurt them).

Stewardship and appreciation of nature included examples of preschoolers showing a general appreciation for nature or direct stewardship (e.g. commenting that the river is beautiful or that trash should be picked up). An "other" category was used to code stewardship that did not fit into one of the existing categories (e.g. "If I pour the water in my boots on the grass, it can water plants" or asking to study a seedpod at the school's nature study table).

Codes for scientific discoveries and hypothesizing included plant, animal, or inanimate object identification and scientific principles or theories. For example, one child suggested that a "high tide" pushed a clump of grass up onto a tree that had fallen into the river. The code could involve actual testing or experience (e.g. noticing the water is

deep while standing in the water). Emotional state was coded only if there was clear negative emotion, because the children's baseline mood state was overwhelmingly positive.

For the qualitative coding of child and teacher interviews, the researchers utilized a constant comparative method, generalizing across specific statements to describe the children's' and teachers' experiences in general. A constant comparative method focuses on comparing the data throughout the analysis, following a circular process of comparing current codes and classifications with existing codes and classifications to ensure more accurate analysis and interpretation of data (Flick, 2006).

Results

Children's Awareness of Themselves in Relation to the Environment

Across the 16 days, 338 instances of children's awareness connected to environmental features were coded (see Table 1), indicating that children frequently verbalized an understanding of their relationship to their surroundings. Examples are provided in Table 2. In one example, after the children crossed the river through rushing water, Daniel reported back, "I've never been so far out in the water before." Emma responded to him by saying "When we were in the current, it was sort of like an earthquake." Another example came on a rainy day when Michael and Emma found a hiking spot about fifty feet away from the group:

Michael: It was fun when me and Emma got to stay by ourselves.

Lisa (the teacher): Oh up at the place where you climbed up to try and find shelter?

Michael: That was fun.

Lisa: Why was it fun to be with just yourselves?

Michael: Because then we could um like… not so much noise and like quiet peace.

The children noticed changes in their environment based on their cumulative experiences over time, and this was often reflected in their interviews at the end of each visit to the river. They noticed when features of the rendezvous stops changed, such as a fallen tree at one spot. When asked "What did you learn at the river today?" one child said, "I learned that you can build a bridge out of sticks," and then two weeks later, another child explained, "I learned that when we made the bridge out of sticks, and the rain moved it to a different place, the way it came back together was not a very strong way." Children's comments in response to "What was fun at the river today?" also exemplified awareness of themselves in relation to the environment, such as "I liked getting out of the mud" or "Playing in the water." Michael stated, "I liked that when I tried to go across that deep water. I liked how I kinda tried and tried and tried again, tried all over again."

In response to the question, "What was challenging at the river today?", all the children's responses were related to self-awareness of environmental features, primarily climbing on rocks or up steep hills, going in water, digging in the mud, and navigating the physical landscape. One child described how it was hard to get to rocks in the middle of the river. Another explained that is was hard "getting across that tree at Rocky Town. Getting across that little log. 'Cause there's a part you could hold on and then you couldn't hold on anymore." Michael explained that it was hard to "get down from [a] tree. It was easy to go up but hard to get down." Some of the physical experiences also had emotional components that made them challenging. For example, one child described "What was hard for me was I was kind of scared to go in that seaweed before near Alone Space rock."

Table 1
Overall Behavioral Frequencies for All Children

		River		
	Behaviors	Total	Mean	SD
Discovery and Reasoning	Plant ID	43	2.69	1.28
	Animal ID	85	5.31	2.92
	Inanimate ID	118	7.38	4.06
	Scientific Principles/ Theories	103	6.44	3.20
	Total	349	21.81	3.17
Stewardship	Picking up trash	17	1.06	0.93
	Leaving plants/ animals alone	12	0.75	0.42
	Verbally valuing nature	16	1	0.52
	Photo documentation	52	3.25	2.48
	Mindful looking/ listening	8	0.5	0.55
	Other	26	1.63	1.17
	Total	131	8.19	1.68
Awareness Connected to Environmental Features	Self in Relation to Environment	338	21.13	6.21
	Personal Challenge	30	1.86	0.32
	Total	368	23	6.16
Teacher Guidance	Strategies to solve challenges	37	2.31	1.45
	Memory keeper/bridges	110	6.88	4.18
	Total	147	9.19	3.82

Note: "Total" denotes the total number of observed instances across all days. Means were calculated as the total divided by the number of days (16) at the river.

Furthermore, children frequently verbally linked what they found physically fun and challenging with what they learned at the river. For example, one child stated, "I learned that getting down to Hiding Tree is tricky. That's what I learned." Other children talked about learning that it is hard to walk up long hills or learning not to run too fast or else they will fall. In a final example, children talked about learning how to throw dirt off their shovels.

Lisa (the teacher): Did you guys learn anything about when you were experimenting with the shovels and the dirt? Did you learn anything about how to make the dirt go where you wanted it to?

Anthony: I learned something.

Michael: Yeah, just look at the spot you want it to go and then flip it and it goes where you're looking at.

Emma: Yeah. That's what I learned too.

Anthony: And sometimes you don't know which spot you want to put it in. Which is the bestest.

The vast majority of children's awareness codes were connected to a positive or neutral emotion (329 total positive/neutral emotions), showing that children's perceptions of their experiences outdoors were very rarely negative.

Table 2
Examples of Children's Awareness of Themselves in Relation to the Environment

Location	Example
River	Daniel saying "I caught myself when I slipped!" after he almost fell on a muddy day.
River	Daniel asking his peers "Why is there no mud up here?" after he noticed that the higher part of the trail did not have mud, and Emma responding "Because we're not as close to the water."
River	Michael, Anthony, and Emma finding and comparing acorns: "Yours cracked open, now it looks like mine," "Here's one with a sharp top," and "This one is huge."
River	After the children cross the river through rushing water, Daniel reports back "I've never been so far out in the water before" and Emma says "When we were in the current, it was sort of like an earthquake."
River	After finding a hiding spot in a tree, Emma notes that "We have shelter from the rain."
River	Daniel explains to the teacher that "I tripped. And when I trip, I lean back so I don't fall."
River	On Gabby's first day at the river, she moves slowly past the rocks and roots, saying aloud that "I'm being very careful."
River	Michael practices his spatial awareness skills, thinking about how different rendezvous connect and explaining "So if we want to go straight to Climbing Rock, we don't go that way to Canoe Launch. We go this way."
River	Michael finds a meditation perch on a tree and describes it being "almost like an eagle perching on a limb."
River	As Anthony and Emma put their hands in the water, Anthony exclaims, "This is so cool!"

Scientific Reasoning and Discoveries, Stewardship, and Appreciation of Nature

Across the 16 river days, there were 246 instances where children identified plants, animals, or inanimate objects; 103 scientific principles or theories; and 131 stewardship codes (see Table 1). There were only 18 instances of negative emotional reactions to discoveries, mostly to animals. Children's discoveries were often supported by the

teachers' inclusion of photo documentation and mindful looking/listening into the routine at the river. Much of the stewardship was joyful and expressive (e.g. singing to a tree that had fallen down).

The children exhibited basic and complex inquiry skills (observing, identifying, comparing, classifying, communicating, and utilizing), showing early scientific reasoning (Kilmer & Hoffman, 1995). Older children in particular developed and tested concepts such as speed and depth of the water, occasionally using tools. For example, Michael put a stick in the water to test how fast it was moving and later realized that if he put a stick in the water, he could also test its depth by the watermark left on the stick. The children also frequently engaged in comparison (e.g. deciding whether one set of animal tracks looked like another set). In another example, Lisa (the teacher) spotted some yellow flowers on the side of the path and asked everyone whether the flowers were taller or shorter than they were. Several children stood next to the drooping flowers and announced that they were taller. Michael, in contrast, held the flower upright and judged that it was actually taller than he was. Thus, he demonstrated knowledge of using evidence to answer questions.

The children also demonstrated the ability to use logical processes when hypothesizing (e.g. "That made a really big splash because it was a really big rock"). Although a child's ideas might be grounded in a falsehood, they would often still utilize logic. For example, Michael told Lisa, "Hey, since there's not any leaves, maybe we'll see some mistletoe on the taller trees. Maybe we'll see mistletoe because there's no leaves and the only leaves that are left is mistletoe because that's a bush." Lisa asked, "It's a bush that grows inside trees, Michael?" He replied, "It's the bush that grows on top of trees – mistletoe." In another example, Daniel employed multi-step hypothesizing, though he also used pre-causal reasoning. He first said that the river was "mean" because it was moving so fast, indicative of attribution of intention to the river, and therefore "fishes are staying home." He then thought the fish would "get flushed all the way to the ocean… And they'll be happier in the ocean," which led him to conclude that the river is "strong" but maybe not "mean."

On her last trip to the river, Sophie, a younger child, showed multi-step hypothesizing and exploration, with teacher guidance, as she searched for water in a little creek off the river:

Sophie: Hey, look what's down there!

Lisa: What is down there?

Sophie: Water and it's so muddy.

Lisa: Oh my gosh, there's even water in the little creek.

Sophie: But not right there (pointing).

Lisa: But not everywhere. Really good point. Where does it go?

The children speculate about where the water goes.

Lisa: Where do you think the water comes from guys?

Sophie: From the rain!

In response to a suggestion from the teacher about figuring out where the water comes from, all the children began to dig to see if they found water underground. As Sophie dug with her shovel, she discovered rocks and realized that the rocks were making it harder to dig. Later, after she had been digging for a while without finding water, she concluded that water comes from rain only and does not come from underground.

Stewardship and appreciation of nature develops with experience and age, and in this study the older children demonstrated more complex stewardship. Many children were able to combine scientific principles or discoveries with valuing nature, and also with an awareness of themselves in relation to nature. For example, Michael understood that clouds are able "to make our plants grow. And to make us grow too because we drink water."

Continuing along that line, he explained that, “The best thing about water is, if we didn’t have water, we wouldn’t even be alive. It’s not just that the trees make us alive, but water does too. Water and food!” He recognized that “You know, everything is a part of nature.” Children also shared ideas about stewardship with one another, building on the group’s ideas (e.g. after Michael commented on rain, Daniel said, “Rain is good because it waters plants” and “The best thing about rain is that it can water plants”).

Teacher guidance was crucial for creating a context in which children outwardly expressed their ideas about stewardship. Lisa provided psychological and material tools that supported the children in building a connection with nature. She offered the use of a camera so that children could take photographs of their observations and discoveries and built in meditation moments each trip. Around snack time, the children would spend one minute in either mindful looking or mindful listening (determined by the teacher), starting and ending with Lisa ringing a bell. After the minute ended, children would report back on any sounds they heard or sights they noticed. She encouraged children to notice the environment with an intentional and appreciative focus. The children were able to make a direct connection to nature with her supportive but subtle scaffolding.

During interviews at the river, children talked about discoveries and appreciating nature, including making statements such as “I liked singing to Fallen Tree,” “I liked watching the turtles,” and “I liked seeing the butterfly.” Another child described learning that “I could get a little more closer to turtles than we did last time.” When asked about what they do to keep the river a nice place to come, both for people and for the creatures that live there, the children made connections to prior knowledge. They talked about picking up trash, not littering, not cutting down trees, and protecting animals by not touching them. The children made connections between rules at school and at the river, with one child explaining, “We don’t bring nature objects back to school ‘cause the animals might need to climb on them or eat them or something.” Connecting to natural processes, Anthony said, “And don’t take the leaves off where they’re growing. You gotta keep them there so they can grow even bigger.” In a different interview, Michael explained that, “For bears, we grow more trees because bears can climb and up on tall trees is good for them to hide from predators.”

In the interviews at the river, children were asked, “Why should we go to the river?” The children struggled to answer this question and repeated their same answers throughout the year, primarily saying that is it fun, that it gives children energy, that children get exercise, and that you learn new information and skills (e.g. seeing interesting creatures, finding footprints, learning how to hike and climb). A couple of children showed an appreciation of the aesthetics of nature, answering “That it’s so nice, just like so beautiful” and “Because there’s so much beautiful sounds.” The teacher encouraged the preschoolers to reflect on their days and challenged them to give thoughtful answers to the questions. In the passage below, Lisa pushed the children to think about why the teachers take children to the river.

Cara: What is good about going to the river?

Emma: That you get a lot of exercise.

Matthew: Yeah, that you get a lot of exercise.

Michael: And you can come practice your muscles.

Daniel: And you can get a little exercise.

Lisa: Okay, so guys, you guys have said that a lot of times when Cara’s asked it. I feel like that’s an idea that you have really strongly, that the river’s good for exercise. Now I’m just going to ask you to stretch a little and wonder ‘cause I’m going to point out to you that would you say you get exercise on the playground?

Daniel, Matthew, and Michael: Yeah.

Lisa: So why would we just not stay on the playground for exercise? Why would we come here? Why would we go to all the trouble to put your car seats in the van and drive all this way? What is particularly special about coming here that's different than school? In your opinion. I mean, I have my opinion, but your opinions.

Emma: Nature.

Daniel: Nature.

Anthony: Yeah, nature.

Matthew: Yeah, nature.

Anthony: Make sure that people are safe.

Michael: You know why I think nature: 'cause trees help you breathe and there's more trees right here.

Lisa: Do you actually mean Michael that when we come here, you think it helps our breathing.

Michael: Uh-huh. 'Cause there's more trees.

Lisa: Interesting. Do any of you notice that you breathe differently when you're here?

Michael: Yeah. (looking around)

Lisa: So interesting. I never thought about that before.

On the final day at the river for the school year, the researcher asked the children about their favorite aspect of going to the river. Many children immediately started looking around, up in the trees and at the sky.

Daniel: That there's so many trees.

Matthew: That we learn a lot of things every time that we come. New things.

Anthony: Like it's so warm here.

Daniel: And sometimes you can see the clouds moving here.

Emma: That even if it's really sunny, it's still shady.

Daniel: (looking up at the sky) Hey, I just saw a few rainbows come down sort of. It's like the sun's making the rainbows come straight down.

Michael: That it's kind of a challenge to stop at all the rendezvous.

Lisa: I would say the river grows your brakes, right?

The children practiced early scientific learning in the context of the constructive, child-centered approach. Through teacher guidance and peer collaboration, children developed the ability to observe, predict, compare, question, and evaluate in highly complex and interconnected ways. In conjunction with early scientific learning, the children showed advanced levels of stewardship, in a variety of forms. Furthermore, child interviews demonstrated that the children enjoyed their time in nature, finding it fun and challenging.

Teacher Guidance

Teacher guidance was examined in the video-recordings primarily through two codes: offering strategies to solve challenges and serving as a "memory keeper" (verbalizing connections between current children's experiences and

also connecting to the wider community of past preschoolers and families). Teacher guidance was further contextualized with interviews, particularly around the themes of fostering inquiry and cultivating an ethos of respect for nature.

Offering strategies for solving challenges. Across the 16 days, there were 37 instances of the teacher providing strategies to solve challenges (see Table 1). One day, for example, the water was very high and the children were walking on a narrow, muddy part of the trail next to the river. Lisa identified and reinforced a safety strategy used by one child by saying, "Matthew, it's a good idea to put your hands like that. You're really balancing."

In another example, the children started walking one-by-one across a bridge they built to test it out. All the children but one crossed the bridge, and the teacher and other children offered guidance.

Lisa: I think we have one more tester – we have Olivia.

Olivia: No, I don't want to.

Lisa: You're not going to test it Olivia? I wonder why not.

Olivia: Because I'm too scared.

Michelle: I'm a person you can hold on to.

Daniel: Yeah, Michelle can hold on to you.

Emma: Anyway, it's safe.

Lisa: Hey Olivia, you could be scared and try it anyway, which would be stretching your courage. It's obviously a choice, but it's just something to think about. It can be a really satisfying feeling to be scared and then try anyway.

Playing the role of memory keeper. The teacher was deliberate about connecting experiences at the river to school, to home life, and especially to past trips (110 memory keeper codes across 16 days, with an average of 6.88 per day; see Table 1). She frequently adopted the role of memory keeper to demonstrate growth over time in individual children. For example, after Daniel initially struggled crossing from the bank to a rock in the river, the teacher returned to it on subsequent trips as it became easier for Daniel.

Lisa: Hey Daniel, I have to tell you that I remember watching you do that early this year or maybe last year, and it took you so much longer.

Daniel: I figured out that I should face forward and then put one leg on and then turn around and hold my hands onto that little backrest and then once I get my other foot on, I sort of step onto that to the lower rock and then I can use my hands onto this rock.

Lisa: You just found a really comfortable procedure for yourself.

The teacher also used the role of memory keeper to offer new perspectives on events that occurred during their explorations. After one child fell in the water and was worried about being wet and muddy, Lisa encouraged him by articulating "that's what you're supposed to do here – get muddy or get wet." By telling the story of a former preschooler who had the exciting record of falling 37 times at the river one day or by describing wet clothes as "awesomely river-y," the teacher built an important narrative for the children. Her language encouraged children to take on challenges and to see engagement with the natural world in a positive light.

Fostering inquiry and discovery. Using an inquiry-based approach around discoveries, the teachers encouraged the development of early scientific reasoning through questioning rather than providing answers. Beyond discoveries, teachers also used questions to engage with children about their experiences, thoughts, and emotions. Through vocalization and documentation, the teachers guided collective emerging narratives, telling stories about the

children that enabled them to develop confidence. The narrative told to children, as described by one teacher in her interview, is "You don't know how to do that yet because you're still learning. It's going to get easier when you practice." Or, "That didn't work that time. Sometimes that happens when you're still learning to do something: you can't do it yet or you mess up the first time you try." Or, "That's what it's supposed to look like when you're learning. It's just exactly where it needs to be for now." The teachers employed a growth mindset to foster children's understanding of continuous learning, a particularly important strategy within a mixed-age group.

The teachers intentionally built a cultural context in which children knew their discoveries would be interesting and exciting to both teachers and peers. Within this framework, children often vocalized what they noticed and spent large amounts of time trying to understand what they discovered. The teachers, by asking questions and not providing answers, instilled in children a sense that if they discovered something interesting, they could learn about it. As one teacher explained in an interview, this approach helps children by "having inquiry as part of their regular life."

Creating an ethos of respect and appreciation for the environment. Lisa identified the "profound mystery" of being at the river: "What is it that de-stresses the stressful environment enough for children to thrive there?" She explained that natural environments challenged the children around "the helpful behaviors, the problem solving behaviors, the physical endurance, physical risk-taking, [and] making something out of nothing like figuring out what to do with yourself when there's no toys except five cups and five shovels." When talking about how a child who, if left alone, would "never leave the concrete," loves the river, Lisa asked, "How does that happen?" Sharon replied, "He was allowed to do it his way" because the teachers did not force him to engage and they gave him space. As Lisa said, the natural environment is "really rough and untidy, [and] it's really beautiful… whatever that mess of mixtures is seems to work on kids in a way that mostly seems really beneficial to them, but I can't exactly tease that apart." At the river, children build a relationship with a wild space, a deep human need, which Lisa said "is grossly neglected in our current world."

In interviews, the teachers explained that wild, unstructured places are forgiving and demanding at the same time, leading to significant growth and development. While it is challenging and uncomfortable with no set activities, children leave feeling empowered as they meet challenges. The teachers identified how the river offers a bounty of opportunities for unstructured play and exploration in an environment that is only naturally provisioned (as compared to a playground or the creek). At times, the environment can be harsher and more difficult for the children to manage as they get wet, fall down, or struggle with boredom, asking themselves "What can I find to do here?" The teachers identified the importance of providing sensitive and supportive guidance within a rich environment that encourages problem solving, pretend play, collaboration, and risk taking; and community support and involvement in children's development, particularly around nature experiences. They take children outdoors because nature is a "mood boost" and a rich, ever-changing place to learn to be a scientist that opens imaginations and provides sensory input while developing children's self-efficacy as they meet challenges. They also stated that nature is one of the fundamental human relationships so it is important to them that children connect with it. They believe that when children are in an environment with other children who are using their bodies, appropriate risk-taking develops. Nature is an outlet and a place where children can be wild. As the teachers explained, nature can "open children's minds and imaginations to the possibility of how things are not just one way… everything is kind of open and moving and different no matter the day."

Conclusions

The present research was a longitudinal case study of a Reggio-inspired and nature-focused preschool that emphasizes time spent outdoors and affords children multiple opportunities to connect with the natural world. During weekly visits to a local state park, the preschoolers verbalized their awareness of the natural environment, demonstrated scientific reasoning, and engaged in environmental stewardship through sustained interactions with each other and their teacher.

As demonstrated in prior research, authentic engagement with nature builds stewardship, environmental awareness, and a connection to a wild place. Those three aspects are key to building a generation that actively

engages with nature, has an environmental ethos, and generates creative conservation solutions (Chawla, 2002). As Chawla (2009) articulated, children move towards complex interactions with nature and a stewardship mindset within the context of collaborative and supportive peer and adult interactions. The results of the present study indicated that children articulated a developing awareness of their selves in relation to the natural world and exhibited stewardship verbally and through actions. In addition, these complex interactions with nature occurred in a context of consistent teacher guidance, interactions with mixed-age peers, and an appreciation for the environment as third teacher.

Examining the results within a longitudinal framework of change over time provides further support for the importance of consistent and repeated time in wild settings for children's awareness of themselves in relation to the environment, scientific reasoning and discoveries, and stewardship and appreciation, all three of which support building a relationship with wild spaces (Chawla, 2002, 2009; Sobel, 1995). Children demonstrated awareness of their surroundings by noticing new plants, by verbalizing their experiences of falling down or exploring new hiding places, and by asking their peers questions about discoveries. Over the course of the year, as children practiced being aware of their selves in relation to the environment, they gained a sense of their own competencies and also came to understand that they live in a world with other living beings (the natural world, their friends, teachers, and families). The children exhibited stewardship in a variety of forms throughout the year, displaying high levels of positive emotion, particularly excitement, indicating that they felt comfortable in the outdoor environment. The results depicted children's developing sense of place and connections to local flora and fauna, especially as they noticed changes from week to week, an awareness of continuity and change that is particularly important for the development of stewardship (Sobel, 1995). Findings from this study indicated that teachers helped cultivate a positive relationship with nature instead of a fear-based relationship, which may support later efforts at conservation and continued stewardship (Sobel, 1995).

The teachers supported children's scientific explorations and discoveries through socially constructed inquiry, which helps to build a connection to the natural world as knowledge is gained through recurrent positive experiences (Inan et al., 2010; Vandermaas-Peeler & McClain, 2015). Teacher scaffolding and involvement created opportunities for children to compare, classify, and communicate as a teacher asked questions or established connections between current and past experiences. Furthermore, the children had an inherently collaborative scientific reasoning and discovery process as they moved through the natural environment in small groups, sharing their findings and hypotheses with one another as well as their teachers. The inquiry-based approach aligns with and supports the teachers' focus on the Reggio Emilia child-centered constructivist pedagogy, in which children make discoveries within a supportive community of adults and peers. Because the school's teachers believe that children are active creators of their own knowledge and understanding of the world, they support the children in actively exploring their environment, asking questions, and reflecting on those experiences. Over the course of the year, the children strengthened their ability to make connections, ask questions, engage in scientific inquiry, apply logical thought, and grapple with confusing or unknown discoveries.

The results provide support for the importance of teacher guidance and support in creating an ethos of respect. The teachers intentionally tried to make the children view themselves as capable and full of interesting ideas. The teachers also gave children room to explore, fall down, and work through boredom, all within the safety net of peer and teacher support. Additionally, as the teacher played the role of memory keeper at the river, she was able to help the children see themselves in their broader context of school and home and to see their growth over time, thus building their capacity for taking on challenges. The narrative the teachers intentionally created at the river to encourage a growth mindset is the same narrative they build at school and that they teach to parents, cultivating a common thread across learning environments. By explicitly talking about how a relationship with nature is fundamental to healthy development, the teachers prioritized time outside with the children and helped the children come to see its importance for themselves.

The results are limited in their generalizability, given the small sample of children, the unique and selective characteristics of the preschool, and the particular natural environments that were studied. However, the intent of the present study was not to generalize to all preschools or all children. Rather, the case study results highlight the

value of repeated and regular experiences in wild settings for young children's developing relationship with nature within a supportive community of teachers, peers and parents.

Gaining a deeper understanding of the impact of recurrent experiences in wild settings on young children's development is important for psychologists, educators, and environmental activists. Findings indicated that while outdoors children showed self-awareness with regard to environmental features, generated complex scientific theories around discoveries, and engaged in environmental stewardship. The teacher provided sensitive guidance for children's individual and collaborative explorations and for their appreciation of nature. Current policies and practices may be pulling children out of the natural world, but results of the present study support the premise that time spent in nature with a caring adult facilitates children's understanding of and connection to the natural world (Chawla, 2009; Chawla, 2002; Louv, 2008).

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"We won't hurt you butterfly!" Second-graders become environmental stewards from experiences in a school garden

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Abstract

This is an important time to catalyze hope about the environment instead of fear and despair. One such opportunity for hope lies in school garden programs. Most of the scant studies on these settings investigate the health/nutritional impacts, science learning potential, or emotional dispositions of students. However, few studies examine the shifts in environmental attitudes that occur for students as a result of experiences in school gardens. This paper provides an example of how a school garden can improve student's environmental attitudes and help them to develop as environmental stewards. A study of second graders experiencing a garden-based science curriculum on insects is described. I argue that school gardens have the potential to help children develop a more empathic view of nature and become environmental stewards, but are often opportunities missed due to the challenges associated with their use.

Keywords: environmental attitudes, environmental stewardship garden-based learning, outdoor learning

We live in a time when our children are bombarded with messages that our Earth's climate and resources are in jeopardy. I hesitate to watch nature programs on television with my seven-year-old son because the last several we watched together ended with a sense of hopelessness that all will be lost unless something is done. This is an important time to catalyze hope instead of fear and despair. One such opportunity lies in school garden programs. I became interested in school gardens as an elementary school teacher over the course of seven years. I found that when I incorporated the garden into my teaching practice, my students learned the required curriculum, and more, in deep and meaningful ways (e.g., 2013; Blaire, 2009; Fisher-Maltese, 2013; Fisher-Maltese & Zimmerman, 2015; Klemmer, Waliczek, & Zajicek, 2005; Williams & Dixon, 2013). My students also seemed to learn about the importance of eating more fruits and vegetables (Nanney, Johnson, Elliot, & Haire-Joshu, 2006) and getting more physical exercise (Dillon, Rickinson, Teamey, Morris, Choi, Sanders & Benefield, 2006). I have been exploring school gardens ever since with the hope of better understanding their potential impacts.

This paper provides an example of how a school garden can instill a sense of hope and help them to become environmental stewards. First I will describe a study I conducted as a doctoral candidate on a garden-based science curriculum and its findings and then discuss the implications and challenges associated with using a garden-based approach. In the study, second graders' (n=71) experiences participating in a garden-based science curriculum led to improvements in their environmental attitudes (Fisher-Maltese, 2013; Fisher-Maltese & Zimmerman, 2015). Environmental attitudes are defined as "a psychological tendency expressed by evaluating the natural environment with some degree of favor or disfavor" (Milfont & Duckit, 2009, p. 81). Specifically, students developed a more empathic view of nature, in this case insects, and became interested in protecting the insects from adverse environmental factors, such as habitat loss and pesticide use.

Similarly, Project GREEN (Garden Resources for Environmental Education Now) is a program that uses a garden to teach about the environment and sustainability (Skelly & Zajicek, 1998). Two research studies, both employing the Project GREEN curriculum, have investigated environmental attitude change in conjunction with school gardens. Skelly & Zajicek (1998) surveyed second- and fourth-grade students (n=153) from four elementary schools in Texas who participated in the garden program and compared them to a control group (n=84) that did not participate in the garden program. Using the Children's Environmental Response Inventory, Skelly & Zajicek (1998) found garden program students demonstrated more positive environmental attitudes. For example, they noted higher scores in pastoralism, or "enjoyment of the natural environment in an intellectual and aesthetic fashion," than those students without the garden experience (Skelly & Zajicek, 1998, p. 579).

Similarly, Waliczek and Zajicek (1999), studied 589 second- through eighth-grade students from seven schools in Texas and Kansas, finding that environmental attitudes changed in a positive direction on a project-specific environmental attitudes scale called The School Garden Program Environmental Attitude Inventory after experiencing Project GREEN gardening activities. Mittelstaedt, Sanker, and Vanerveer's (1999) study of 46 U.S. children attending a five-day environmental summer program found that "although students arrived with a positive attitude toward the environment, they left the program with an even stronger environmental attitude" (p. 147). More broadly, Dillon et al. (2006) reviewed research conducted in Europe, Australia, and the United States on the value of outdoor learning experiences. They found that outdoor learning opportunities improve students' attitudes about the environment, along with other positive impacts.

As I have found through my own work, experiences in school gardens not only have the potential to improve students' attitudes toward the environment, but provide opportunities for children to develop as environmental stewards (Fisher, Svendsen & Connolly, 2015). Fisher, Campbell, and Svendsen (2012) define environmental stewardship as, "conserving, managing, monitoring, advocating for, and educating local people about a wide range of quality-of-life issues related to public and private resources in their local areas" (p. 27). Through this garden-based curriculum, students explored whether they felt it was important to protect where insects live and how to protect insect habitats, which are so often ill affected by human behavior. Many of the students shifted from fearing insects to wanting to protect them. As I discuss in greater detail in the following sections of this paper, engagement with the school garden in this garden-based science curriculum encouraged the students to become environmental stewards. In the following sections, I will describe the study context, the curriculum that was implemented, the data sources, and results of the study.

A Garden Instills Hope and a Will to Protect Nature at Penn Valley Elementary School

At Penn Valley Elementary School (a pseudonym), in New Jersey, I created and evaluated a garden-based science curriculum on insects in four second-grade classrooms using multiple forms of complementary data. Sixty-six second graders participated in the study, along with four teachers, and one principal (n=71).

I had taught second grade at Penn Valley, a K-3 elementary school, and initiated a school garden in 2005. The school garden at this school consists of four large and two small raised beds surrounded by mulched paths and a deer- and rodent-proof fence. Teachers, students, and parents grow vegetables, herbs, fruit, and flowers, and maintain the garden. The fence is lined with an internal and external border of perennial plants. One section of the border contains perennial plants that are food sources for local butterflies. The garden is located on the school's property, although a distance from the building and across a parking lot. Students primarily use the garden during class time accompanied by a teacher. Students and their parents volunteer to help maintain the garden year-round, especially in the summer (see Figure 1).

Figure 1. Teachers, parents, and students volunteer on a garden work day.

Garden-based Curriculum

The second-grade science curriculum at Penn Valley Elementary School includes a unit on insects during the spring. Typically, specimens are ordered from a science supply company and raised in the classroom to demonstrate their life cycle changes. Painted lady butterflies are the most common insect observed in classrooms at the school. The year of the study, teachers from Penn Valley also chose to study ladybugs and praying mantises since they are beneficial to the garden and served as a practical means to connect the insect curriculum to the school garden. However, ladybugs pose a unique challenge to observing the different phases of the life cycle since most science supply companies typically ship adults, because larva are fragile and tend to die during transport. The garden provided a living laboratory where the different phases of the life cycle of ladybugs were observed (see Figure 2).

Figure 2. Ladybug adult and eggs found on the underside of a leaf of a Milkweed plant.

Following a co-design approach (Penuel, Roschelle, & Shechtman, 2007), I developed a four-week standards-based science curriculum on insects collaboratively with four participating teachers, utilizing the school garden (see Figure 3). The students participated in classroom and garden insect lessons every day during the curriculum. I facilitated lessons by supporting the teachers and co-teaching the lessons in the school garden. Lessons were focused around

week-long themes including anatomy, life cycles, helpful and harmful insects, butterfly and larva identification, and designing a butterfly garden (see Table 1).

Table 1
Curriculum Overview

Lesson 1: Using the 5 senses to observe and explore the school garden	
Days	Key Questions and Activities
Day 1:	What's a garden? How do I use my 5 senses to observe and explore?
Day 2:	Exploration in the school garden
Lesson 2: Arthropods and insects – Basic anatomy and life cycle	
Day 1:	What's an insect? What's an arthropod? Conduct an observation of a praying mantis Using a rubric in the classroom
Day 2:	Catch and conduct an observation of an insect in the school garden
Day 3:	Helpful and harmful insects
Lesson 3: Butterflies – A type of insect	
Day 1:	How to identify butterflies
Day 2:	Conduct an observation of butterflies in the school garden
Day 3:	Identifying butterflies by their larva; Conduct an observation of caterpillars in the classroom
Lesson 4: Designing a butterfly garden	
Day 1:	What attracts butterflies to a specific habitat?
Day 2:	Butterfly life cycle
Day 3:	Plant nectar and host plants in the school garden

Figure 3. As part of the garden-based curriculum, second-grade teacher releases Painted Lady butterflies in the garden with her students.

Data Sources

Over the course of the four-week curriculum, I collected several forms of data related to attitudinal shifts by students. Complementary data sources included: (a) pre/post-tests, (b) pre/post environmental attitude surveys, (c) interviews, and (d) student conversations in the garden.

Pre/post-tests. I administered pre/post-tests to assess science content knowledge and student attitudes toward the environment. Pre-tests were administered the same week the curriculum was initiated and post-tests within one week of curriculum completion. Pre/post-tests included multiple choice and open-ended questions designed to elicit students' understanding of insect anatomy, life cycles, behavior, habitats, and attitudes toward insects and habitat loss.

Pre/post surveys. To capture shifts in students' environmental attitudes over the course of the curriculum, I used a pre-existing survey instrument designed by Ratcliffe (2007). Ratcliffe's (2007) survey was selected because it was previously used to measure changes in environmental attitudes as a result of a school garden experience and was most-closely age-appropriate (although some language had to be simplified since it was designed for sixth-grade students). An abbreviated version of Ratcliffe's (2007) Ecoliteracy Survey included statements about students' ecological attitudes toward extinction, organic produce, water pollution, land conservation and littering, and energy and water conservation. Sample survey items are found in Figure 5. Ratcliffe (2007) explains, "These eco-attitudes were identified as 'things environmental people cared about' and are conceptualizations of environmentally responsible behaviors found in the literature (Bunting & Cousins, 1983; Jaus, 1982)" (p. 78). In Ratcliffe's Ecoliteracy Survey (2007) there were a total of seven attitudinal statements, which included a 5-point Likert scale (e.g., 1 = strongly agree, 5 = strongly disagree). For example, one statement from the survey was, "Trying to protect the environment is my responsibility," with response options ranging from "agree" to "disagree" across a 5 point Likert scale. Another statement was, "I think people should build more parks for animals." For all but two of the statements (2 and 8), a 1, or strongly agree, was the most desirable response. For example, statement 1 read "I am worried about animals that are going extinct." For statements 2 and 8, the inverse was the most desirable response so the responses were re-coded for consistency (i.e., a 1 became a 5, a 2 became a 4, etc.).

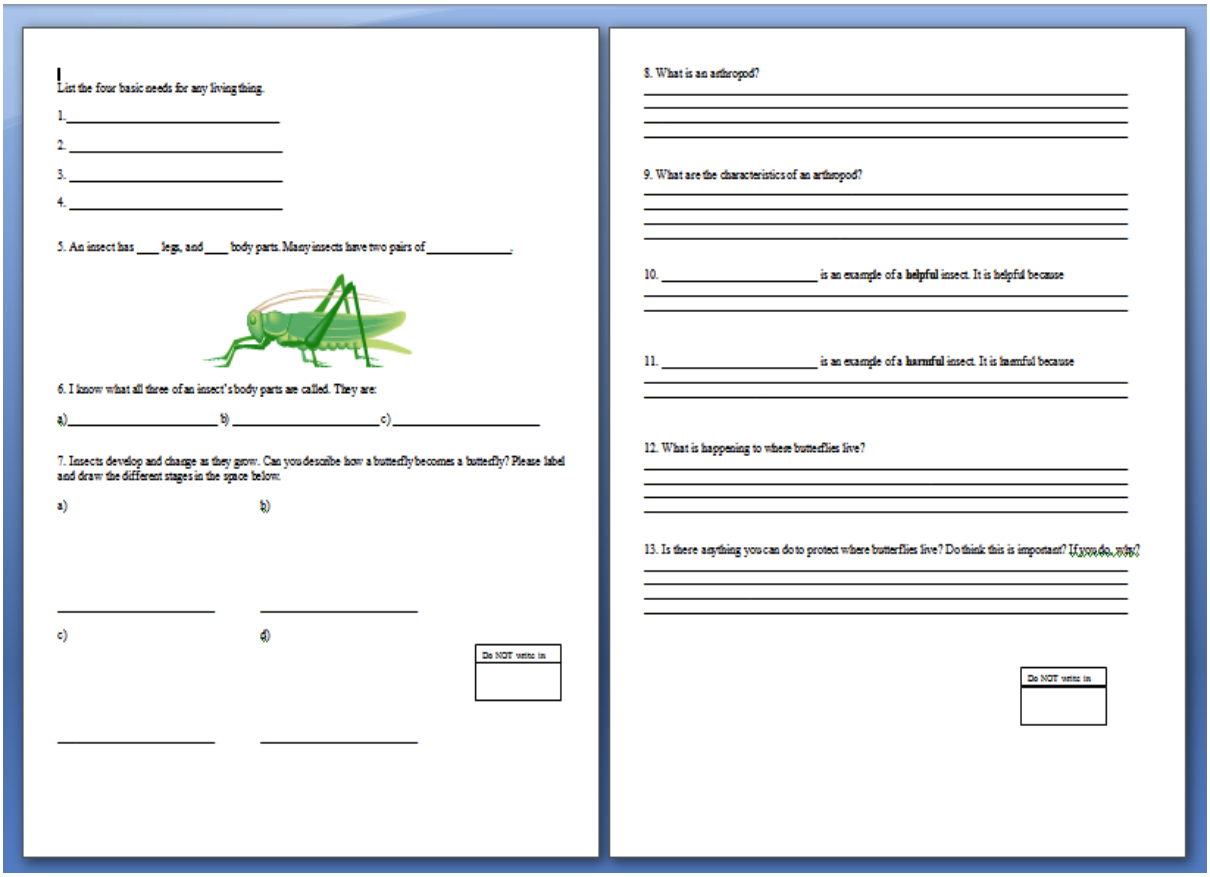

Figure 4. Pre/Post Test Sample Items.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am worried about animals that are going extinct.	**1**	**2**	**3**	**4**	**5**
Trying to protect the environment is my responsibility.	**1**	**2**	**3**	**4**	**5**
I would come to school on a Saturday to plant flowers.	**1**	**2**	**3**	**4**	**5**

Figure 5: Pre/Post Environmental Attitudes Sample Items.

Interviews. I conducted semi-structured pre-/post-curriculum interviews with four students in each classroom (n = 16). Interviews were audio recorded and videotaped for accuracy and later transcribed.

Student conversations. I digitally audio-recorded student conversations during lessons in the school garden to capture in situ learning and attitudinal shifts. I placed small digital recorders in students' pockets and lapel microphones on their shirts to capture their conversations (see Figure 6).

Figure 6. Students with parental permission wore digital recorders with lapel microphones to capture in situ conversations.

Data Analysis

Data analysis followed a multi-step process; quantitative and qualitative data were analyzed separately and then examined for triangulation purposes.

Pre/post-tests. Pre/post-tests primarily assessed science content knowledge, but also contained one question which measured attitudes toward the environment. Pre/post test data were analyzed using a rubric I developed. Inter-rater reliability was conducted and yielded 94% reliability. Paired sample t-tests were conducted using the statistical software, SPSS, on the pre/post-tests.

Pre/post surveys. I used Ratcliffe's (2007) Ecoliteracy Survey described above. Students' responses were entered into an Excel spreadsheet. Responses were then added together to create an index (Index A = pre-test, Index B = post-test). Indices provided a general measure of environmental attitudes over time (i.e., from pre- to post-test). Statistical analysis involved paired sample t-tests using SPSS.

Interviews and student conversations. Interview and student conversation data were first transcribed and organized by data source. Next the data set was described with several rounds of coding. The first round of coding involved looking for evidence of environmental attitude shifts. For subsequent passes of data coding, sub-codes were created both deductively from the literature and inductively from the data, following recommended qualitative data analysis protocols (Creswell, 2007). Table 2 describes the coding scheme we used, including the code, criteria, and examples. Codes for environmental attitudes included "protect habitat," "fear of insects," and "desire to protect insects/compassion towards."

Table 2
Coding Table

Code	**Criteria**	**Example**
Protect habitat	Demonstrated a desire to protect insects' habitat	"Yes, because they didn't harm you or anything and they didn't do anything to your place and now you should do something to help them because they need to have a habitat to survive."
Fear of insects	Demonstrated a fear of insects	"Yeah, because then like bees, if you ruin their home, they'll chase after you. But beware of killer bees because they might like, I think they might kill you because they're called killer bees."
Want to protect insects	Demonstrated compassion towards insects	"What? No! Don't hurt nature!"

Results

Several forms of data were used to assess if students' attitudes toward the environment changed throughout their use of the school garden. In this section, the following results are discussed: responses to a specific question on the pre/post-test, pre/post environmental attitudes survey, interviews, and student conversations in the garden.

Quantitative Results

Pre/post-test. Of the 88 students who took the pre-test, 63 also took the post-test. Therefore, a total of 63 paired pre/post tests were collected. Only one question assessed students' environmental attitudes on the pre/post-test. Question 13 read: "Is there anything you can do to protect where butterflies live? Do you think this is important? If you do, why?" However, this one question was separated into the separate sections, each coded independently. For the first part of this question, among answers coded as "correct" were responses such as plant seedlings for nectar plants (i.e., those with flowers from which butterflies obtain nectar), don't pull important plants thought to be weeds, and don't harm habitats (see Figure 7).

Figure 7. Students plant nectar plants for butterflies.

These responses also can be coded as pro-environmental responses and thus relate to students' attitudes toward the environment. If students provided some "other" response, it was considered incorrect. While many students answered, "I don't know" (n = 53) to question 13 on the pre-test, post-test answers included a variety of responses. Many students had ideas for things they could do to protect where butterflies live (question 13: n = 36 answered "1" for a positive behavior), such as "plant food for the butterflies to eat" and "ask my parents to stop spraying our lawn [with pesticides]." On this part of the question, students' pro-environmental responses increased by 32% and the number of students having no opinion decreased by 17% (see Table 3).

Table 3
Responses to "Do you think it is important to protect where butterflies live?"

Response	Pre-Test	Post-test
Yes	17	25
No	1	1
I don't know	48	40

For the third part of the question, 36% more students provided a "good reason" for why it is important to protect butterflies. Good reasons included: "butterflies are helpful insects because they pollinate flowers," "help plants grow," and "are living things." ("Not a good reason" usually was an unrelated response, e.g., "butterflies have three body parts," "butterflies are different colors.") 21% fewer children had no opinion on the post-test compared to the pre-test (see Table 4).

Table 4
Responses to "If you do [think it's important to protect where butterflies live], why?"

Response	Pre-Test	Post-test
Good Reason	16	25
Not a Good Reason	7	7
I don't know	43	34

Pre/Post environmental attitudes survey. Sixty-three students completed both the pre- and post-survey; only these repeated measures were analyzed. Analysis of these pre/post surveys did not result in a statistically significant pre-post change.

Qualitative Results

Interviews. Sixteen students (four in each of the second-grade classes) were interviewed before and after the curriculum. Pre/post curriculum student interviews included the questions, "Do you think it's important to protect where insects live? If yes, why? How can you protect where insects live? Is there anything you can do?" In total, 6 out of 16 students' interview responses showed a positive shift in environmental attitudes from pre to post curriculum (see Table 5); the other 10 students had a positive attitude toward the environment at the start of the curriculum which remained positive at the end of the curriculum (i.e., there was no change in their attitudes toward the environment).

Table 5
Student Interview Responses to "Do You Think It's Important to Protect Where Insects Live?"

Student	**Pre/Post**	**Response**
Pamela	Pre	*No. Because they eat our plants.*
	Post	*Some places like we don't need to protect where ants live. And other critters, but we do need to protect some of, ones that eat other insects and that don't do any harm to us.*
Carson	Pre	*Yeah, because then like bees, if you ruin their home, they'll chase after you. But beware of killer bees because they might like, I think they might kill you because they're called killer bees.*
	Post	*Yeah, because some are helpful so, like the ones that are helpful you would keep safe and then the ones that are not very helpful, you wouldn't.*
Margaret	Pre	*No.*
	Post	*Yeah, because insects are important to the world. You can't live without insects because some are helpful. For example, a dragonfly. Because mosquitoes bother people, but dragonflies eat mosquitoes and then there are less mosquitoes. And an example of a harmful insect is a killer bee.*
Kyle	Pre	*Yes, because if you hurt an insect, they'll hurt you back. Like if you hurt a bee, it will sting you.*
	Post	*Yes, because they didn't harm you or anything and they didn't do anything to your place and now you should do something to help them because they need to have a habitat to survive.*
Isaac	Pre	*Yes, otherwise you have another animal to add to the endangered species list. There are so many.*
	Post	*Yes, since most butterflies now are dying…because people are killing like, they're putting bug spray…and then they're well, they're searching for the habitat and [people are] building cities there.*
Noah	Pre	*Mm-hmm. Because they could become endangered and maybe even extinct. We need insects…I mean if we didn't have honeybees, there would be no such thing as honey, which never spoils.*
	Post	*Yes. Well, because not all of them are pests or harmful. They're helpful because they want to protect, and they help pollinate flowers.*

Table 5 demonstrates the six students' shifts in attitudes from pre to post curriculum. In summary, Pamela[1] and Margaret exemplify students who had a complete attitude change. They changed their attitude from "no, you should not protect where insects live" in the pre-curriculum interview to "yes, because some insects are actually helpful, and not all are harmful." Similarly, Pamela, Carson, Margaret, and Noah seemed to regard insects favorably in the post interview because some insects are helpful. Isaac and Noah did not change their opinion that insects' habitats should be protected, but their reasoning in the post-interview was much more sophisticated. During the pre-interview, both explained that you should protect insects because you do not want more animals added to the endangered animals list. However, in the post-interview, Isaac explained how people are responsible for the butterflies dying due to spraying pesticides and habitat destruction and Noah explained how insects are important for pollination. Carson and Kyle explained that you should protect where insects live because insects will hurt you if you don't protect their habitat. In the post-curriculum interview, Carson expressed that you should protect the insects' habitats that are helpful. Kyle seems to have developed some compassion towards insects. He thinks he should help them since they need a habitat to survive.

At least four students communicated a fear of insects in the pre-interview. Clearly, students had either been taught or learned through personal experience that insects are frightening. For example, Darren explained in an interview, "I don't like insects. Like I can draw an insect, but when people talk about them a lot, I start to shiver and then I feel like I have bugs and insects crawling on me." Darren refused to touch the plastic creatures I asked him to sort into two groups during the interview: insects and non-insects. He felt more comfortable pointing as I moved them for him into two different piles. Interestingly, Darren seemed to overcome or forget about his fear during the lesson in the garden which involved catching insects with tweezers and nets and observing them in bug boxes. In the audio-recorded conversation between him and his partner, Darren does not once express fear and seems engaged in the activity.

Figure 8. Students caught insects in the garden, which they later identified and observed.

Student conversations in the garden. Student conversation data also provided support that students had a positive shift in attitude toward the environment. Students' comments fell into two categories: expressing concern for insects and wanting to protect them and expressing excitement about catching insects as part of the curriculum (see Table 6).

[1] All names are pseudonyms.

Table 6
Student Voices from the Garden

Concern for Insects/Desire to Protect Them
We won't hurt you butterfly! (chasing a Cabbage White)
Robert, let it go. Let him go! There he goes. He jumped! There's Larry, the grasshopper. Don't touch him!
You have to learn to be gentle with that! (to others with nets)
Dude, don't do that. You're going to kill it.
Student 1: *Look, there's a wood ant! Right there. Kill it!* **Student 2**: *What? No! Don't hurt nature!* **Student 1**: *I'm not. I'm just kidding.*
Excitement About Catching Insects as Part of the Curriculum
Teacher: *Group 1, you're going to look for insects.* **Students**: *Yes!* (squeals)
I saw a really cool insect, Rohan. Somewhere…here. Get over here! Look at that one. Get it!
Student: Mrs. F-*M can you come next week and we can try to catch more butterflies*? **Researcher**: *Yes, we're going to do that.* **Student***: YAY!!!*
Teacher: *Would you like to help me break the lumps?* (in the soil before planting flowers) **Student**: *Sure, I'd love to!*

Figure 9. Two students run to catch butterflies by the garden.

Discussion

Findings from this study are in line with conclusions from Blair's (2009) review that found students' environmental attitudes do not consistently improve with gardening. I attempted to use triangulation to corroborate my results, but instead found interesting differences between the survey results and the pre/post-test, interview, and student conversation data. The quantitative survey data for this study show no statistically significant shifts in attitudes. However, in contrast to the survey data, data from the pre/post-test, interviews, and student conversations suggest an improvement in students' attitudes toward a more empathic view of nature, thus preparing to become environmental stewards.

Figure 10. Student observes a caterpillar she caught in the garden earlier that day.

Students' changing their opinion of insects as a result of studying them is not unique to this study. For example, Ratcliffe (2007) found that teachers from her study reported that students became "more insect friendly" and that "not all kids want to make their hands dirty, but…they got used to it and [then]…they wanted to touch the worms and insects" (Ratcliffe, 2007, p. 80). In addition, my pre/post-test, interview, and student conversation data are in-line with other research studies that show positive shifts in environmental attitudes for students as a result of outdoor education programs generally (Carrier, 2009; Fancovicova & Prokop, 2011; Farmer, Knapp & Benton, 2007) and experiences in school gardens, in particular (Skelly & Zajicek, 1998; Waliczek & Zajicek, 1999).

However, there are methodological challenges in generating classroom-based action. I encountered challenges with regards to an inconsistency in my results, which led me to question the survey tool I used and its reliability for this population and for this context. During my search for a valid, reliable instrument for measuring environmental attitudes, I found only three instruments that had strong measures. However, only one of these instruments had been modified for research with children (Manoli, Johnson & Dunlap, 2007). I ultimately chose the only instrument I could find that was developed for students participating in a gardening activity. I believe I saw no change from pre- to post-survey because of the limitations of the instrument and a possible ceiling effect. In hindsight, the questions from the survey I used were too general and did not match the specific curriculum content. For example, our students' shifts in environmental attitudes were often about insects specifically. Data suggest that perhaps another tool would have resulted in quantitative pre-post changes. For instance, a scale that included fear toward nature (or specifically insects) would have captured changes in the students' environmental attitudes. In addition, similar to interview responses in Mittelstaedt et al.'s (1996) study, a majority of our students (10 out of 16) began the curriculum with a positive attitude toward the environment, however, I was not able to demonstrate that they finished the curriculum with an even stronger environmental attitude. This indicates a possible ceiling effect, where the items on the instrument limit the possible answer choices in a way that constrains possible higher measures.

Conclusion

Environmental education produces environmentally literate and responsible citizens (Knapp, 2000). It also has the potential to develop young scientists who will potentially find the solutions to global environmental problems (International Social Science Council, 2014). In the U.S., The National Environmental Education Act of 1990 (NEEA) established an Office of Environmental Education in EPA's headquarters to provide leadership and support of educational programs (EPA, 2015). "Environmental education, with its emphasis on informed decision-making and stewardship, comes to the forefront as one of the most appropriate and effective tools for improving environmental quality" (EPA, 2015). School gardens are logical sites to teach about living things and environmental stewardship. Some states (e.g., California and Washington, D.C.) have passed policy that directly supports school gardens by providing funding for which schools can apply. For example, in August 2010, the Healthy Schools Act of 2010 was unanimously passed by the City Council of the District of Columbia to "improve the health, wellness, and nutrition of the students of the public and charter schools." Building on the momentum for urban agriculture, local foods, and school gardens, the Act formally establishes a school garden program for schools in the District, including the distribution of competitive grants that support the creation and maintenance of school gardens.

School gardens provide an opportunity for even our youngest students to learn science and ecological awareness. Unfortunately, in spite of some supportive policies, like the ones mentioned above, school gardens represent a critical tension in programming. In spite of evidence-based beliefs, such as children learn science or improve their environmental attitudes when out in a garden, teachers often report that they seldom use the school garden, if their school has one. Barriers, such as a lack of time and content knowledge in the areas of science and gardening, have been reported among teachers (Fisher-Maltese, 2013). These barriers are perhaps related to a policy context that requires teachers to administer high-stakes tests and adhere to curricula that exclude a thoughtful understanding of what kinds of environments might be most conducive to learning. Moreover, because students (and teachers) are expected to meet curriculum standards and test score benchmarks, indirect academic effects do not provide the hard assessment data that is required in a high stakes climate. This may explain why teachers and administrators may have difficulty justifying the time to work in the garden. This is unfortunate for *all* children, especially those who attend struggling schools and often already have little exposure to nature. There is a need for more school gardens and garden-based curricula, like the one described in this study. It is educational gardens like these that will help children develop a love of nature and become environmental stewards motivated to protect our Earth.

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Playing with Nature: Supporting Preschoolers' Creativity in Natural Outdoor Classrooms

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ABSTRACT

Conducted at two separate natural outdoor classrooms with preschool-aged children from three to five years old, this qualitative research study investigated how outdoor environments supported children's creativity and imagination. Although many studies have explored the development of creative arts in the young children, few have focused on creativity with regard to problem solving, ingenuity, and construction, as did this study. Four factors in natural outdoor classrooms that enhance children's creativity and imagination were revealed: (a) predictable spaces, (b) ample and consistent time, (c) open-ended materials, and (d) caring, observant adults who support creative play and learning.

Keywords: Affordances, creativity, environmental education, natural outdoor classrooms, young children

The continuing sustainability of our planet will require people to solve problems, adapt to a variety of situations, and communicate effectively with others. Our future world will need people who seek adventure and are on the lookout for better ways of doing things; people who have had opportunities to develop and express their creativity, who carry those experiences inside, and who can apply this quality in a wide range of life circumstances. People with these characteristics and experiences tend to live more fully and have more control over what happens to them because they have a creative outlook towards life (Bruce, 2004). For these reasons, creativity plays an important role not only in schoolwork, but beyond the school environment. Furthermore, creative problem-solving drives economic growth and factors in solutions to societal challenges. In essence, creativity can maximize human potential, people's sense of well-being, and positive societal change. Creativity can be the motivation to learn and develop skills that allow people to do what they want to do (Pratt, 2014). Bronson and Merryman (2010) report that children with high creative self-efficacy are better able to handle stress and are more "confident" about their futures than those who lack this characteristic.

Although the need to support creativity in children today is becoming increasingly evident, research indicates that it has been declining significantly on a global scale over the last 20 years. One recent report states that our approach to education in the United States and elsewhere is one of creativity's biggest threats. This decline in creativity was evident in children's responses to the challenges they faced in school, life, and work. "Children have become less... expressive... energetic... humorous... imaginative... unconventional... less likely to see things from a different angle" (Kim, 2011).

A challenge for educators who want to address this decline in creativity is that much of the literature primarily shows examples of creative experiences for children in the visual arts and dramatic play. Ideally, creativity resources would include examples of innovation and imagination from all domains of learning. Educational theorist and creativity researcher Howard Gardner remarks, "I don't think creativity is particularly connected to the arts—I think you can have creativity in any realm from business to politics to technology" (Gardner, 2012, p. 46).

Educators can support creativity in young children by encouraging flexible thinking and wide-ranging play experiences. Play can be used as a springboard for teachers to scaffold and support. Educational theorist John Dewey's work urges educators to give children something to *do* not something to *learn.* In these cases learning becomes a natural result of play. Dewey's theory supports early childhood educators who strive to offer provocations for learning in their environments and plan open-ended play-based experiences. To the untrained eye, this may look unproductive and like "messing around." However, creativity guru Sir Ken Robinson urges educators to invite this kind of "messiness" into learning for both children's sake and their own. "Creativity is not the opposite of discipline and control. On the contrary, creativity in any field may involve deep factual knowledge and high levels of practical skill. Cultivating creativity is one of the most interesting challenges for any teacher" (Robinson, 2015).

The environment's influence on the creative experience

The *Learning with Nature Idea Book* includes guiding principles for designing effective natural outdoor classrooms as learning environments (Arbor Day Foundation & Dimensions Educational Research Foundation, 2007). Natural outdoor classrooms designed with those principles in mind are environments that stimulate children's creativity and enhance their learning opportunities. Research on these natural outdoor classrooms indicates that teachers who use them credit the enhanced aesthetic value and natural, open-ended materials available to children in these spaces as two key ingredients for supporting all learning opportunities, including creativity. A recent post-occupancy study describing the attributes of natural outdoor classrooms that teachers describe as effective states, "The most successful outdoor classrooms provided: maximum choice, many child-sized spaces, pathways and borders as play affordances, flexible spaces, and support for stakeholder engagement" (Dennis, Wells, & Bishop, 2014). An earlier study conducted at a Nature Explore Classroom in Minnesota also stated that the well-designed environment filled with natural materials supported creative play. The implementation of the guiding principles for designing outdoor classrooms supported the children's freedom to choose what, how, and where to play with materials (Bohling, Saarela, & Miller, 2010).

The role of the adult in supporting and documenting play

Prior Dimensions Foundation research also explored how adults who support experiential learning were key to enhancing children's creative play. Children's experiences in their environment are shaped by the design of the space and also by the adults who share it with them. It is important for teachers to employ open-ended questions that further scientific inquiry. They should also ensure long blocks of time for deep exploration (Veselack, Cain-Chang, & Miller, 2010). "Play is the way children discover the world around them. They explore, invent, and transform it to suit their needs" (Almon, 2013, p. 6). During child-directed, open-ended play, children can try something over and over until it satisfies them and their companions. They are not forced to compete with each other or be evaluated by adult standards. They participate when and how they feel comfortable. Children's play outdoors is often seamless, moving from one interest to another reflecting the natural rhythms of children's concentration and curiosity (Nelson, 2012). When opportunities for play occur in nature-rich environments, children develop the skills across all learning domains. Teachers must be keen observers of children's play in order to see and document this wide-ranging learning as it occurs. Caroline Pratt, in her book *I Learn From Children,* first published in 1948, describes children's play and teacher's experiences observing and facilitating play in this way, "How hard they work, only we who have watched them really know. They do not waste one precious moment. They are going about their jobs all the time" (Pratt, 1948, p. 13).

Effective teachers begin with close observation of children's explorations, then strategically support children's processes and thinking to enhance learning. (Bohling, Saarela, & Miller, 2010). "The teacher's role is critical to supporting children's skill development in self-initiated experiences in a Nature Explore Classroom. The teacher needs to be physically in proximity of children, offer observations, ask thought-provoking questions, follow children's lead without taking over, and trust children to make decisions" (Veselack, Cain-Chang, & Miller, 2010). Conversation is a vital aspect of teacher support. Dialogue among children and with their teacher provides opportunities to take others' perspectives and learn about problem-solving with others. "Encouraging creative exploration and play across all domains of intelligence allows the children to develop their individual strengths into a product uniquely theirs" (Cline, Edwards, et al, 2012, p. 107).

The value of natural materials

Natural outdoor classrooms filled with intriguing natural materials invite creative play inspired by children's imagination. This is in contrast to many manufactured toys, which often encourage children to act out familiar scenarios filled with predictability. A mistaken belief is that an effective way to support creativity is by providing toys in which the inventor has already done all the creating. Premade props for dramatic play do not offer the challenges or opportunities that arise when children must find natural items they can use to represent what they envision. Natural loose parts such as sticks, logs, sand and snow can be anything children want them to be and are ever changing.

Playing with materials provided by nature has the added value of helping children learn to care about nature. "If we encourage children to hone their own imagination and inventiveness, they are less apt to need the transient novelty of a new toy to generate capacity for creative play. We are helping them develop skills and values that lend themselves to better stewardship of the earth and its natural resources" (Linn, 2008, p. 200).

This study was designed to gather information to address the challenges teachers face in incorporating time for play in their curriculum, creating environments that support it, and recognizing creativity in all its forms when they see it. We hoped to learn more about opportunities to support creativity specifically for preschool children. For the purposes of this study we identified creativity in terms of children's capacity to engage in both divergent and convergent thinking. We analyzed teacher's documentation of children who discovered ways to solve their own problems in play with three-dimensional materials as evidence of their creativity. We focused on the learning environment, the materials available, and the teacher's role.

Research Approach and Procedures

This study was conducted in collaboration between Dimensions Educational Research Foundation and the Child Educational Center. We focused on two aspects of creativity, specifically looking at children's problem-solving and ingenuity. We further narrowed the scope of our exploration of creativity to investigating how the natural outdoor classrooms supported creative thinking and imagination through opportunities for building and construction, rather than through the creative arts. Thus, we chose to focus our project on three-dimensional manifestations created by preschool-age children as evidence of their creative processes.

This qualitative research study was conducted using a case study approach (Creswell, 2007). The cases or sites selected for this study were Dimensions Education Programs in Lincoln, Nebraska and the Child Educational Center (CEC) in La Cañada, California.

Teachers as co-researchers. Research is an ongoing focus at both Dimensions and the CEC. All teachers at both centers receive training on documenting children's experiences using Nature Note forms, a protocol tool designed for Dimensions research (Appendix B) as part of their orientation. These Nature Notes include written narrative and photographs and/or sketches of children's visual-spatial work. Teachers observe and record Nature Notes regularly to document all aspects of children's experiences to inform the teaching and learning cycle. Teachers then share their Nature Notes with the analysis team. Nine out of 14 (64% of staff) of Dimensions preschool teachers accounted

for 33 or 63% of the Notes. 10 out of 18 CEC teachers (55% of staff) contributed 19 Nature Notes or 37% of the Notes analyzed for this study. Dimensions began implementing the teacher/co-researcher model in 1998 whereas CEC began implementing the model in 2009. Excerpts of several teachers' observations are included in this paper. In order to protect the anonymity of the children who participated in this research, pseudonyms instead of real names were used.

Site Details - Dimensions Education Programs

Participants. Dimensions Education Programs (Dimensions) serves infant, toddler and preschool age children throughout the school year and adds school-age children in the summer. Participants in this study were enrolled in the preschool program and included approximately 80 children. Half of the children attend the program Monday through Friday full day while the other half attend part-time. Teachers/Co-researchers at Dimensions all hold 4-year degrees in education and staff turnover is low. They are professionals who spend many hours planning and studying together each week.

Setting. The Nature Explore Classrooms on site and the program policy of going outside each day provide children daily access to nature. The Nature Explore Classroom was designed with the Nature Explore Guiding Principles (Arbor Day Foundation & Dimensions Educational Research Foundation, 2007). The natural outdoor classroom is rich with plants, trees and a variety of surfaces intended to create an aesthetically appealing, predictably arranged space that lends itself to children's self-discovery and adventurous play. The Nature Explore Classroom includes the following clearly delineated areas:

a. Entry feature to signal entering a special place and Gathering Area
b. Climbing and Crawling Area for large-motor activities
c. Building Area with natural blocks and mini-bricks
d. Nature Art Area and Artist Garden with an easel and art table tucked into flower, vegetable and herb gardens
e. Music Area with permanently installed and hand-held instruments adjacent to an Open Area to encourage movement
f. Messy Materials Area filled with natural loose parts to encourage dramatic play and large-scale building

The space also has many unique features such as a greenhouse, mural, brick sculptures, mosaics and native prairie plants.

Curricular Approach. Dimensions provides a hands-on, experiential approach to learning that is based on the needs and curiosity of young children. Its mission is to inspire children, families, and educators to connect more deeply with the world around them. Each day children are involved in creative, interest-based experiences that provide them with many opportunities to develop a foundation for life-long learning as they grow socially, emotionally, physically, and intellectually. In the preschool program, approximately 80 children used the outdoor classroom daily. Two groups of children (20 total) and their teachers are scheduled in 45-minute outdoor time blocks during each half-day (3 hour) session. With the understanding that the environment is the third teacher, each teacher plays a part in caring for and thoughtfully readying the natural outdoor classroom for children. When they are outdoors with children, the teacher's role is to facilitate and scaffold children's learning modeling and supporting a sense of wonder.

Site Details - Child Educational Center

Participants. There were 88 children sharing the outdoor classroom for preschoolers ranging in age from two years 11 months to five years 11 months. Eighteen teachers are divided among the four classrooms: two Master Lead Teachers, six Lead Teachers, seven Associate Teachers and three Teacher Assistants over all. There are two classrooms of 22 children ages two years 11 months to four years 11 months and two classrooms of children ages

three years 11 months to five years 11 months. Teachers and children are assigned an indoor classroom but share the outdoor classroom.

Setting. The CEC is a private, nonprofit program and is located just north of Los Angeles. Nestled near the foothills of the San Gabriel Mountains, the CEC serves infants through preschool children as well as providing after-school programs for kindergarteners through sixth graders. The programs serve as the model for the Outdoor Classroom Project, (an initiative of the CEC) There are two distinctive characteristics of this site: the amount of outdoor space children have to play in and the emphasis on natural beauty outdoors. Each age group of children, from infants through preschool, has their own outdoor space which allows the spaces to be specifically designed for the ages of children using them. The program recognizes the importance of children learning though outdoor play and connecting to nature, both of which are reflected in its daily practice with children and through its consulting and educational outreach with the Outdoor Classroom Project. The space is designed to be complex and challenging and to assist preschoolers in becoming capable and knowledgeable with a strong sense of themselves and the world around them. The size of the natural outdoor classroom (over 15,000 square feet) provides ample space for a full range of outdoor activities that support extensive development of children's physical, cognitive, social-emotional, and language skills and abilities.

The design concept emphasizes supporting children as active, independent learners. Permanent equipment (swings, climbing structure, and outdoor cabin) occupies little space relative to the whole space so that children can exercise flexibility and creativity in how they use their environment. Some areas are established to support specific child-initiated experiences, including the garden, wild grass nature area, climbing tree, nature art area, messy materials area, block area, music area and two sand boxes (one of which also includes a dirt digging/mud pit area). A large, open space in the middle provides children with opportunities for whole-body movement and for children to create their own experiences using materials throughout the outdoor classroom. Trees supply shade and provide opportunities for children to have daily experiences with trees. Several storage areas in different locations assist children and teachers in setting up and cleaning up materials.

All teachers contribute to the daily set up of the art area, cabin/dramatic play area, sand boxes, music area, reading area and science exploration area. Teachers also make sure there is an abundance of loose parts available to children. A wide variety of natural materials can be found in the outdoors for children to discover as they move about the space or to use in their play. Natural items such as rocks, shells, pinecones, seed pods, twigs, leaves, tree cookies and acorns can be found throughout the outdoor classroom. Large branches are also available for children to carry, construct with or simply lift to feel the weight of the branches. Some of these materials occur naturally in the space and teachers bring others into the outdoor classroom.

Curricular Approach. The CEC is a play-based program in which children spend their days engaged in play either indoors or outdoors. Each classroom has direct access to their outdoor classroom. Doors are open throughout the day to allow children free and easy access to the outdoors without having to wait for an assigned outdoor time. This fluid indoor/outdoor flow allows children to spend as much time in the outdoor classroom as is needed by children. Children also understand that an open classroom door is an invitation to enter and use not only their own assigned classroom, but the other three classrooms as well. Children are encouraged to do what they would typically do indoors in the outdoor classroom. Teachers bring a selection of equipment and play materials outside from storage sheds and classrooms daily based on several factors: teachers' observations of and response to children's needs; children's articulation of their needs or initiative in bringing items outdoors themselves; staff members consideration of the weather or other factors.

Teachers use an Emergent Curriculum approach in which they develop curriculum based on children's interests and developmental needs. Teachers observe children engaging in their environment, listen to their conversations and questions and then they provide provocations and curriculum based on their observations. In this way, the environment is every changing and dynamic, meeting children's developmental needs on a daily basis.

Comparing and Contrasting the Sites

Both of the research sites are intentionally created outdoor learning environments. Both include the guiding principles developed by the Dimensions Educational Research Foundation therefore share many important similarities. See Appendix A for the Dimensions Education Programs Nature Explore Classroom concept. The CEC research site also reflects the Nature Explore Classroom principles as well as the principles that guide the Outdoor Classroom Project. In both spaces, plantings and a variety of natural surface materials are used to clearly delineate interest areas that include a complete mix of experiences to support comprehensive child development. A clear difference between the sites is that the CEC outdoor classroom is larger.

The curricular approach and teacher's roles are also quite similar at both sites. Both programs follow the children's lead with teachers closely observing and scaffolding experiences. Daily time outdoors is important at both sites but a noteworthy difference is that at CEC children always have the choice to work outdoors so many spend longer blocks of time outdoors. The climate in California facilitates this practice particularly well. There is common vocabulary used by staff and children to name and describe the areas, all of which are accessible to children daily in the same general location. An emergent curriculum educational approach is used at both sites in their outdoor classrooms so that the majority of time children are encouraged to choose for themselves the materials and experiences that most pique their interests. Teachers join children in relationships that scaffold learning (Vygotsky, 1962).

Dimensions Education Programs, Lincoln, NE

Child Educational Center, La Cañada, CA

Analysis

The research director at each site coordinated the collection of teacher's documentation (Nature Notes) and served together as the analysis team. The Nature Notes were digitally scanned and shared electronically. Each week the directors jointly analyzed the Nature Notes shared by teachers using an analysis protocol specifically designed for this study (Appendix C). The Nature Notes were read multiple times for clarity and new insights. Fifty-two Nature Notes were individually analyzed using this systematic, methodological approach. Teachers/co-researchers at both sites were involved in member checks after analysis on their Nature Note to capture their views on the credibility of the analysis interpretations and to offer elaborations if or when appropriate.

After each Note was analyzed it was put into spreadsheets to more fully study, understand, and sort the data looking for themes. The key themes emerged and analysis continued until the team was satisfied they were the salient themes and each included examples with breath, depth and richness.

Findings

Four Key Research Themes

Our grand tour question for this research was, "How do natural outdoor classrooms support children's imagination and creativity?" As we analyzed teachers' Nature Notes, four key themes emerged that seemed to be consistently present: (1) the value of predictable **spaces**, (2) the need for ample and consistent **time**, (3) the power of open-ended **materials**, and (4) the essential role of caring, observant **adults** who support creative play and learning (see Table 1).

Table 1
Teacher identified themes related to supporting children's imaginations in natural outdoor classrooms

Key Themes*	**Sub-themes**
Space	flexibility predictability adequate space
Time	large blocks of uninterrupted time
Materials	abundance of natural materials large selection of open-ended materials
Adult Role	caring observant participating as needed

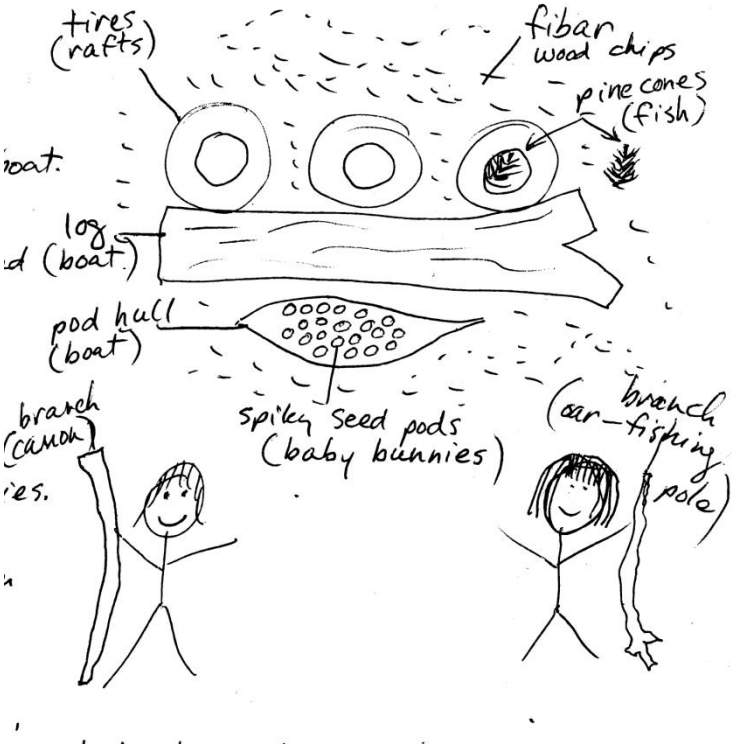
* It is somewhat artificial to talk about these separately because they are so interlinked, but it was important to look at each key theme as a separate element to fully understand the impact each had overall on the creative experiences of children. Thirty-six of the 50 Nature Notes (72%) included elements of 2 or more of the key themes and 28% had three or more.

The following Nature Note illustrates all of the themes evident in the analyzed documentation. This scenario reflects the value of providing children with predictable spaces that encourage freedom; ample time; ample supplies of open-ended materials; and the chance to be with caring adults who support rich play and learning.

Nature Note: *Boating on a Log*

Kip and Isabella decided the log was their boat. The wood chips became the water as they pretended to swim to the boat. They sat and stood on the log as they "stirred" the water with branches. Tires became rafts attached to the boat made of a large pod hull, and they gathered small seedpod balls to fill it. "This is a boat and these are baby

bunnies," said Isabella continuing to share with her teacher that her stick was an oar and though "this is a speed boat, sometimes we need to row. Also they have fishing poles so they can get fish for dinner." The important aspects that Kip described included "This is my cannon to keep sharks away. It just puts the sharks to sleep until we are far away." Eventually the children's attention turned from the teacher and toward each other again as Isabella gathered pine cones for fish and they continued to discuss boats and bunnies. Kip launched into a story about a "mysterious sound that everyone heard.... until it was never....heard....again." (With very dramatic pauses noted the teacher.) (V. Forest, 2014)



This type of play is not unusual in early childhood centers, but the depth and complexity is really noteworthy. At five years old, these children are experienced in working together and are able to elaborate with the storyline, scenario, and props. The children had to think about what they needed as props to play out their story. Every material they chose transformed into something else. This could not have happened indoors because of the amount of space required to build a boat large enough to get inside of themselves. The amount of time these children had to explore meant they could be fully engaged in their process and create a more detailed scenario. Just the boats and bunny aspect of the play lasted about 15 minutes, though they spent additional time prior to the teacher's capturing the story collecting and arranging their materials.

The value of predictable spaces

Space was the first of the four key themes that became evident from the data we collected. Past Dimensions research in natural outdoor classrooms has frequently documented the role of intentional design so this has been well supported over time. Many of the Nature Explore and Outdoor Classroom Project design principles hinge on items such as well-defined areas, a rich mix of activity areas, and pathways that encourage movement throughout. As we considered creativity specifically in this project, we looked for indications that nature-filled environments were

uniquely supporting preschool children's imagination and creativity. We noticed that when children have the ability to spend regular daily time in a predictable outdoor environment, it becomes known to them, understood by them, and familiar. In other words, its predictability empowers children to explore their own ideas. This predictability showed up in teacher's documentation as children formulated plans for their work in the designated interest areas that they knew would have the right materials and ample space. Upon entering the outdoor classroom, teachers frequently noted that children went directly to the areas of their interest and were often able to begin again in places where they had left off previously

Because we targeted children's creativity specifically as it was revealed through their construction or manipulation of materials, it was not surprising to us that the majority of the documentation we analyzed occurred in the Messy Materials Area and the Building Area or a combination of those areas (31/50 Notes or 62%).

We found the idea of scale to be an important differentiator in outdoor spaces as compared with indoor classrooms. Many of the Nature Notes indicated children built full-scale structures that they could fit inside. Children even discussed in one Nature Note the benefits of replicating an indoor experience outdoors because they could "make it bigger." The large size of much of the construction seemed to encourage group involvement. Many notes included scenarios with three or more children (23/50). An example of the value of space with freedom to move comes from one Nature Note in which four children made a block structure and named it the "honey house." The teacher noted that after the children built the house they created an elaborate pretend scenario that revolved around their structure as a home base and included opportunities for children to take turns walking around "exploring." At one point when children were disagreeing about what would happen next, a child named Lanny left to go out and explore. When he returned back to the group and told them about a "half-crocodile half-lizard thing" he found, this changed the focus of the group's play. In our analysis of the scenario it seemed that Lanny was using exploration to give himself time to come up with a plan (a social problem-solving strategy) to shift the group's dynamics so he could lead some of the experience.

In another Nature Note, children pretended to be birds building their nests with logs, sticks and large pieces of fabric. They built two structures large enough for them to get inside of and far enough apart that they enjoyed "flying" back and forth. The teacher/observer reflected that the large body movement involved in climbing, balancing and flying were quite important to the children and enhanced their play.

It was also interesting to see that in many (16/50 or 32%) of the notes teachers documented, children working independently. This was not surprising because earlier natural outdoor classroom research (Dennis, Wells, & Bishop, 2014) indicates that the design of a natural outdoor space with a rich mix of activity areas allows some children to spread out and work together collaboratively, while others enjoy solitary exploratory play at their own pace without conflict.

One Nature Note based on independent play included a four-and-a-half year old girl named Tara. She used a variety of types of blocks (bamboo, tree, and small square) and other materials to work by herself to "build a village" and then sketch it. She put the materials together in the way that best represented what she was thinking about. She had a concept of what makes up a "village" – which is a variety of buildings for various uses. Typically if a child wanted to create a village with pre-made toys, it might include a post office, pet store or other scripted pre-formed items. The child would not be required to use imagination to conceive what these building might be, but would instead simply place items that adults had conceived and manufactured. Since Tara was using open-ended natural materials, she completely wrote her own script as she created her village, choosing materials to represent what she was picturing in her mind. With pre-made toys she would not have needed to use nearly as much problem-solving and engineering.

This scenario could not have played out at all on a typical playground without natural loose parts. Tara went on to synthesize and deepen her own learning when she sketched her village with a clipboard, paper, and pencil which are consistently available to her in her outdoor classroom.

Flexibility in use of the space also showed up as a noteworthy aspect in both the sites. Children often carried materials from one area to another or occasionally their play spilled over from one designated area to another. Children felt comfortable to move around in ways that worked best for them. At times, nature provided some dynamic elements and new materials that were included in teacher's documentation such as when snow became a pie ingredient or a pumpkin that froze overnight became a canvas for chipping into. This element of unpredictability brought forward opportunities for children to engage in problem-solving, ingenuity and flexible thinking.

Another insight worth noting includes the frequency of peer-to-peer learning. It was evident in many of the Nature Notes that teachers shared with us. There were examples of children taking turns being experts and sharing information and past experiences with each other. In the scenario below children created and played on a motorcycle. Analysis revealed that the space to move about enhanced their opportunity to work together and create what they envisioned. It seemed to be a critical factor in their imaginative play.

Nature Note: *The Motorcycle*

Ani, a teacher, approached Camden playing in the area in a front of the bike shed. He was sitting on a tree stump making loud sounds and leaning side to side. As the teacher sat quietly nearby and continued to observe, Jake, a child who had been following her, came and sat too. Camden looked at them and said, "I am driving my motorcycle to Hawaii!"

Jake quickly replied, turning to his teacher, "I know Hawaii, I went there, do you remember?" He then quickly picked a piece of paper off the ground and showed it to Camden telling him, "I have a map." Camden replied, "We need to go that way."

They both decided that the motorcycle needed gas and agreed to go pump gas and bring it to their motorcycle. Camden suggested a wheelbarrow to deliver the gas (see pictures below). Taking turns pushing the wheelbarrow they circled around the cabin and stopped in a front of the mailbox. "We have mail!" Camden exclaimed grabbing a stick from the ground, Jake pushed it into the mailbox and said," No, this is the gas place." Using the same stick, he put the stick next to the wheelbarrow's wheel. Ani supported the boys by asking them, "I wonder what you are doing?" "I am putting gas for my motorcycle!" Jake answered. After pumping gas, they negotiated their way back to the motorcycle and delivered gas to it. (A. Ivanov, 2015)

This is a rich authentic play experience that we believe happens often in natural outdoor classrooms where children are empowered to let their imaginations and bodies roam free to transform, invent, and create. The space outdoors allowed the children to exercise their gross motor skills at the same time as their cognitive ones.

Creating this play scenario required open-ended materials, sharing ideas, and some schema or prior knowledge about getting gas and driving a motorcycle. The children seemed to be creating the story of their play as they went along; as they encountered challenges they created solutions such as when the first child came upon a mailbox and commented on having mail, the second child redirected back to the needing gas scenario.

The stationary log that they pretended was a motorcycle allowed for nuanced dramatic play and gross motor practice itself that included leaning and holding handlebars. Because the 'motorcycle' couldn't actually move they creatively had to find a way to bring gas to it.

Freedom of materials and space outdoors allowed these children to make their play their own. In turn this encourages authentic play that is not influenced by media or acting out something seen on a screen. With each piece of documentation we considered and discussed whether or not the experience could have happened similarly indoors. We noted in this example that a motorcycle could be built with blocks indoors but the nature of that log seemed to encourage the child to call it a motorcycle. Our interpretation is that the attributes of the log reminded him of a motorcycle. The fact that natural materials are all different seems to suggest different things to different people at different times.

Natural materials require children to recall images, asking themselves, "what does this look like to me?" This process promotes flexible thinking and searching for analogies that represent the necessary play props: a stick becomes a pump, a mailbox a gas station, the wheelbarrow is now the vehicle to bring gas back to the empty motorcycle.

Another example of a documented of an experience that required ample and flexible use of space is the story below of a girl using natural materials to build something that represented a door to her.

Nature Note: *The Door*

"Can I make a cabin again?" asked Elizabeth. She was referring to a structure her friend Alex had recently built for her in the Messy Materials Area. Her teacher encouraged her to build her cabin and asked if they should get her friends to help lift the heavy wood pieces that had been used before. "I can lift the heavy stuff!" Elizabeth assured her teacher and proceeded to pick up a large tree cookie and carry it to the Open Area leaning backwards a little to balance herself as she walked (see pictures below). She placed it on the ground and said, "see" with pride as she walked past again to gather more materials. Elizabeth chose one piece at a time (3 sticks, bark, chunks of wood, tree cookies, bamboo poles, and large yellow fabric) and carried them to the Open Area. Next, she arranged it piece by piece, continually changing the placement and then eventually saying "I'm decorating it now" as she added a

pheasant feather and small bricks. As Elizabeth eliminated the materials she had gathered but chosen not to use, she tossed them back to the Messy Area. **"**That is the door knob," she declared as she added a tree cookie and seemingly making it complete. She then tossed the yellow fabric inside the structure saying, "Wait, one more thing," and slid aside the longest stick. Elizabeth then entered the door once and left her door creation for another plan. The teacher asked Elizabeth if other friends could use her door and she agreed so it was announced to other children as they passed by that Elizabeth had made a door. Several children entered and told each other where they were going. The first was going to a "unicorn place." (J. White, 2015)

What was especially unique about this Nature Note was that this child, Elizabeth, created a flat structure, that she called a door, which is typically vertical. She searched for and collected natural loose parts that fit her visual image. According to her teacher, she at one point indicated she wanted to build a cabin. She chose to do this in the Open Area adjacent to the Messy Materials Area in what seemed to be a nice, blank canvas. Elizabeth purposely chose one material at a time, carried it to her workspace, and piled it up where she had plenty of space to work independently.

The amount of space that Elizabeth was able to claim to work in seemed important to her experience. She gathered materials from a variety of places then sorted and returned the ones she did not need. There is a sense of freedom in this experience as well as respect from her teacher that seemed not to view this as merely just cute. The teacher documented the experience, materials and words Elizabeth used to be able to see the learning that occurred.

The Need for Ample Time

Time is the second key theme that emerged from our data. Children were afforded large blocks of time to work in the natural outdoor classroom. In 20 of 50 nature notes (40%), our analysis revealed that time was a key factor in children's creativity and engagement. We had multiple nature notes revealing children working on single experiences for 30-90 minutes at a time. The majority of nature notes where time was found to be a significant contribution to creativity took place at the Child Educational Center where children are able to flow freely between the indoor classroom and the outdoor classroom throughout the day, allowing very large blocks of time for children to engage in their experiences. The importance of ample time for children to engage in play has been documented in past research projects related to children's skill development. (Veselack, Miller, Cain-Chang, 2015; Veselack, Cain-Chang, Miller, 2013)

Longer periods of time give children the chance to think about what they are doing, consider and test solutions to their problems and be elaborate in their constructions. For example, five children were engaged for over an hour pretending to travel to South Carolina. They gathered materials, such as milk crates, big sticks, and palm fronds, to construct their vehicles. They worked with one another sharing ideas, thinking creatively to use the materials and craft their stories. In another example five other children started with an idea of building a castle and had to find materials, make decisions about what they wanted their castle to look like and then construct it. There were multiple opportunities for creative problem solving during the 45-minute observation. Another story described a group of children spending the morning building bird nests with tree cookies, logs and fabric. Once their nests were complete they planned a Halloween party for the birds, including pondering what a bird should be for Halloween. They were

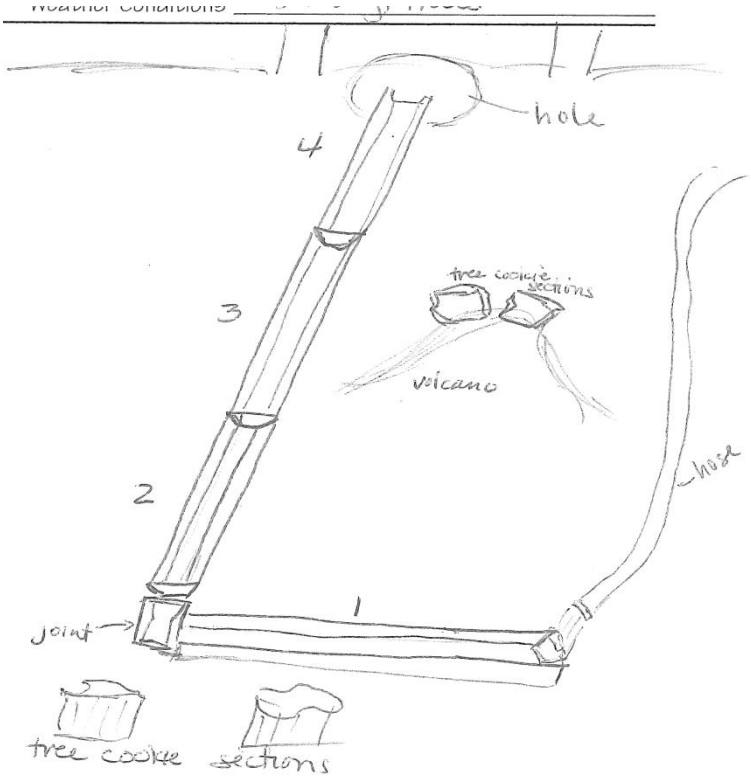
not only able to take their time to be thoughtful about their building but also in creating a play scenario. They engaged in creative problem-solving as they built and creative thinking as they crafted their play scenario.

We found the longer children had to engage, the deeper their engagements with the materials and each other were. Extended periods of time in the natural outdoor classrooms gave children the chance to immerse themselves fully in their tasks at hand. They had ample opportunity to engage in their experiences fully, to find problems that needed solving, and then solve them.

The following two stories fully demonstrate how time played a factor in children's creative experiences.

Nature Note: *Gravity with Gutters*

Five children, all boys, were recreating a waterfall from the previous day. The plan was to run water from the hose, along four gutter pieces into a hole they had dug at the other end. As they began running water into it, they discovered the water leaking at the joint. They tried various ways to solve the problem, first by adding some tree cookies sections under it, which lifted it up. In doing so, it lifted the gutter piece up enough so that the water flowed back towards the hose. One child observed, "It's going up hill!" There was a great deal of conversation about who should hold the hose, where the hose should be (in the gutter or in the volcano they had built.) Lyle expressed frustration that the water continued to flow back out of the gutters. He began lifting the gutter at the hose end every so often so the water would flow down towards the joint. When Jason commented that the water was flowing uphill, Lyle exclaimed, "No! That's wrong! Jason's wrong! Water doesn't go uphill!" His teacher prompted him to consider why the water flowed in the right direction when he lifted up the end. He watched, thought about it, then removed the tree cookies pieces that were under the gutter at the joint and the water began flowing in the right direction again. (S. Walsh, 2015)

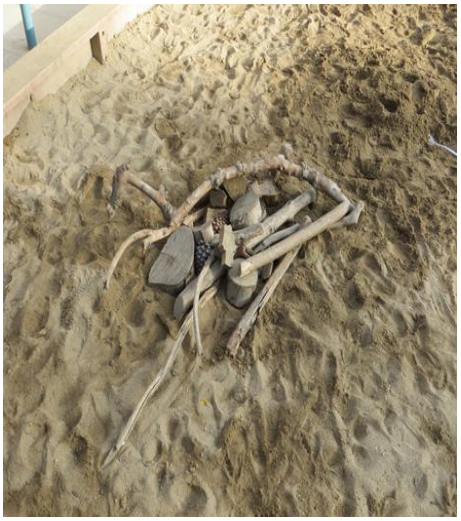


This a good example of what can happen when children have time to work through their process to the end. These children had ample time to fully explore their process, to problem solve together, to negotiate and debate and to have support from a caring adult. They were able to work, rework, consider, test, posit theories and discover.

Learning is a long process in which children must be fully engaged and involved. The child who observed the water going "up hill" had the opportunity to express his discovery, share it with others and then get input from Lyle about the impossibility of water going up hill. Lyle had lots of time to consider what was happening when he propped up the gutter and the water began going the wrong way. He tried several solutions to fix both the leaking and the water flow problems. Had they only been given 35 minutes outdoors, they would not have had the time to get fully immersed in their experience, nor would they have had time to question their process and consider solutions.

Nature Note: *The Dinosaur*

"Waahoo! I'm so excited I found a saber tooth fossil. Be careful, it's very fragile." William had been exploring the natural materials in the nature sandbox when he came upon his discovery. He began collecting and piling up more natural materials, calling them fossils. He was narrating his process out loud. "I found the entire remains of a stegosaurus, so many fossils. Now I have to put it together. He began to construct the stegosaurus and said, "The stegosaurus' brain is the size of a walnut." (See pictures next page.) He held up a small piece and said, "This is the tiniest piece ever! It's the brain." He continued to move around putting together the skeleton, grabbing like pieces from the pile. "It's finished! Come and see. I'm the discoverer." He then started to add more pieces to the stegosaurus and said, "It can switch into a jet. It's a switch and go dino!" (A. Fiore, 2015)



William started this project early in the morning when the yard was fairly quiet and with few children around. He worked independently gathering materials into a pile, being selective about which sticks and natural materials he put in his pile. He then began to meticulously construct his dinosaur. His teacher, Amy, watched him but largely left him to his own process. He showed her the brain and explained its size, but his other narrations were really to himself. He truly got lost in time constructing this dinosaur. He spent nearly an hour and a half in his process, unimpeded by adult interruptions or schedules. He worked until he decided he was finished. This time allowed him to think creatively, problem solve his construction and to work with great detail and care. He was not rushed to completion or expected to conform his ideas to fit into a shorter time frame. Time was a critical component in the success of this experience for William.

Open-Ended Materials

Our analysis uncovered that the most commonly used materials were plants or plant parts. See Appendix D for a list of materials children used. Teachers documented at least 23 different natural materials in the Nature Notes they recorded. The most commonly noted were living plants or the small loose parts they create such as acorns, leaves, and pinecones. Many play scenarios also included very flexible items such as mulch, dirt, and sand. The second most commonly used materials were parts of trees such as sticks, branches, logs, and stumps.

Real open-ended materials that have no prescribed use seemed to support children's divergent thinking and therefore ingenuity. Our analysis shows that the non-standardization of the materials (really no two sticks are alike), the quantity of materials, and the freedom to combine materials were all important because those three aspects were frequently noted in Nature Notes. Children created many things including teeter-totters, ice cream trucks, campfires, a playground, many forts, a conveyor belt and even a ski ramp.

In one Nature Note taken over two days' time, two four-year-old girls worked to make a bridge out of a stump, a log, and a plank. The children experimented with making a bridge sturdy enough for walking across. They employed creative problem-solving to get the plank balanced. The materials allowed for lots of problem solving because the materials were not uniform and with their goal, they had to consider stability and height as they worked. On the second day, the children were successful in creating a bridge that they could walk across. It was significant that the girls did not solve their design problem the first day but worked together a second day until they were able to make a bridge they could move across. Also, the cooperation of these two girls and their interest in working together to move heavy objects stands out. They used positive language such as "we just have to try" and "we can do it together."

Another important variable in many Nature Notes considering the impact of open-ended materials was that children knew where to find what they needed and could independently access them. Children also needed time to mess about with materials exploring their properties and then to create and explore new functions. The data indicate that both the frequency of access to natural materials over time as well as the duration of the time spent with materials is important. The many play affordances supported by open-ended materials is also supported in earlier Dimensions research (Veselack, Cain-Chang, & Miller, 2010 and Miller, Tichota, & White, 2013).

The following is a documented example of children demonstrating ingenuity by using natural loose parts to test hypotheses about how they will travel down a ramp.

Nature Note: *Ramps and Balls*

The children first worked together to assemble a set of chutes (see pictures below). They set it up to traverse a slope from the low brick wall in the Messy Area all the way across the Open Area to the sidewalk. They looked for balls but when only finding a few, they looked around for more things to use. They tried pinecones, acorns, and corncobs. They found out that the pine cones and acorns worked better than the corncobs. Next, one child, Alice, invited another, Thomas to do a "corn cob race" on other constructed ramps with varying angles of incline. They sent the corn cobs down their ramps and even compared it to how pine cones traveled down the slide as well. When discussing this process with the teacher and how each of their tested materials performed, Thomas said, "The corncob does better cause it slides down and flips over on turns because it's going so fast." (C. Heinzman, 2015)

These children engaged in an investigation using ramps and not just balls but also tested their pathways with pinecones, acorns and corncobs. It seems the children had a plan and devised alternatives. They had theories and tested them out. This may be the clearest example of testing hypotheses that we analyzed. The open-ended materials provided some problems for the children to solve. Because they didn't have enough balls, they discovered which other materials they could test to see how they worked. Alice, comparing the acorns with the corn cobs, said, **"**They work better because they are round."

The children also had flexibility in their thinking**,** especially when posed with the challenge of not having enough balls to use and perseverance to continue testing things. Thomas hypothesized that the cobs ability to flip over was what made them go fast on the turns.

Creativity requires more than remembering information but also understanding, analyzing and evaluating. It requires both divergent and convergent thinking. The children used divergent thinking to gather materials to test out. As they were testing out materials they needed to analyze and evaluate how each worked. The next step was critical and required some adult scaffolding. The children then synthesized what they had learned and used convergent thinking to communicate their new understandings of the properties of the materials that traveled down the ramps most quickly.

Another Nature Note that exemplifies the value of natural materials is Corn Pies below. In this example children combined many loose parts in a frequently occurring outdoor classroom project, imaginative cooking.

Nature Note: *Corn Pies*

On this day, six children joined in a cooking project (see pictures below). Placing the large, metal bowl on the ground in the Messy Area, the children carried small containers as they searched the ground for kernels of corn. Another teacher had brought ears of corn from her farm for her group to shell and there were kernels of corn everywhere. The children gathered the corn and added it to the bowl of dirt and mulch. Lucy announced, "We're making corn pie. It's for the squirrels so they can eat it for the whole winter." Chelsea added, "We're getting corn so the squirrels have enough food to eat." Evie was scouring the area for corn. She told the children around her, "We need another shovel so we can get it big. I have to use my hands. Here's more corn and dirt too." Carmen used a large plastic spoon to scoop more dirt into the "corn pie." She also used the spoon to stir the ingredients. Chelsea scooped the mixture into several small containers and said she needed to boil it.

The focus of the play then shifted suddenly to selling corn pie to other children. Chelsea began asking other children, "Corn for sale, anybody want corn?" Lucy said, "We can only have seven customers because we only have seven pots." She added that the cost for each was one dollar. (K. Tichota, 2014)

These children are cooking and selling corn pies while sharing control of materials and ideas. The natural materials they used included corn kernels and whole ears, mulch, dirt, and an oak leaf all of which are clearly not standard in size. They also used a variety of other materials and did not limit themselves. When they did not have enough shovels, they used their hands to dig. We also got the sense from this teacher's documentation that the experience seemed to feel free because they were outdoors, more so than if they had been indoors. There was enough space for this large group of children to work without conflict. Also noteworthy to us as we analyzed the Nature Note was that many learning domains were simultaneously being supported. This scenario is an example of the ways in which creativity thrives at the same time as learning occurs across multiple domains. The open-ended materials provided the opportunity for children pretend it was anything they wanted it to be. Sometimes, as in this case, the materials seem to suggest an idea to children. The corn seemed to say corn pie to them at first. Then it morphed from being pie for squirrels to corn pie for sale to other children and so on.

We also noted the plethora of opportunities provided by the sheer amount and variation of natural loose parts available in the natural outdoor classrooms. The materials tended to provoke creativity, divergent thinking and problem solving. Many of the Nature Notes we analyzed were examples of children building in some shape or form. Often the process occurring during building was the important aspect because it was frequently noted that children didn't actually use the creations they worked hard to make. Many times children didn't seem to identify what they were building until they are at least partially done with it. As we analyzed we came to understand that often the important thing for young children is the joy in creation and not as important to them to elaborate, modify, or even use their structure. In much of the literature about creativity, many creative people do their work and move on. This was true in both the door and dinosaur scenarios shared earlier.

The Essential Role of Caring, Observant Adults

The role of the adult is important to the development of creativity outdoors in some ways that are different than indoors. We recognize that adult support of children's learning is not unique to development of creativity but it was essential that teachers supported children in several key ways in the Nature Notes we analyzed. First, we noticed that teachers often allowed children to stretch boundaries, were nearby the creative play but were careful to stay out of the way, avoiding undue influence and encouraging children to explore and solve their own problems. In many cases, the teacher's primary role was to stay back and allow the events to unfold, stepping in only when needed.

One example of this was as a four-year-old girl (Clara) tried to get another child to understand how to make their seesaw work properly. Clara constructed a simple seesaw out of a tire and a plank. She invited Bradley to sit on the other end and told him to "push up" while she pushed down. He didn't follow her directions though she tried several ways to get him to understand her directions. Janet, the teacher, observed them without interrupting their process. She could have stepped in to tell Bradley how to work the seesaw but she allowed the two children to own their process and explore the physics of working the simple structure. As a result, the children had the chance to problem solve, experiment and use their creative thinking to make it work.

The earlier example of William building the stegosaurus is also good example of this. His teacher, Amy, was nearby and checked in on him frequently, but stayed back and let William do his own work. She didn't tell him how to do it, suggest materials or interrupt the flow of his work.

Teachers play a very important role in children's creative thinking. It was by allowing children to engage in their own thinking that teachers noted they saw children working through their own problems, coming up with solutions, creating new ways to use materials and stretching the boundaries of convention. The next Nature Note documented by Janet as well exemplifies this type of support.

Nature Note: *Planting Children*

Janet, the teacher, was working in the garden with several children (see pictures on next page). They were getting the beds ready for planting, turning over the soil with trowels. Children began digging holes and piling up soil and

Janet talked with them about the possibilities of finding worms or roly-polies. During the 20 minutes they worked, children came and went, eventually leaving 2 children, Brandon and Eloise. Brandon wanted to get into the raised bed to better reach the depth of the hole he was digging. Janet helped him dig a hole big enough for Brandon to sit in. He wiggled around in it, still moving soil with his trowel and hands. Soon he was laying down in the soil, rolling over and allowing himself to be covered with the soil. “I’m taking a mud bath,” he said as he continued to move the soil.

Eventually, Eloise asked if she could get in too and promptly did so. Both children walked, sat and shoveled soil onto their feet, and digging holes to sit in. Brandon asked Janet to pour soil onto his feet and as he rolled in the soil said, “I’m having a dirt bath!” They asked Janet to pour soil onto their bodies and as she did, the soil tumbled down their backs and bellies, sometimes rolling down inside their shirts. Eventually they both wound up back in their respective holes. Janet covered their feet, mounding it up over their legs. Brandon slowly began standing up, bent over then pulling up to his full height. He waited a bit and said, “I’m a daisy” as his hands spread to his sides and upwards near his face. He continued to want his teacher to “water” him with soil. After a while he said, “I’m dying” and his body shrank back into a small ball. He did this several times. Eloise joined in, becoming a different flower, and growing as Brandon did. Janet asked them what season their flower was in as they were in different positions. They responded with spring, summer or fall. Janet then introduced the word “dormant” when they were in a crouched position. They spent approximately 40 minutes in this activity. Brandon actually continued this play throughout the day being a flower in various states of growth throughout the yard. (J. Sedhom, 2014)

This experience happened because the teacher provided support for the children. Brandon was demonstrating some flexible thinking, creating a story of a flower's life cycle. His teacher, Janet, allowed him to push the boundaries by getting up into the planter box. She participated as she was invited by Brandon but didn't take over his play or change it to suit her own needs. She remained respectful of Brandon's ideas and demonstrated respect for them by following his lead. She also extended the children's thinking with her questions and by adding new vocabulary.

In summary, the data revealed four significant ways natural outdoor classrooms support children's creativity and imagination: predictable space, extended blocks of uninterrupted time, an abundance of natural, open-ended materials, and a caring adult to support their work. The educators documented children working for long periods of time, engaging in creative problem solving, building and storytelling in their nature-filled spaces.

Discussion

Children must have opportunities to engage in creative endeavors, whether it is solving a problem, planning and building a structure or creating a venue to tell a story. Flexible thinking and creativity are critically important skills for children to develop in order to be productive, contributing adults. This happens best in environments that allow children the freedom to think for themselves, ponder problems and dream up creations; where they have time to work until they are done, space and freedom to move about while they work, an abundance of open-ended, natural materials to use and caring adults to support their efforts. The natural outdoor classrooms we studied had all of these elements to support young children's creativity.

The Nature Notes we included in this paper illustrate the unique value a natural outdoor classroom adds to support children's creative play and imagination. The combination of all four of the themes that emerged from our data; space, time, materials and adult support, are all essential ingredients to experiences for children's opportunities to drive their own learning process and imaginative play. We recognize that creativity and imagination occur indoors, but found that the open-ended loose parts and inspiration that nature provided enhanced the freedom and opportunities for children's inventiveness to flourish.

Space

In well-designed natural outdoor classrooms where children spend time daily using plenty of loose parts they are able to play with information and concepts. This play that children engage in is the most serious work they can do. Children must experience things for themselves, process information in a way that is right for them, struggle with problems and use their ingenuity to create their own solutions. These are the seeds of learning for young children.

Children need rich environments for these seeds to grow. They must have spaces that are conducive to learning, spaces that are predictable and reliable. Natural outdoor classrooms should have an element of predictability to them so that children know where to routinely find the materials they need to carry out their work. Children should be able to envision where they want to be and where the materials they need can be found.

While children benefit from predictability, the element of flexibility in the environment is equally important: flexibility that allows children to move materials from area to area based on their needs. The space should bend to the needs of the children, ebbing and flowing with them, adaptable and flexible enough to become anything children can imagine.

The environment should also be spacious enough for children to build and create on a grand scale. Children benefit from being able to spread out, unconcerned about spilling over into the area next to them, or needing to elbow for space with the children working next to them. While children may still put themselves next to other children and may need to negotiate that area, when there is ample room they have greater freedom to expand their play, to spill over the edges without impeding on other children's experiences. A well-designed natural outdoor classroom provides the space children need to work, to expand and contract and most of all to create and imagine.

Time

There is a tendency in early childhood programs to artificially divide time into easily manageable blocks but the data suggests that children's engagement and creativity is enhanced with longer periods of uninterrupted time in the schedule. Quantity of time is especially critical to experiences that support creativity. An important concept for young children's deep engagement is the opportunity to get lost in their play. They do not have to think about what their next task will be, who will be interrupting them or how quickly will they need to be done and to move on. They are truly able to work on their project or activity until they decide they are done. Children need to be able to work until they are finished or they may be reluctant to engage in a deep and meaningful ways.

Children have the capacity for deep focus and sustained attention when their play is meaningful to them and they have lots of time to formulate, process, engage, evaluate, trouble-shoot, construct, rethink, rework and discover. This is where the true learning takes place, when the child's brain is engaged and working hard. This all takes time. Lots and lots of time, uninterrupted by well-meaning adults who want to move them on to the next activity. Large blocks of time allow children to go deeper in their exploratory processes resulting in creative problem-solving and original ideas, freeing the mind of the young child to ponder and dream, to think over a problem critically and try a variety of solutions, an important activity for learning and growing the capacity for flexible and divergent thinking.

Materials

Natural loose parts are the bread and butter of early childhood creativity in a natural outdoor classroom. Children gain so much from working with these materials because they have to think for themselves while being creative in problem-solving, constructing and imagining. Natural materials can be anything children want them to be and this ambiguity spurs their imagination. Some bits of nature are suggestive, looking like a motorcycle, for instance, or a piece of pie. While children may choose to play with the materials with that in mind, they are also free to use them in completely unique and inventive ways. When children have mostly closed-ended materials, or items that are authentic replications of items in real life, there is little room for imagination and creativity.

Children need to have a wide variety of natural loose parts available to them that offer a nearly limitless set of options for them to imagine and create. Nature offers a wealth of interesting and intriguing shapes, textures, colors and smells. This variety provokes a child's imagination and creativity. Children have to think so much harder to imagine that pile of sticks and logs transforming into a stegosaurus skeleton for example. Their play is less scripted as well when they are using natural materials. The objects are their own creation, not what they've seen on television, and the dialogue is whatever they imagine it to be. That kind of scripted character driven play is often about repeating lines memorized by children and not conducive to creativity and imagination.

Children are also processing daily life through their play. Children can recreate their own family or community culture through the use of open-ended, natural materials. They naturally weave together prior experiences into their play scenarios and nearby adults who are closely observing can use that get to know the children better.

Adult Support

The role of the adult in supporting children's creativity in natural outdoor classrooms is crucial. Too much teacher direction can shut creativity down before it ever develops. Teacher's view of children's creative capacities and respect for their experiences inform how they support imaginative play. There are many supporting roles that educators take with children ranging from observing from a respectful distance to being fully immersed in the child's play. The most supportive role is one that balances the two extremes. Teachers should make themselves available and be nearby the children and then participate, as it seems necessary. There is a delicate balance that must be achieved by teachers: stepping back while still remaining open to engagement, and interacting with children without taking over.

Many Nature Notes reflected observations from teachers who did less managing of children because the children were managing themselves, with support from a teacher, while involved in their own creative thinking and problem-solving. When teachers step in too soon and provide answers, solutions and their own ideas to children, it often interrupts children's flow of inspiration or takes away their opportunity to resolve a problem themselves, or create and imagine.

Opportunities for further study

This research adds to the growing body of knowledge about the value of natural outdoor classrooms. Further study is needed to understand the influence of frequent access and use of nature-filled environments on learning and wellbeing. Examples of research questions that would be helpful to study include:

- What are teacher's perceptions of their ability to effectively use nature-filled spaces to support educational outcomes?

  Identifying how effective teachers feel when they are working with children outdoors might reveal the administrative support and professional development opportunities that could enhance their ability to teach in natural environments.

- How does frequent use of natural outdoor classrooms influence children's behavior?

  Nature is often described as calming and peaceful. Identifying the attributes of natural outdoor classrooms that support positive behavior in children would be helpful for people who make decisions regarding children's daily schedules in early care and education settings.

- How do natural outdoor classrooms support children's development of executive function skills?

  In educational literature executive function skills are often referred to as including flexible thinking, self-regulation, and working memory. Investigating how open-ended natural materials might uniquely support development of executive function could add to the perceived value of unstructured time outdoors.

- How do opportunities for children to use natural open-ended materials support inclusion of children with varying abilities and cultural backgrounds?

  The role of natural open-ended materials in supporting children with special needs deserves more research. In this study, we were intrigued by the ways in which use of hands-on materials can be used to document children's abilities with less reliance on verbal language skills than traditional indoor supplies. Another area that could be studied in greater depth is the impact of children engaging in creative play in natural outdoor classrooms without looking 'wrong'. An investigation that identifies if or how experiences with natural loose parts are potentially more inclusive of children's varying needs, abilities, and backgrounds.

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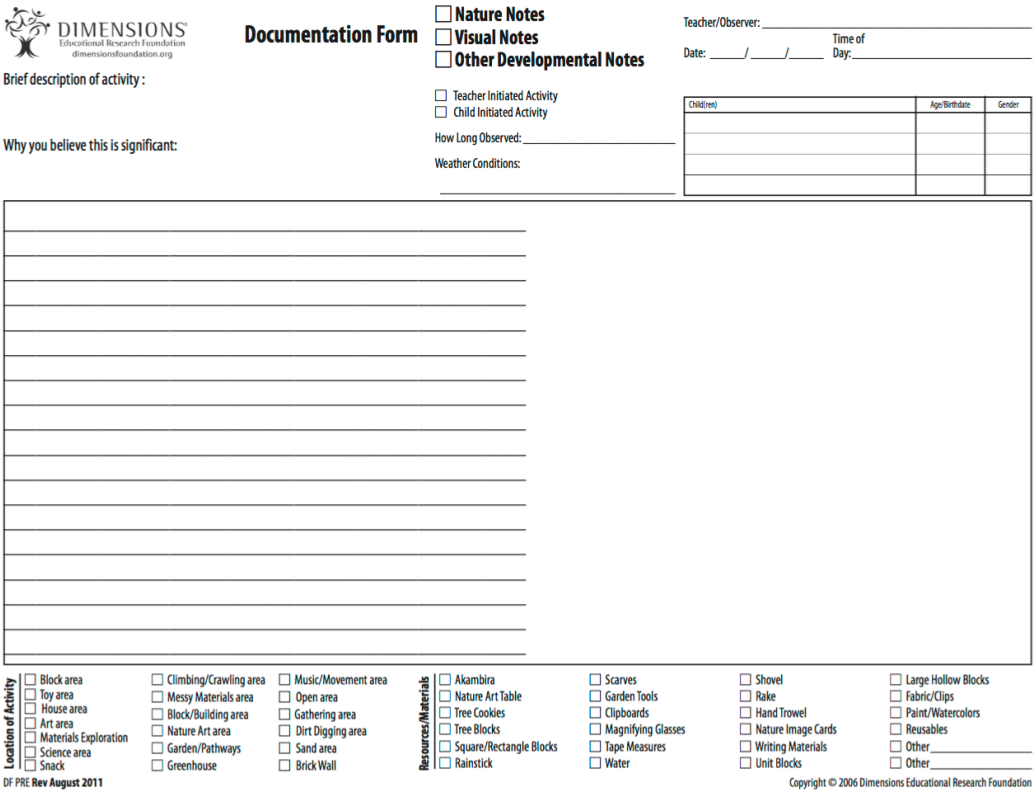
Appendix A: SAMPLE NATURE EXPLORE CLASSROOM CONCEPT PLAN

Appendix B: Dimensions Educational Research Foundation Documentation Form



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Documentation Form

☐ **Nature Notes**
☐ **Visual Notes**
☐ **Other Developmental Notes**

Teacher/Observer: _____

Date: ____/____/____ Time of Day: _____

Brief description of activity :

Why you believe this is significant:

☐ Teacher Initiated Activity
☐ Child Initiated Activity

How Long Observed: _____

Weather Conditions: _____

Child(ren)	Age/Birthdate	Gender

Location of Activity

☐ Block area
☐ Toy area
☐ House area
☐ Art area
☐ Materials Exploration
☐ Science area
☐ Snack
☐ Climbing/Crawling area
☐ Messy Materials area
☐ Block/Building area
☐ Nature Art area
☐ Garden/Pathways
☐ Greenhouse
☐ Music/Movement area
☐ Open area
☐ Gathering area
☐ Dirt Digging area
☐ Sand area
☐ Brick Wall

Resources/Materials

☐ Akambira
☐ Nature Art Table
☐ Tree Cookies
☐ Tree Blocks
☐ Square/Rectangle Blocks
☐ Rainstick
☐ Scarves
☐ Garden Tools
☐ Clipboards
☐ Magnifying Glasses
☐ Tape Measures
☐ Water
☐ Shovel
☐ Rake
☐ Hand Trowel
☐ Nature Image Cards
☐ Writing Materials
☐ Unit Blocks
☐ Large Hollow Blocks
☐ Fabric/Clips
☐ Paint/Watercolors
☐ Reusables
☐ Other _____
☐ Other _____

DF PRE **Rev August 2011**

Appendix C: Analysis Form

Analysis Form **Nature Note #: _____**

Teacher/Observer: _____Observation Date _____/_____/____ Analysis Date _____/_____/____
Time of day: _____am/pm Duration of experience_____
Analyzed by:

Child(ren)'s Name(s):	Birthdate/age	Gender

What are children doing? What is the activity/story? **Teacher Initiated** **Child Initiated**

What materials did children use?	**Natural materials**	**Other materials**
Where in the Natural Outdoor Classroom did this experience take place?		
How is the fact that the child is using open-ended materials enhancing imagination/creativity? (If this is a natural open-ended material, how is the fact that it is a nature item enhancing imagination/creativity?)		
How is this imaginative/creative experience unique to the natural outdoor classroom? (In other words, how is it one that could not have happened indoors as well?)		
What skill(s) are being developed or enhanced through the creative/imaginative work being demonstrated?		
What is the most important aspect of this nature/visual note?		
Is there something in this nature/visual note that, to your knowledge, you have not observed before?		
Other important insights worth noting?		

Appendix D: MATERIALS TABLE

Natural Materials Children Used	Other Materials Children Used
acorns	balls
bamboo pole	bamboo blocks
branches	blocks
bushes	bricks
corn (cobs, kernels and ears)	buckets
dirt	cameras
feathers	cardboard boxes
frozen snow	chalk
hedge apples	climbing structure
ice chunks	clips
large palm fronds	garden hand tools
large wood chunks	hoe
leaves	hose
logs	large exercise ball
mulch/wood chips	large fabrics
pinecones	low brick wall
pumpkins	magnet blocks
recycled evergreen (Christmas) trees	mailbox
rose quartz rock	mat
sand	milk crates
squash	measuring cups
sticks	metal cake pan
stones	muffin tin
sweet gum seed pods	paper and pens/pencils
their own body	pipe cleaners
tree cookies	plastic bat
tree stumps	plastic cones
water	plastic shovels
willow branches	raised garden bed
	ramps
	scarves
	shovels
	small containers
	spoons
	sunglasses
	tables

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