

Planting the Seeds for Nature-Based Learning: Impacts of a Farm- and Nature-Based Early Childhood Education Program

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ABSTRACT

Farm- and nature-based early childhood education programs have a unique potential to provide young children with skills and experiences that build a strong foundation for future learning and environmental stewardship, but can also to extend positive impacts to families. In this paper, we work to bridge the gap between research and practice by presenting a description and program evaluation of the Farm Sprouts farm-based preschool program. The Farm Sprouts program supports learning and positive child development in the context of the natural world, with a focus on environmental stewardship, food systems, and nature. Semi-structured interviews (n = 16) and surveys (n = 33) were conducted with parents of children enrolled in the Farm Sprouts program. These interviews and surveys collected information on parents' perceptions of how the Farm Sprouts program impacted their child, with specific focus on changes in children's cognitive, language, and social skills, scientific inquiry, interaction with nature, interest in exploration, as well as impacts on family interactions. The results of this program evaluation suggest that quality farm- or nature-based programs can positively impact a child's language and conversation skills, increase their interest in nature and desire to explore, and positively impact family interactions. Lessons learned and implications for other farm- and nature-based educational efforts are discussed.

Keywords: farm pre-school, nature-based learning, place-based education, whole child education, early childhood education

"I'm going to be a farmer when I grow up!" exclaims a four-year-old, outfitted in green rubber boots designed to look like frogs as she walks back from the sustainable agriculture field after harvesting asparagus with her teachers and the staff farmers. As they return to the classroom, children wash both their hands and the asparagus, which they munch on raw for their snack. Some can hardly wait to taste the fresh asparagus, while others seem hesitant to try even a small taste of this stalky vegetable. This experience becomes a risky new adventure as they engage first-hand with the food system.

As farm- and nature-based preschool programs are gaining popularity and becoming more widely available for children across the United States, there is a need to investigate the theories, core values, and strategies associated with positive outcomes for both children and families participating in these programs. Like any early childhood

program, quality nature- and farm-based programs should provide opportunities for children to play, explore, and engage in developmentally appropriate learning experiences. This paper focuses on a specific nature- and farm-based program, Farm Sprouts.

Here, we describe the Farm Sprouts program, a farm-based preschool program in Novi, Michigan – within this paper, we use the term “preschool program” to describe early childhood education programs designed for and delivered with preschool-aged children. This paper outlines the core values and models behind the Farm Sprouts program, and introduces evaluation data that describes the potential impact farm- and nature-based preschool programs can have on children’s learning, their behavior, and family engagement. We conducted interviews and surveys with parents of children who participated in Farm Sprouts to gain more information about the impact of the program. Parents were asked about their child’s participation in the program, their cognitive skills and engagement in scientific inquiry, their language and social skills, their exploration and interaction with nature, and the impact the program has had on their family.

Foundations of Farm-Based Education

Nature-based and farm-based early childhood education programs engage young children and their families in nature and agriculture, providing foundational experiences that support health and well-being both now and in the future (Sobel, 2008). Nature-based early childhood programs include a curriculum focused on nature, incorporate nature in their indoor environments, and adopt a daily schedule that includes at least 30% of the time outdoors (Baillie, 2012; Larimore, 2019). Such programs place nature at the core of their curriculum, blending traditional, high-quality early childhood education practices with environmental education, preparing children to be environmentally literate stewards of the earth (Chawla, 2009; Wells & Lekies, 2006). Nature classrooms include materials from the natural environment and access to diverse environments (nature trails, gardens, orchards, etc.). These programs help children engage in nature-related activities in multiple formats including small group, large group, and individual activities and activities that take place both inside and outside (Sobel, 2016). Children who participate in nature- or farm-based programs have organic opportunities to ask questions, explore, observe natural phenomenon, be adventurous, and take appropriate risks. They also have increased opportunities for dialogue and exploration around food and where it comes from, gardening, and the natural world.

In many ways, nature- and farm-based education programs are rooted in whole child and place-based education. Most traditional educational models in the United States do not emphasize nature or the natural world within their curriculum or educational theory. Principles of whole child education and place-based education provide a strong foundation for principles and practices in nature- and farm-based education programs.

Whole child education. Early childhood education through its many curricula, models, and methods, seeks to support the healthy development, growth, and education of young children. High-quality early childhood education can have significant positive impacts not only on a child’s development early on, but also throughout their lifetime. Studies of high-quality preschool and early intervention programs have shown favorable outcomes for children in several domains of development, including language and literacy, cognitive, and social emotional development (Schweinhard, 2014; Ayoub et al., 2015; The Impacts of Early Head Start, 2002; Head Start Impact Study, 2010).

The educational system in the United States heavily focuses on academic preparation, with the goal of early childhood education programs being able to support later academic success. Whole child education begins with an intent to support and enrich *all* areas of a child’s development, including their body, mind, and spirit, as well as finding ways to connect children to their community and the world (Miller, 2010). Whole child education is not focused on specific educational metrics, but instead on other important skills, such as the foundations for social-emotional development, critical thinking, creativity, and curiosity, which all inform a child’s ability to learn, retain, and use academic skills (Miller, 2010).

Farm- and nature-based programs and spaces allow children to naturally engage in play experiences either through intentional teacher-led activities or open exploration. These play experiences help children engage in early science exploration, a critical component of early learning. Early nature play experiences can also help children engage in

activities that support the development of healthy emotional patterns as well as intellectual mental patterns (Banning & Sullivan, 2011). The Next Generation Science Standards indicate that children in kindergarten through second grade should be learning how to analyze and interpret data, which includes using observations to describe patterns in the natural world (Next Generation Science, 2013). Children who participate in nature-based education have the opportunity to observe and experience natural patterns on a daily basis. For example, star shapes appear at the core of an apple sliced in half and can be spotted in the petal formations of flowers, such as that of a tomato. Another example of a phenomenon is steam formation, which children might observe as pond water meets colder air or warm-blooded animals exhale on a cold day. Through authentic, hands-on experiences engaging with such phenomenon, children develop schemas to guide growth in future understanding of complex concepts.

Place-based education. The concept of connectedness at the center of whole child education ties into place-based education. Place-based education centers on both natural and built environments, which includes learning opportunities focused around history, folk culture, social problems, economics, and the environment (Sobel, 2013). This model of place-based education uses a theoretical framework known as “pedagogy of place,” which emphasizes the interconnectedness of a child’s learning within school, community, and environment (Sobel, 2013). Participation in place-based educational programming means that students use not only their immediate environment, but also their other surroundings and community as a framework to construct their own learning (Sobel, 2013).

In place-based educational programs, the child is not an observer, but an active participant in their learning. The child is also an active citizen who contributes to the larger community and environment (Sobel, 2013). The use of the place-based model allows programs to be rooted in and deeply connected to their physical place, their natural environment, their history, and their community to create an interconnected individual-community-environmental learning space.

Embodying a place-based perspective, farm-based programs also provide opportunities for children to become connected to a larger community and to the environment. For instance, maple sugaring is a common farm-based activity in the northeastern portions of the United States. This might involve children tapping a sugar maple tree, harvesting sap, and engaging with volunteers to produce syrup to be sold to the community or planting and harvesting sunflower seeds to be given to families to plant in their yards and community. Farm-based programs intentionally and naturally afford many opportunities for conversations and learning around food including the food system (i.e., where food comes from, how it grows, etc.). Intentional teaching, including direct experiences with the food system and interactions with people working with food, can bring these conversations to the forefront. Children in farm-based programs have unique opportunities to observe and interact with adult models to grow, prepare, and eat fresh food.



Figure 1. A Farm Sprouts preschooler works to harvest asparagus, guided by the Tollgate Farm Sustainable Agriculture Instructor.

Ecological Systems Theory

Children do not develop independently in isolation, but rather within the influence of external forces that impact their development. Bronfenbrenner's Ecological Systems Theory (1979) explains that child development is not only impacted by a child's direct experiences with their own environment, like their direct relationships with their parents, caregivers, or their school, but also by broader environmental influences that impact the family itself, such as their broader community and society as a whole.

Taking the influences and impacts of these ecosystems into account can enhance our understanding of the whole child within the context of the child's environment. Ecological Systems Theory posits that children's experiences and their development as a whole are shaped by inputs across multiple levels. The smallest level of impact is the microsystem, where a child interacts with their immediate environment, including parents or caregivers and schools. The subsequent level, the mesosystem, includes the interactions between those immediate environments, like a child's parents and teachers working together to solve a problem. Children are also impacted by indirect environments and at the exosystem level the interaction between those environments influence a child's development. For example, elections for a local school board will impact school funding or policies that, in turn, impact a child's experiences. Further removed from the child, larger systems, like systemic racism, influence a child's experiences and development at the macrosystem level. The chronosystem level involves changes that occur over time and the impact they have on a child's development, for example differences children today may experience in their upbringing due to the availability of technology or the occurrence of a global pandemic (Bronfenbrenner, 1979). Further, while children are impacted across multiple levels and systems, these impacts are also bidirectional in the sense that children, in turn, impact their families and larger communities through their knowledge, experience, and interactions.

Just as the whole child educational approach dictates that all areas of development must be taken into consideration, Ecological Systems Theory posits that attention must be paid to the other environments that impact young children. Farm- and nature-based preschool programs tie nicely within the lens of the Ecological Systems Theory, as well as the concepts of whole child and place-based education. Instead of an early childhood program solely focused on the direct education and experiences of individual children, farm- and nature-based programs can and should use interconnectedness at the root of their educational principles, activities, and interventions, which can impact children on multiple levels (Bronfenbrenner, 1970; Sobel, 2004).

An example of this can be seen in Figure 2. A young child enrolled in a nature-based preschool program may have a nascent interest in butterflies. Through their preschool program, this curiosity can further blossom and grow through natural exploration and outdoor learning opportunities. Seeing the child's interest in butterflies, their teacher might include lessons on butterflies that would further grow the child's knowledge and interest, discussing the impact of climate change on butterfly populations or conservation efforts to protect endangered butterfly species. The child may become more passionate about conservation after learning about the endangered status of some butterfly species. Seeing their child's interest in butterflies, a parent may ask their child's teacher for ideas on how they might expand on that interest in the home environment, perhaps by planting flowers that attract butterflies in their home garden. The teacher could also share opportunities to advocate for a local millage to protect natural lands used by butterflies, lands that the child and their family could then visit.

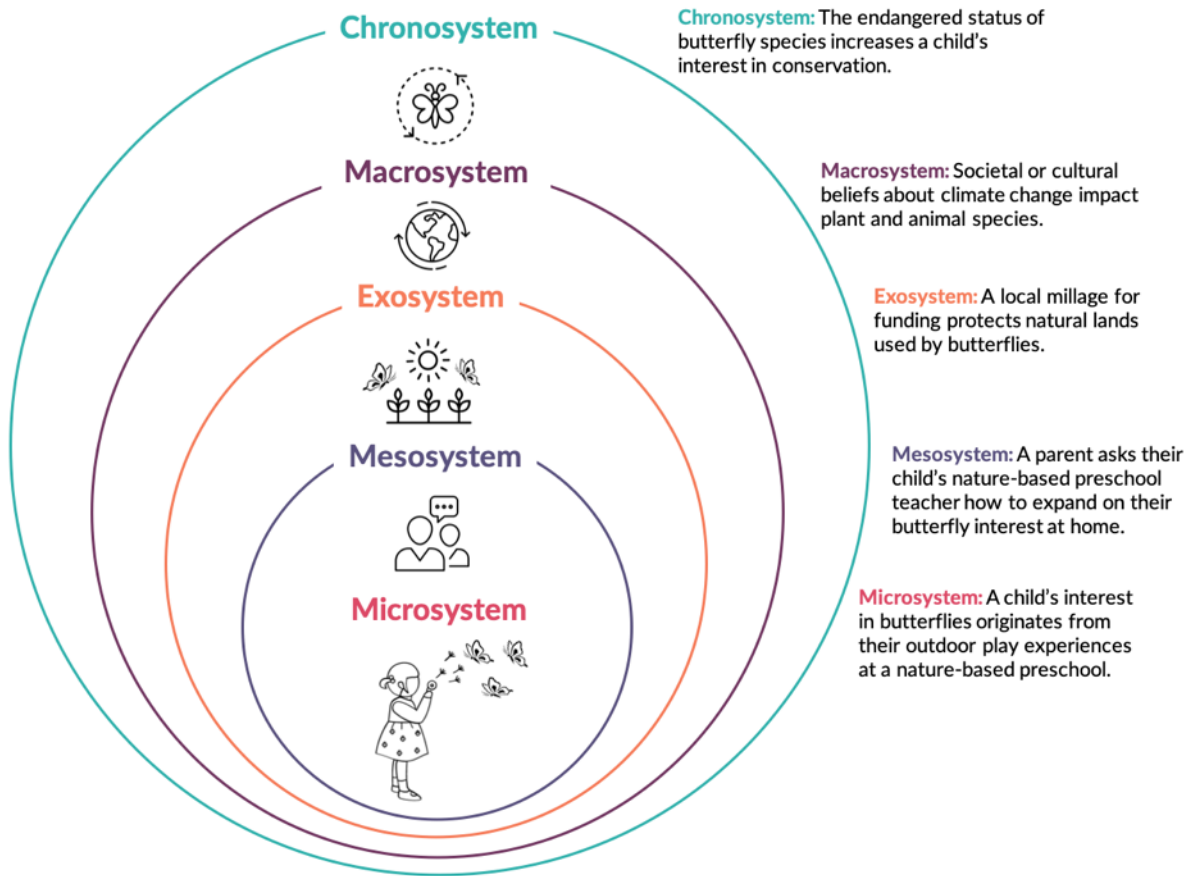


Figure 2. Nature-based education framed within the Ecological Systems Theory

Impacts of Nature- and Farm-Based Programs

Farm- and nature-based preschool programs provide opportunities for children to engage in early learning and science exploration and encourage quality play experiences. Recent research shows that nature-based education programs can have several benefits for children, including increasing motor and social skills, creative thinking skills, and physical activity (Müller et al., 2017; Wojciehowski & Ernst, 2018; Coe et al., 2014). Broadly, time spent in natural learning environments can positively benefit young children's cognitive functioning, self-regulation, and environmental stewardship (Wells, 2000; Burdette & Whitaker, 2005; Chawla, 2009; Wells & Lekies, 2006).

Research also shows that children who participate in nature- and farm-based educational programs may choose healthier options at school meals, increase their fruit and vegetable consumption, and can be more willing to try new foods (Joshi, Azuma, & Feenstra, 2008; Taylor & Johnson, 2009; Rombinson-O'Brien, Story, & Heim, 2009; Bontrager Yoder et al., 2014). Beyond changing eating habits, nature- and farm-based programs have also demonstrated the potential to increase a child's access to fruits and vegetables, improve food security, and even increase the planning and preparing of meals at home (Savoie-Roskos et al., 2017; Health Impact Assessment, 2011). Beyond the individual child, less is known about how these impacts might extend beyond children and into families. Within the Ecological Systems Theory (Bronfenbrenner, 1979), farm- and nature-based early childhood education programs have the potential not only support young children's development, but also to expand upon these impacts by extending more broadly into the family environment. Additional research is needed to elucidate the relationship between nature- and farm-based program participation and positive impacts to families.

The Farm Sprouts Program

The Farm Sprouts program is a farm- and nature-based early childhood education program that takes place at the 160-acre Michigan State University (MSU) Tollgate Farm and Education Center in Novi, MI. The farm includes 40 acres of forest, a pond, pastures, and a variety of gardens, in addition to crop production fields, livestock, and wildlife. The farm is situated 25 miles from the center of Detroit in a suburban setting. Today, the farm reaches approximately 20,000 visitors per year through events, volunteer activities, and programs.

Tollgate Farm and Education Center is run by MSU Extension. Cooperative extension programs act as the educational arm of the university, delivering the research, knowledge, and best practices at the university level directly into communities. MSU Extension fulfills the land-grant mission of MSU through educational experiences for adults and children to both improve their lives to make for a better future.

Program Structure

In the Farm Sprouts program, approximately 60 participants attend one morning or afternoon per week on either Tuesdays or Wednesdays over the course of eight weeks in the spring and fall. The winter season takes place over four weeks on Wednesdays with approximately 30 participants. Many children attend the program from one season to the next for approximately two to three years. The program maintains a low child-to-teacher ratio, with one teacher for every five to six children, and no more than 17 children per group.

The Farm Sprouts program's central purpose is to engage young children with local food and the natural world through hands-on experiences in the outdoors, building a foundation for future learning and stewardship. The Farm Sprouts program philosophy includes:

1. A belief in the importance of play, through which children grow emotionally, develop social, physical, and cognitive skills, and gain the self-confidence required to engage in new experiences.
2. Use of an interdisciplinary, child-centered approach to education in order to create meaningful and essential connections for learning.
3. Providing young children with opportunities to experiment, explore, and engage in science play and practices as they build an understanding of scientific inquiry processes and concepts.
4. Developing lifelong habits and preferences by involving young children in all aspects of the farm-to-table experience.
5. Striving to build a strong learning community in which families, diversity, and collaboration are valued.

On a typical day, the majority of time in the Farm Spouts program is spent outdoors, during which children and educators engage in free and guided play, hikes, animal interactions, and consume snacks sourced directly from the farm. For safety reasons, both drop-off and pick-up take place indoors in a classroom that was once a 1950's hog barn and is now used as a learning space. Free and guided play takes place in and near the children's garden, educational garden, orchards, arboretum, fields, and forest, as well as in the indoor classroom upon arrival or in the case of severe weather.

Farms are places which involve intense and varied work that is a source of interest and fascination for children. The program integrates the work involved in the farm context into play and each day children engage in animal interactions and chores. Children spend time observing animals from a distance and working with smaller animals before caring for larger animals, such as a horse. Preparation for grooming a horse would include reading about horses, sharing in a story about how we are feeling about interacting with the horses, practicing and modeling how to be safe near a horse, and playing as horses. During the winter season, children use a drill, with support, to tap a sugar maple tree, monitor the sap level, and once full, haul the sap to larger tanks to be transported to the sugar shack (see Figure 3). This authentic work is a source of interest and joy as children participate in long-standing agricultural process, part of the rich history of the region as a result of the range in which the sugar maple tree grows.

While this work is happening, children are engaged nearby in free play, balancing on logs, rolling in the snow, and closely inspecting discoveries made in the forest. Opportunities to engage in work activities and with materials in novel, safe, and developmentally appropriate ways provide for meaningful and essential connections for learning. The accomplishment of authentic work, by using real tools, supports growth and development in fine motor and problem-solving skills and self-confidence.



Figure 3. Farm Sprouts preschoolers work with their teacher to tap a sugar maple tree.

The Farm Sprouts program includes collaboration with local farmers: in this case, the Sustainable Agriculture Team that works on-site. This collaboration supports the larger aim of developing lifelong habits and preferences by involving children in the farm-to-table experience. Interactions with the farmers who grow the food the children eat are rich in learning opportunities. Each day children observe and ask questions about the crops and their methods, and work with the farmers to harvest and prepare certain crops for their snack. Program staff attempt to source as much of the program snacks as possible from the farm and involve children in growing, harvesting, and preparing the food to eat. Fresh asparagus, applesauce, and smoothies made with local produce and honey are all on the menu, depending on the season. Children engage in guided play experiences that parallel the work of the farmers.

For example, in the fall children participate in a “veggie wash station,” (seen in Figure 4) set up with a bin of water, brushes, and towels before carrying the vegetables to a pretend play farmer’s market to be sold to their peers. This close connection to the source of the food and being a part of a community, which celebrates and shows gratitude for the process of growing it encourages children to take the risk to try new foods. Songs, children’s literature, and discussion related to the food system and characteristics of the food accompany snack time to guide learning.



Figure 4. Farm Sprouts preschoolers wash vegetables harvested from the farm.

Building a Learning Community that Thrives on Inquiry

Inquiry is at the heart of the educational approach of the Farm Sprouts program, with a particular focus on curiosity, discovery, and instilling a sense of wonder. Teachers model scientific inquiry practices, such as observing, questioning, and forming explanations. Children are accustomed to hearing teachers questioning what they are observing with the sentence starter, “I wonder...?” and soon adopt it themselves as a part of their language and disposition to thinking about the world around them. As children experiment, explore, and engage in science play and practices, they build an understanding of scientific inquiry processes and concepts.

While the Next Generation Science Standards are not a direct aim of the program, they are naturally addressed as a result of the focus on using scientific inquiry practices to make sense of what is happening within the surrounding farm learning environment. For example, as children engage with natural materials and living things in varied and novel ways, they identify patterns which extends to support new understandings of the various systems in which they exist. Identifying patterns, such as observing animals and noting their needs for survival, is one of the Next Generation Science Standards (2013) kindergarten standards.



Figure 5. Farm Sprouts preschoolers engage in pretend play as beekeepers.

Telling the Story

Both Reggio Emilia and Harvard's Project Zero have been sources of inspiration for the strategies that teachers use to tell the story of the learning taking place. Carlina Rinaldi (2003) refers to the idea of both children and teachers engaging in research together, meaning they are continuously asking questions, forming theories, and revising those theories to form new bodies of knowledge within a learning community. Throughout a Farm Sprouts program season, teachers carefully observe, record, and share in dialogue on the children's current understandings in relationship to the larger questions of inquiry. Forms of documentation, such as children's journals, anecdotal records to capture quotes and questions, and photographs all inform the process of interpreting and reflecting on the learning taking place. Teachers and children engage in the process of creating a Wonder Wall each season to present these documentation artifacts to children as seen in Figure 6. The Wonder Wall supports memory recall of past experiences and sparks dialogue with the aim of building important learning connections.



Figure 6. Farm Sprouts preschoolers review the content of the Wonder Wall in their classroom.

Parent and Family Engagement

Throughout the Farm Sprouts program, staff engage parents and families in a number of ways, primarily through the availability of a Community Supported Agriculture (CSA) program and a program blog. A number of families in the Farm Sprouts program belong to the CSA program which, for a fee, provides community members with a share of fresh farm produce. Through the CSA program, children can assist their family members in collecting the produce during the share pick up each week, which includes weighing tomatoes, counting onions, and conversing with the farmers about their day at the farm and the food that will journey from the farm to their table. Children, families, teachers, and farmers all engage in exchanges about the farm and food through these programs and experiences on the farm, including harvesting produce together, engaging in conversations as they navigate the farm, sharing written communications about the program, and moving through CSA pick up. For the farmers, the collaboration adds rewarding and fun opportunities to share their knowledge and passion with an audience who shows great curiosity and enthusiasm for their work, boosting the morale of the team.

In documenting the Farm Sprouts program, teachers also make efforts to engage families. Farm Sprouts program staff write a blog each week to share their children's experiences and discoveries with families. The blog also serves as a place to provide parents with information and resources connected to topics of exploration, including news and events taking place at the farm and within the greater MSU and MSU Extension community. Families are encouraged to read the blog to their children to elicit dialogue, strengthen bonds, and deepen understanding of concepts they are investigating at the farm. Teachers form additional farm-to-school connections by sharing activities for families to engage in at home, such as nature-themed scavenger hunts. At the conclusion of a program season, families are invited to join their child, who becomes the "expert guide," to become an interpreter of the farm. This conclusion event to the season, called the Celebration of Learning, includes a wagon ride around the farm and a tour of the Wonder Wall. Together, these efforts engage families and children in the content of the Farm Sprouts program, providing opportunities for learning and engagement beyond just the "classroom."

PROGRAM EVALUATION

In seeking to capture the impact of the Farm Sprouts program, we conducted a program evaluation to measure the impact the program had on children and families. In evaluating the Farm Sprouts program, we focused on three primary research questions:

- 1) In what developmental domains did parents observe their children grow after participating in the Farm Sprouts program (e.g., language, social skills, scientific inquiry)?
- 2) Did Farm Sprouts participation positively impact children's behavior (e.g., exploration, interest in nature/outdoors)?
- 3) Did program participation positively impact families' engagement with nature- and farm-based activities (e.g., spending time outdoors, conversations about food)?

To answer these questions, we used a mixed methods approach, collecting quantitative data from parent surveys and qualitative data from parent interviews.

Participants

Participants in this program evaluation included the parents of Farm Sprouts children. Semi-structured interviews were conducted with parents during the summer of 2018. Interviews were solicited from parents of Farm Sprouts children graduating from the program in the Spring 2018 season (n = 16). Many of these children had attended Farm Sprouts across multiple seasons; as a result, these interviews allowed us to ask parents to reflect on the collective impact that multiple seasons of Farm Sprouts participation had on their children. Surveys were solicited from parents of Farm Sprouts children participating during the Fall 2018 program season (n = 33), including a number of questions on the impact of the Farm Sprouts program on children's interest and comfort with the outdoors and nature.

Interviews

During the interviews, parents answered a number of questions regarding the impact the program had on their children and their families (see Table 1). Questions centered around families' participation in the program, changes in children's cognitive skills and scientific inquiry, changes in children's language and social skills, changes in children's interactions with nature and interest in exploration, and impacts experienced by the broader family. Interview questions were developed in part based on the Farm Sprouts program philosophy (see p. 8), as well as the interests of program stakeholders, an important element of conducting a utilization-focused evaluation (Patton, 2008).

Interviews with parents were audio recorded and transcribed. A deductive analysis process was then used to code transcripts for themes centered around the primary evaluation questions: (1) In what developmental domains did parents see their children grow after participating in Farm Sprouts (e.g., language, social skills, scientific inquiry)? (2) Did Farm Sprouts participation positively impact children's behavior (e.g., exploration, interest in nature/outdoors)? (3) Did program participation positively impact families' engagement with the content covered in the program (e.g., spending time outdoors, conversations about food)?

Table 1
Semi-structured interview questions

Question topic	Specific questions
Program participation	<ul style="list-style-type: none"> • How many years/seasons has your child been in Farm Sprouts? • Why did you decide to enroll them in Farm Sprouts the first time? • What have you enjoyed most about seeing your child in Farm Sprouts?
Cognitive skills and scientific inquiry	<ul style="list-style-type: none"> • Have you noticed any changes in your child's ability to ask questions about what is around them? If so, how? • Have you noticed any changes in your child's ability to make decisions? If so, how?
Language and social skills	<ul style="list-style-type: none"> • Has your child's ability to hold a conversation improved? • Does your child seem more comfortable interacting with other children since starting Farm Sprouts? What, if any, improvements have you seen?
Exploration and interaction with nature	<ul style="list-style-type: none"> • Has your child shown a larger interest in nature or a greater comfort level being in nature? How so? • In what ways, if any, has your child become more daring or adventurous since starting Farm Sprouts? Is your child more open to exploration?
Family impacts and connections	<ul style="list-style-type: none"> • How, if at all, has your life as a family unit changed due to your child being in Farm Sprouts? • Did you connect to other parents in the program?

Surveys

In the surveys, parents completed a number of retrospective pre-then-post ratings of their children's interests and behavior before and after participating in the Farm Sprouts program. Questions included ratings of children's interest and comfort in spending time outdoors, interest and comfort in interacting with animals, interest and comfort in making new friends, children's sense of belonging, and children's sense of connection to nature (see Table 3 for specific items).

Results

Interviews. Interview analyses revealed several primary themes regarding the impacts of the Farm Sprouts program (see Table 2). Regarding children's growth across developmental domains, primary themes included children improving their conversation skills and interest in engaging in conversations, children asking more in-depth questions, and improvements in children's decision-making skills. Parents recounted that their children were more communicative and conversational after participating in the Farm Sprouts program. Parents also reported that their children asked more insightful, thoughtful questions and were more decisive after participating in the program.

Regarding the impact of Farm Sprouts participation on changes in children's behavior, themes included children displaying increased interest in nature, and being more adventurous and interested in exploration. Parents mentioned that their children are now more interested in spending their time outdoors, whether playing in their own backyard or spending time exploring while hiking in the woods.

Regarding impacts on family engagement, themes included increased conversations on the origins of food, increases in time spent outdoors, and more time spent gardening as a family. Many parents mentioned that their children

have asked insightful questions about the origins of their food, some even changing their eating habits to stop eating meat. Many parents also spoke about spending more time together outdoors, whether on family hikes or in gardening and planting things together in their yards.

Table 2
Qualitative interview themes

Evaluation question	Theme	Example quotes
In what developmental domains did parents see their children grow after participating in Farm Sprouts (e.g., language, social skills, scientific inquiry)?	Improved conversation skills/interests	<p><i>"[He's] definitely more communicative. He even... told one of the stories last week. So he got up in front of the group and told... they were making up stories and he stood up... usually he's more observant, he'll want to sit back and observe. For him to get up and present a story, that he felt comfortable to do that."</i></p> <p><i>"I think that he... his ability to hold a conversation or even just to be interested in wanting to. Like he'll sit down and do work, but he's very active, but it peaked his interest in learning about things and wanted to talk more about it. I don't know if it improved his ability, but definitely I feel like improved his desire too if that makes sense."</i></p>
	Asking more in-depth questions	<p><i>"She's interested in how things are sort of interconnecting in with her context, and it's really cool. When she finds new or different bugs in the yard, she talks about like how it's affecting the plant that she found it by, and 'I wonder if what happens when this bug dies. Does it go back into the soil?' Like a whole life cycle, a whole ecology perspective... The way she's asking questions is totally from this program."</i></p> <p><i>"Before we would just go hiking and it might just be the very basic, 'What is this?' or 'Why is this here?'... [Now] they just ask more in depth questions about the different species and how they work instead of just general questions... I think they go more in depth with their questioning."</i></p>
	Improvements in decision making skills	<p><i>"She is more decisive. I didn't think about it, but not that she was indecisive before, but she seems to be able to process the information and know what she wants it faster now."</i></p> <p><i>"Yeah, we tend to give a lot of input what we do anyway, but definitely it's helped to have decision making abilities."</i></p>
Did Farm Sprouts participation positively impact children's behavior (e.g., exploration, interest in nature/outdoors)?	Increased interest in nature	<p><i>"I would say increased interest because it's a part of her week now... when she comes here, she's engaging in educational type things with the class. She enjoys that. She loves learning... With the Farm Sprouts, there's that educational aspect, and I think that's really enhanced her love of nature and her excitement to get outside."</i></p>

“She just wants to be outside more. She was always wanting to be outside, but now it's like all the time. ‘Let’s go outside, let’s go to the park. Let’s see what’s out there.’ Bugs and stuff. Even though she said she’s scared of them, she’ll go look for it.”

“In the backyard play, we’re noticing were able to turn the tv off more go outside more. He can occupy himself outside. Everything gets made into soup outside. He find all this stuff and put it into a big pot. He’s able to [do] self-directed play outside and we can work on the garden or just sit there and he can just go.”

More adventurous and interested in exploration

“He’s usually been the one to sit back and observe... [but] he was right at the head of the pack when they walked out, so he’s ready to go. There isn’t any, he’s gone through a phase even where his comfort thing was wearing a cape and he would wear a cape everywhere and he was just kind of shy and would stand by me. The cape is gone and he just is the head of the pack. He just goes for it and he’s not clinging to me, we don’t have to calm him by saying “If you feel better, wear your cape,” whereas we haven’t had to do that. He’s into the adventure now.”

“I think it give her confidence... she's kind of always been adventurous, but... yeah, yeah. She's always up for anything, especially if it's outside. But I find her if we do go outside, she goes off the beaten path and is looking for, ‘Oh, I look at this ravine. Look at this rock. Look at this leaf.’ That’s what I see from her.”

Did program participation positively impact families’ engagement with the content covered in the program (e.g., spending time outdoors, conversations about food)?

Increased conversations around food and where it comes from

“We end up with a lot conversations of explaining where different food would have come from... she’ll ask where different things come from, how they make it.”

“He started having a lot of questions about meat and where meat comes from and what specific kind of meat comes from a cow... he just had a lot of questions for me when we were the supermarket and a lot of specific questions: ‘Are the animals killed?’ Yes, they are. ‘For their meat?’ Yes, they are. ‘Do they do it in right in the back of Kroger?’ No. Ya, know?”

Spending more time outdoors *“It’s caused [our family] to do more stuff outside, go on family hikes, and experience things that never really did before.”*

“It definitely makes me want to not just take my kids into the woods, or go hiking or to go for a walk, but to actually take time when we’re in the woods to explore and learn. I think before it would be ‘Oh we’re out in nature.’ It’s nice, but to actually bring their journals with them or to bring a camera with them, or to bring the wildlife or the identifications, really. Then use the opportunity to teach them about things.”

Spending more time gardening as a family *“[Working in the garden is] a new thing. We had one big gardening plot last year, we built another one this year and built them their own wildflower garden this year. Him and his little brother got to sprinkle all the seeds and help water everything.”*

“We started a little garden really because of Farm Sprouts, because they were interested they wanted tomatoes.”

Surveys. Retrospective pre- and post-test survey data were analyzed using paired comparisons. Paired-sample t-test comparisons showed that parents reported statistically significant improvements in their children’s interest and comfort in spending time outdoors, interest and comfort in interacting with new animals, interest and comfort in making new friends, sense of community belonging outside of their family, and connection to nature beyond their yard or neighborhood (see Table 3).

Table 3
Mean ratings of pre-post retrospective survey ratings

<i>Item</i>	Pre-test		Post-test		<i>p-value</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
My child is interested in spending time outdoors.	4.41	0.56	4.82	0.39	<.001
My child is comfortable spending time outdoors.	4.31	0.54	4.81	0.40	<.001
My child is interested in interacting with new animals.	3.88	0.93	4.64	0.55	<.001
My child is comfortable interacting with new animals.	3.52	0.94	4.55	0.56	<.001
My child is interested in making new friends	3.70	0.95	4.12	0.78	0.002
My child is comfortable with making new friends.	3.58	0.90	4.06	0.86	0.002

My child felt a sense of belonging to a community outside of the family.	3.25	0.76	4.22	0.75	<.001
My child felt a deep connection to a natural place outside of his/her own yard or immediate neighborhood.	3.19	0.95	4.31	0.59	<.001

Limitations

Though these data demonstrate compelling impacts of the Farm Sprouts program on children and families, a few limitations must be acknowledged. Primarily, the small sample of data collected limits opportunities for the generalizability of these findings. Continued research is needed to further elucidate how farm- and nature-based early childhood education programs can impact children's social and cognitive skills, and how these impacts can extend into families. Additionally, survey data was collected using a retrospective pre- and post-test survey design, which introduces potential for bias. Although retrospective pre- and post-test designs can reduce or eliminate response-shift bias in survey data, this methodology is still prone to bias in respondents' memory recall in reporting and rating pre-program thoughts and behaviors (Prat, McGuigan, & Katzev, 2000).

Discussion

The results of this program evaluation suggest that nature- and farm-based preschool programs have the potential to impact change across multiple levels or ecological systems for children and families. Parents reported that children who participated in the Farm Sprouts program engaged in increased conversations around program topics and improved their conversation skills. Participating children also showed positive changes in their behaviors, including increased interest in nature, adventurousness, interest in exploration, and an increased level of comfort with animals. These impacts to individual children align with previous findings that cognitive, social emotional, and executive functioning skills can all be positively impacted by nature- and farm-based learning (Wells, 2000, Burdette & Whitaker, 2005; Chawla, 2009; Wells & Lekies, 2006).

Families of children who participated in Farm Sprouts also reported changes in family interactions, including increased time spent outdoors and time spent gardening as a family, and more conversations about the origins of food. These findings support previous research that children who engage in nature-based learning experiences are more likely to be more in tune with food and where it comes from (Savoie-Roskos et al., 2017; Heath Impact Assessment, 2011).

Lastly, families reported an increased connection to nature on a community level. Parents described spending time with their children exploring the outdoors, planting and gardening, and discussing the origins of food. Research surrounding the impacts of nature-based early childhood education programs on families has been more limited. Findings about the impact of the Farm Sprouts on family engagement and interactions can add to the limited literature base for the impacts of these types of educational programs on family systems. Further research should be done to measure and describe the impact of these early educational programs on larger family and community systems.

Interestingly, program evaluation results did not indicate any strong findings in terms of children's interactions with other children (e.g., improvements in social skills). This could be due to several factors, including the frequency of the program and the short-term nature of the program seasons, which would limit opportunities for children to interact and engage in long-term ways. The ages of the children involved in the program may also play a role in that developmentally, children at these ages are still learning the basics of peer interactions, and appropriately are spending time playing independently or engaged in parallel play that does not involve direct interaction with peers. Future work should more closely examine the specific impact that nature-based early childhood education programs may have on social skills and peer relationships.

Community Connection

In the Farm Sprouts program, a strong community was formed through intentional efforts focused on family engagement, as children voluntarily or naturally participated in engaging activities with their families outside of the program or more formally within the confines of the program (play groups, etc.). Children and families were connected to sustainable agriculture through a purposeful collaboration with agriculture staff at Tollgate, through the CSA program, and through educational inquiry around sustainable agriculture in the Farm Sprouts curriculum. Children also engaged in meaningful play experiences that went beyond having fun and moved into the work of childhood: exploring, asking questions, understanding consequences in the natural world, and engaging in authentic ways with other children, teachers, families, and the larger world around them. Intentionality regarding relationships, connections, and community not only helps children understand concepts like where their food comes from, it helps them build a larger understanding of how the world works, how things and people are connected, and where they fit into the system.

After program evaluation data was collected and analyzed, several changes were made to the program to improve its effectiveness, grow the program, and to build even stronger connections with families. Efforts were made to help build connections for families and emphasize a home-school connection. Teachers and program administrators helped connect families to MSU and MSU Extension services and events by sharing marketing materials and communications through the classroom blog and emails to families. Other small parenting workshops covering topics such as identifying poison ivy and managing ticks provided opportunities to alleviate concerns with knowledge, support, and resources.

Implications for Practice and Future Directions

The implementation and evaluation of the Farm Sprouts program suggests that founding a preschool program with an intentional focus on ecological systems, place-based learning, and whole child education has the opportunity to impact a child's learning and development across multiple levels or systems. Other farm- and nature-based preschool programs, or any preschool programs striving to incorporate farm- and nature-based learning, can benefit from the Farm Sprouts program's successes and lessons learned. Purposeful experiences around farm- and nature-based education can have impactful, positive outcomes for young children. Whether a program is formally nature- or farm-based, or just interested in building connections to the natural world from their more typical preschool classroom setting, using inquiry-based educational approaches and play experiences that integrate concepts within the natural world can enhance a child's learning. Teachers and administrators can reevaluate their core values and philosophy to prioritize an inquiry-based approach, aim to integrate nature and opportunities to connect with the food system into all aspects of their programs (i.e. indoor space, snack time, schedule), seek out relevant professional development opportunities for program staff, and refer to guidelines and best practices to ensure expectations for high quality are being met, such as by utilizing the Nature-Based Preschool Professional Practice Guidebook (NAAEE, 2019).

Connecting preschool programs with local farms, nature centers, or other outdoor spaces in the local community is an ideal way to engage in this systems, place-based approach to learning. As a land grant university, MSU provided networks of resources that were critical in developing the Farm Sprouts program. In Michigan, the MSU Center for Regional Food Systems collaborates with the National Farm to School Network as partners to support efforts to grow young children's connections to healthy local foods, gardening, food and agricultural educational opportunities. Other teachers can mirror this by reaching out to their local and regional food systems and connecting to national organizations focused on these efforts, including the National Farm to School Network and the NAAEE Natural Start Alliance. With at least one land grant university in every state, other US-based educators can connect with their state's land grant university to access similar resources and supports. These resources may also be particularly relevant in situations like the COVID-19 pandemic, where outdoor spaces and programs may create opportunities for safe engagement with children and families.

These connections do not all need to be rooted in larger, more formal systems, however. These relationships can be authentic and informal, such as finding a local beekeeper when students show an interest in insects to help expand

their knowledge and build learning connections between content covered in the program and “real world” professionals. Something as simple as a contract with a local farm to provide some ongoing education or partnership could enhance classroom learning and provide additional opportunities for nature-based and place-based education. To form a healthy, thriving learning culture which truly centers the children’s needs and interests as the primary focus, program teachers and administrators must think beyond the classroom walls, enriching the possibilities for learning through connections and relationships formed among the broader systems.

In reflecting on the Farm Sprouts program during the time of data collection and using the results of the program evaluation, several areas for growth have been identified, including funding, staffing, and inclusivity. The short-term and part-time nature of the Farm Sprouts preschool program may have presented barriers for some families. For instance, parents who required regular, reliable childcare, or families with transportation limitations may not have had equitable access to the Farm Sprouts program. Further, the cost of enrolling in the program may also have presented barriers for some families, though financial aid was made available to those who needed it.

Like many early childhood programs, Farm Sprouts had limited external funding to support the program. Additional funding sources would allow for an expansion of the scope and breadth of the program, including being able to offer a more regular or full-time structure, rather than operating on short “seasons.” This additional funding would also increase the accessibility of the program for families who needed more regular or full-time childcare. A more regular program schedule would also allow for more stable staffing conditions, as hiring and retaining highly qualified, dynamic, and motivated staff for seasonal part-time positions proved to be challenging. Additional funding would also expand the planning and preparation time for program staff.

Any outdoor program faces challenges regarding inclusion, especially for individuals with physical disabilities or limitations. Additional funding and time for staff would create more opportunities to offer supports for children and families above and beyond the accommodations currently provided in the Farm Sprouts program. These additional accommodations might include more focused one-on-one interactions, a fenced area dedicated to free play and discovery, and wheelchair-accessible paths.

Addressing issues of diversity, equity, and inclusion is also critical to establishing and maintaining appropriate, equitable, and open early childhood programs and Farm Sprouts has made some efforts to address these concerns. Cultural competency and concepts of diversity, equity, and inclusion were incorporated into policies, procedures, and staff development. The Farm Sprouts program has worked to improve cultural competency by designing training for staff, and using an equity lens when writing, reviewing, and enacting program policies. The program continues to seek opportunities to connect and build relationships with diverse local populations by offering events around topics of interest to local communities.

Conclusion

The results of this program evaluation suggest that intentional farm- and nature-based preschool programs that focus on whole child education can impact children’s learning and development in many ways and on several levels. Children’s learning, connection to nature, food and the environment, as well as family engagement can all be positively impacted by high-quality nature- and farm-based programs. Investment in developing, enhancing, and sustaining these programs can create high quality educational experiences that impact multiple ecological systems and move beyond direct impacts on children to reaching families and communities.

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