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Wild Leaves on Narrow STEMs: Exploring Formal and Non-formal Education Tensions Through Garden-Based Learning

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Abstract

School gardens and garden-based learning, though not new in the landscape of United States public education, have gained great popularity in recent years. Scholars from myriad disciplines have examined school garden programs' impact on outcomes ranging from standardized test scores to childhood obesity. As school gardens become commonplace across the country, scholars and practitioners must ask critical questions about program efficacy, sustainability, educational philosophy, and teaching methods. The public school garden site is a unique environment in which constructivist, non-formal educational philosophies are entangled in the structure of standardized, formal education. To examine these tensions and consider opportunities for student learning and the ongoing evolution of public education, we conducted a qualitative case study of a school garden program transitioning from non-profit to public school district control. We conceptualize the non-profit era of the Midwest Garden Education Project as an example of a non-formal education paradigm, and the school district-funded era as its formal education counterpart. Using the findings that emerged from this research, we argue for public education to embrace non-formal learning in the school garden, and put forth a call for broader legitimation of garden-based learning in curriculum.

***Keywords*:** school gardens; elementary education; non-formal education; garden-based learning

Introduction

The early histories of agricultural, extension, and public elementary education are punctuated with examples of school gardens and garden-based learning (Hayden-Smith, 2006; Phipps, Osborne, Dyer, & Ball, 2008; Subramaniam, 2002). Liberty Hyde Bailey, founder of the Cornell University College of Agriculture, is also credited with developing the nation's first elementary-aged gardening text in 1890 (Banks, 1994). In recent years, school gardening has experienced a resurgence, and gardens have become a popular feature of many elementary and secondary schoolyards in the United States (Hirschi, 2015). In 2013, the United States Department of Agriculture Farm-to-School census recorded 2,401 school gardens, and by 2015 that number had jumped to 7,101 (USDA, 2015). In effective garden-based learning, the goal is not simply to prepare future gardeners by teaching gardening skills, but also to utilize a garden as a context and hands-on tool for teaching subjects including nutrition, environmental science, and even English and social studies (Graham, Beall, Lussier, McLaughlin, & Zidenberg-Cherr, 2005; Passy, 2014). The positive, measurable impacts of school gardens on student fruit and vegetable consumption, physical activity level, academic performance, and attitudes towards school have been repeatedly substantiated in both public health and education literature (Berezowitz, Bontrager Yoder, & Schoeller, 2015; Blair, 2009; Klemmer, Waliczek, & Zajicek, 2005;

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Lautenschlager & Smith, 2007; Williams & Dixon, 2013). Additionally, school gardening is one small piece of the larger movement to supplement and enrich traditional classroom education with outdoor education and place-based learning (Sobel, 2004).

The public school system in the United States is vast, and both shapes the development of American society and reflects its values back to the citizens (Center on Education Policy, 2007). It follows, then, that a nationwide network of garden-based education programs, working with or for the public school system successfully could mean widespread advancement of the aforementioned benefits of school gardening. However, research must examine how these two potentially philosophically disparate entities, the school garden and the public school, interact and cooperate (Cramer, Ball, & Hendrickson, 2019). While the dramatic increases in school garden numbers, proponents, and funds in recent years are worth acknowledging, it is important to reflect upon the historical roots of the school garden movement, and take note of what may change or be lost when attempting to conform garden-based learning to modern educational structures and standards. The earliest forms of garden-based learning, those influenced by Maria Montessori and the nature studies movement of the 19th century, were inherently constructivist endeavors (Desmond, Grieshop, & Submaraniam, 2004). As school garden researchers and practitioners enjoy the revival of school gardening, they must also consider how the behaviorist, standards-based structure of modern public education may shape the very nature of the school garden learning experience.

Review of Literature

Juxtaposing non-formal and formal garden education in literature

To establish a foundation for our research into garden-based learning in a public school setting, two bodies of literature were reviewed: garden-based learning in cooperative extension literature and garden-based learning in agricultural education literature. From extension literature comes a non-formal education perspective on pedagogy and garden education, while agricultural education literature provides the formal education counterpart. In reviewing and juxtaposing these bodies of scholarship, we developed a scaffolding for analyzing the ways in which the non-formal, constructivist roots of garden-based learning may be altered or constrained within the standardized structures of formal education.

Garden-based learning in cooperative extension literature

Cooperative extension programs have historically been drivers of school garden initiatives (Hayden-Smith, 2006). Take, for example, Liberty Hyde Bailey of Cornell and his aforementioned gardening text (Banks, 1994). Cornell Extension remains a modern-day leader in garden-based learning. Their program, "Learn, Garden, Reflect with Cornell Garden-Based Learning" is managed cooperatively through the College of Agriculture and Life Sciences and Cornell Extension and provides resources including curriculum, Citizen Science projects, and toolkits for program planning and volunteer management (Cornell Garden-Based Learning, 2017). Garden-based learning initiatives are a natural fit within extension education, given their melding of agricultural knowledge and skill building with the experiential learning that defines so much of extension programming.

The general themes that emerge from a review of extension-specific literature on garden-based learning are of particular use in examining the dichotomies between the nature of non-formal garden-based learning and the nature of standard public education. Though they have changed, modernized, and been shaped by financial pressures and stakeholder demands, current cooperative extension programs in the United States, overall, remain guided by the experiential, hands-on, and regionally specific vision of extension education on which they were founded (Peters, 2002). Many garden-based

learning programs are administrated by extension educators, and the philosophies of cooperative extension may be found throughout garden education initiatives of myriad organizational structures (Foerster & Barry, 2007). While extension educators and program planners are often asked to frame their educational objectives within the parameters of public education, explaining, for example, that programs meet Common Core or Next Generation Science Standards, the efficacy of extension programming is not determined by standardized testing (Rodriguez, Lamm, Odera, Owens, & Thompson, 2015).

DeMarco, Relf, and McDaniel (1998) discuss classroom teachers' use of Master Gardener volunteers to help with their gardening lessons. This article provides an introductory example to illustrate the dichotomy between the educational approaches of extension (the more constructivist example) and standards-based public education. Teachers in the study were not confident in their gardening content knowledge, so they found the Master Gardeners' horticulture expertise to be most beneficial. Though teachers recognized the interdisciplinary benefits of gardening with their students, they had not actually been trained to lead gardening activities themselves. Additionally, they needed the help of the volunteers to manage behavior in a garden setting, speaking to another potential deficiency of the teachers' training. Welsh, Whittlesey, Seagraves, Hall, and Harlow (1999) describe the Junior Master Gardener (JMG) curriculum, which, since 1972, has been adopted in some form in all 50 states. Though a more rigid curriculum than some garden programs employ, the JMG program still helps demonstrate the non-formal/formal dichotomy of garden-based education. In addition to developing horticultural skills, JMG's stated goals include identifying and fulfilling community needs through volunteer service, developing mentorship relationships between older and younger youth participants, and providing cross-curricular, hands-on learning opportunities. Junior Master Gardener is billed as a flexible curriculum that can be adapted to public school, home school, after-school, or youth club settings. By stretching traditional school day boundaries of when, where, and how learning happens, JMG provides a clear example of the cooperative extension approach to garden-based learning (Cater, Fox, & Fletcher, 2012). Finally, Nelson and Shaw (2013) build upon the work of Smaldone, Boone, Selin, and See (2011) and propose extension-facilitated environmental education programs and natural schoolyards as solutions to the common challenge that classroom teachers simply lack time to create these opportunities. Nelson and Shaw also contrast the measures of student achievement used by extension-facilitated outdoor education programs, such as developing a commitment to environmental stewardship, with, for example, Common Core State Standards, once more demonstrating how these programs operate outside the realm of traditional public school evaluation.

Garden-based learning in agricultural education literature

The fields of cooperative extension and agricultural education frequently overlap, often sharing space in university departments, at academic conferences, and in scholarly publications. While operating in similar physical and disciplinary spaces, agricultural *extension* education may be conceptualized as the non-formal counterpart to more formal, school-based agricultural education. Having reviewed cooperative extension's approaches to garden-based learning, it is helpful to turn to garden-based learning scholarship from the field of agricultural education to illustrate a more formal, standards-based paradigm. Research on school gardens and garden-based learning published in the *Journal of Agricultural Education*, while related to that of the *Journal of Extension*, presents a different epistemic and structural perspective. Because garden education programs generally focus on primary and elementary grades, and not the secondary grades most of interest to readers of the *Journal of Agricultural Education*, school garden scholarship in this journal is relatively scant. Beckman and Smith (2008) even seem to reflect on the novelty of their research on a nutrition-focused, garden-based education program being published in the *Journal of Agricultural Education*, stating, "Readers of this journal will find the article significant because a garden program inherently incorporates agricultural education and can educate youth at an early age about nutrition from a food system perspective" (p.

12). However, the literature that exists is of value in illustrating how formal education, agricultural education in this case, approaches the school garden.

Agricultural education literature on elementary-aged, garden-based learning programs, as opposed to extension literature or resources produced by independent garden-based learning leaders such as Life Lab or Edible Schoolyard, is rife with terms such as "STEM" (science, technology, engineering, and math) and "agricultural literacy." At first glance, it is as though traditional agricultural educators are speaking a different language than garden-based learning practitioners and researchers. The term "agricultural literacy," or the working knowledge of the food and fiber system, is absent from any of the garden-based learning literature mentioned previously in this review of literature, but is used frequently in relevant *Journal of Agricultural Education* scholarship (Brandt, Forbes, & Keshwani, 2017; Graves, Hughes, & Balgopal, 2016). Of course, garden educators would certainly agree that what they are doing is fostering in their students a working knowledge of the food and fiber system. It is, however, worth considering why these similarly motivated groups—garden educators and agricultural educators—are linguistically disconnected, and if that is reflective of a larger philosophical disconnection. The discursive divisions between the terms "gardening" and "agriculture" are fascinating, but beyond the scope of this review (Sachs, 1996).

While literature from the non-formal education contingent seems to view meeting Common Core or Next Generation Science Standards as bonus to the many additional, less quantifiable benefits of garden-based learning, agricultural education literature places standard methods of evaluation at the forefront (Diaz, Warner, & Webb, 2018). Researchers talk in terms of agricultural benchmarks (Trexler, 2000) or National Agricultural Learning Objectives (Brandt, Forbes, & Keshwani, 2017). Additionally, garden-based learning scholarship from the *Journal of Agricultural Education* refers more frequently to "horticulture" as the *content* area, rather than the garden as the *context* for learning (Graves, Hughes, & Balgopal, 2016). This is a diversion from the twin roles of agricultural education as outlined by Roberts and Ball (2009) in which agriculture is both content and context. Each of these trends reflect the more rigid, disciplinary and assessment-driven bounds of formal education, as demonstrated within the context of agricultural education. Graves, Hughes, and Balgopal (2016), specifically, present findings that run counter to most garden-based learning scholarship. They state that the teachers in their study felt that garden-based curriculum detracted from instructional time they could be devoting to content assessed on state standardized tests, rather than viewing it as enhancing and supplementing the assessed content. Whether presented positively or negatively, scholars of agricultural education, at least as evidenced by the publications in peer-reviewed outlets, conceptualize garden-based learning in terms of standards and assessment.

In addition to the *Journal of Agricultural Education* themes that emerged related to content and assessment, the review of relevant literature also uncovered a trend of highlighting the "urban" or "inner-city" location of garden education programs (Beckman & Smith, 2008; Duncan, Collins, Fuhrman, Knauft & Berle, 2016; Mabie & Baker, 1996). While it is reasonable to view these terms as racially coded, they also speak to a perceived division of agricultural knowledge between urban and rural residents. Though context is certainly important, and it would be logical to assume that a student from a farm background would possess greater agricultural knowledge, it is striking nonetheless that no other reviewed articles on garden-based learning, outside of the *Journal of Agricultural Education*, use the words "urban" or "inner-city" in their titles. It is as if there is a presumption that garden education is not a necessary endeavor in rural locations because of the predominance of agriculture, when it is clear that knowledge of growing produce or consuming healthy, fresh food is no longer correlated with living on a farm or in a rural area (Champagne *et al.*, 2007).

A final theme emerged from the agricultural education literature that was consistent with all other garden-based learning literature: the efficacy and importance of experiential learning

opportunities. Though researchers evaluated programs through different lenses and using different methodological processes, it was clear throughout the body of scholarship that, no matter the intended outcome, an experiential approach was deemed to be most effective (Duncan, Collins, Fuhrman, Knauft, & Berle, 2016; Mabie & Baker, 1996). Mabie and Baker (1996) articulate a prescient call for science teachers in the future to become more "constructive" rather than "instructive" in nature. Though they were publishing in an arguably standards-based educational journal, and well before the current school gardening and place-based education boom, the authors nevertheless express a perspective on education more often associated with that of progressive, non-formal educators. The question, though, is if the recommendations of Mabie and Baker (1996) to increase experiential science education wherever possible could withstand the impact of the Next Generation Science Standards unveiled seventeen years after their article's publication. If experiential learning is understood to be effective, can educational standards and standardized testing capture that and make room accordingly for appropriate teaching methods? Can authentic garden-based teaching methods be successfully incorporated within the structure of the public school, or must they be adapted to fit the environment?

Methods

Establishing the case

The Midwest Garden Education Project (MGEP), pseudonym, is a school garden project founded in 2007 by a group of parent volunteers. The project is located in a rural, Midwestern community with a population of roughly 5,000. Within the community's reorganized school district there is one primary school, one elementary school, one middle school, and one high school. In the years since its founding, the MGEP has grown and expanded dramatically. In the early years, the MGEP consisted of a set of raised beds behind the elementary school, tended by volunteers and a 13-student after school garden club. By 2012, the physical garden space had grown to occupy nearly an acre of the school grounds, and with the receipt of a $500,000 grant that year, the organization became an official non-profit with an executive director, board of directors, team of contract employees, and AmeriCorps service members. For the five years of the grant's disbursement, the MGEP operated under this model, in cooperation with the school district, to teach school-day garden classes to the district's kindergarten through fifth grade students and lead after school garden clubs. In anticipation of the grant ending in December of 2017, the superintendent allocated district funds to maintain the project as an official program of the school district. After years as a volunteer and non-profit organization, the MGEP transitioned to school district control during the 2017-2018 school year. A certified elementary teacher was hired in 2017 to serve as the first district-funded garden teacher.

Purpose and research questions

The purpose of this instrumental case study (Stake, 1995) was to examine how the transition of control of a garden-based educational program from independent non-profit to school district affects various elements of the school garden. The central issue question that guided the study was: How does a change of control of a school garden, from volunteer or independent non-profit to public school district, shape the nature of the garden program and the learning experiences therein? In the context of this broader issue question, we investigated a specific set of sub-questions to understand what learning in the garden program looked like, both before and after the organizational transition of control. To answer this question, we asked:

1. Where does learning happen?
2. With whom does learning happen (volunteers, parents, certified teachers)?
3. How does learning happen (teaching methods, content)?

This research aligns with National Research Agenda guidelines, and specifically addresses Research Priority Area 4: Meaningful, Engaged Learning in All Environments (Roberts, Harder, & Brashears, 2016).

Research design

This study employed an instrumental case study design (Stake, 1995). Yin (2003) states that a case study design is appropriate when a) the study aims to address "how" and "why" questions, b) the researcher cannot manipulate the behavior of the participants, c) the contextual conditions must be included in the research because they are believed to be relevant to the phenomena under study or d) clear boundaries may not be drawn between the phenomena and context. Instrumental case study moves beyond this descriptive level of inquiry, and facilitates the researcher's understanding of a deeper issue or theory (Stake, 1995). In this study, the bounded system of the case was the MGEP. Though, as an exemplar model of garden-based learning, the MGEP may not be typical of other school garden programs, nevertheless it provided a rich context in which to study the changes that occur when a garden-based educational program transitions to school district control. In line with Yin's suggestions, the phenomena that occurred within the bounded system of the MGEP case, and the context itself, were wholly inextricable.

First author positionality statement

My entry into formal education occurred through the "gateway" of non-formal education during my years working at the MGEP as a garden educator. I acknowledge that my worldview and educational philosophies are profoundly shaped by this experience, and that my bias towards non-formal, outdoor, experiential learning has the potential to alter and determine the research findings I put forth. While qualitative researchers make no claims of objectivity or neutrality in our research (Creswell, 2013; Merriam, 1998), we must still maintain rigor in our methods by, in part, bracketing out our own opinions and reactions to participants and data. To keep my bias in check, I engaged in extensive reflexive journaling, member checks, and peer debrief throughout the data collection process. I was particularly attentive to potential bias given the specific methodological critiques leveled at case study researchers of findings confirming our preconceived notions about study topics (Flyvbjerg, 2006).

Data sources

Case study research relies upon multiple sources of data to triangulate findings and create an "incontestable description" of the bounded system and phenomena therein (Stake, 1995, p. 62). Semi-structured interviews with research participants and field observations of garden classes constituted the primary sources of data, and first author reflexive journal entries, and analysis of organizational artifacts supplemented these sources.

Interviews. As Stake (1995) states, "Much of what we cannot observe for ourselves has been or is being observed by others. The case will not be seen the same by everyone. The interview is the main road to multiple realities" (p. 64). In line with this perspective, we conducted one-on-one, semi-structured interviews with participants who were purposively selected for the insight into the MGEP that they could provide. We interviewed seven key participants, with differing backgrounds, varied connections to the bounded system, and extensive involvement with the MGEP. Interviews ranged from 68 to 138 minutes, and all interviews were recorded and fully transcribed.

Participant pseudonym	Role	Length of involvement
Kerry	Co-founder of MGEP, executive director of MGEP non-profit 2013-2017	10 years
Faith	Former fourth grade teacher, current certified garden teacher	10 years
Mark	AmeriCorps garden educator 2015-2016 school year	3 years
Pete	AmeriCorps garden educator 2015-2016 school year	3 years
Sue	Former MGEP board chair, former second grade teacher, current primary reading teacher	10 years
Maggie	AmeriCorps garden educator 2016-2017 and 2017-2018 school years	2 years
Tori	AmeriCorps garden educator 2016-2017 and 2017-2018 school years	2 years

Figure 1. Participant characteristics.

Garden lesson observations. There is a precedent for classroom observation data in qualitative educational research (Merriam, 1998; Stake, 1995; Yazan, 2015). Observation of garden lessons provided insight into the teaching methods, content, and student engagement within the MGEP. From October of 2017 to February of 2018, we conducted more than sixty hours of garden lesson observation. A sample of classes from all grade levels, from kindergarten to fifth grade, were observed. Most lessons, and therefore observations, took place in the school garden space, but when weather or teacher preference moved lessons indoors, observations also occurred indoors. Data from lesson observations shaped interview questions, as well. We used Merriam's checklist (1998, p. 97-98) as a starting point for notetaking and data collection during lesson observations.

Data analysis and establishment of trustworthiness

Data collection continued until saturation was reached. Data analysis was ongoing throughout data collection, in the iterative "spiral" of qualitative inquiry (Creswell, 2013), but concrete analysis began in earnest with line-by-line coding of interview transcripts and observation notes. We then aggregated codes into themes and categories, and selected representative quotes and excerpts of observational data to illustrate these findings (Yin, 2003). With case study research's reliance on multiple data sources, triangulation and the establishment of trustworthiness are natural offshoots of the data analysis process (Creswell & Miller, 2000; Stake, 1995). To further establish the credibility of the findings, we engaged in extensive reflexive journaling, maintained a comprehensive audit trail, and utilized member checking and regular peer debrief to verify that findings were true to the participants' experiences.

Findings

The purpose of this case study was to examine how the transition of control of a garden-based educational program from independent non-profit to school district affects learning in the school garden. The central issue question that guided the study was: How does a change of control of a school garden, from volunteer or independent non-profit to public school district, shape the nature of the garden program and the learning experiences therein? Findings, derived from participant quotes and observational data, are presented below. The findings are organized thematically and contextualized,

and themes are titled with participant quotes, to underscore the centrality of the participant voice in the study

What does learning in the school garden program look like?

"She's got that classroom now." Perhaps the single most significant change to the MGEP over the course of transition to school district control was the acquisition of the garden classroom. During the five years as a non-profit, the MGEP operated out of an off-campus office space in town. Lessons were taught in the school garden on school grounds. In the event of poor weather, MGEP garden educators had to either cancel a lesson, or ask the grade level classroom teacher whose class was to come out to the garden if they could bring the garden lesson into their room. This was hectic and stressful for the garden educators, whose lessons did not necessarily translate easily from the outdoor to indoor classrooms, and classroom teachers were not always eager to have messy garden lessons in their rooms.

As a certified employee of the school district, Faith's position came with a regular classroom, right next door to the art room and school library. Maggie and Tori moved their workspace into the classroom at the beginning of the school year, and with that transferred much of the MGEP operations and materials. Though set up roughly like a typical elementary classroom, with tables and chairs for students, Faith's room contained a full-size refrigerator from the previous MGEP office to store garden produce, large bins for recycling and compost (the MGEP handled all recycling in the school since the district had quietly canceled its recycling contract years before), grow lights and trays of seedlings, some gardening equipment, and cooking implements. At one point during data collection, a significant portion of the ceiling was covered with mint bundles hanging to dry, which had been harvested by students to later use for mint tea.

With the classroom came a legitimacy of the garden program's presence in the school, as well as a place to hold classes in inclement weather. The classroom also provided a site for lessons for three additional months during the winter (December, January, February), a period of time during which the MGEP non-profit had not taught. Maggie perceived the classroom itself, and her and Tori's presence in the classroom and consistent presence in the school through the transition, as elements that strengthened Maggie and Tori's place in the school district. Maggie said:

> I think that made it feel very real because the kids get to see us a lot more, the teachers see us more, so you feel like, "ok I am part of the school district." Like, just walking to the classroom in the morning I'll have three kids come up and give me a hug or something like that, so, I think that was probably the biggest part of the transition, just that classroom space.

Like many changes over the transition of control, participants perceived the acquisition of the indoor classroom space to be a change that brought both positives and negatives with it. Tori talked about the challenges of planning exclusively outdoor lessons before the transition of control, and then being forced to move them inside haphazardly in the event of inclement weather. She said:

> Maggie and I, we had to do it mostly outside. If we had to go inside the classroom, it was hard for us because we didn't know what we'd pull up on a SMART board. Can we use a teacher's SMART board? What can we use in the classroom? What can we not use? If we didn't have the materials to do an indoor lesson that's reflective of the outdoor lesson, it was difficult. We just rescheduled it for another day.

Kerry talked about how the classroom was certainly an asset to the program, but that the classroom coupled with Faith's background in indoor education and comfort inside diminished the MGEP's self-perceived role as challenger of the school district's policies and structure. She said, "There have been more classes inside because she [Faith] has that classroom now which is nice, you

know we would have loved to have had a classroom for those days that you can't be outside or during the winter." Tori commented on Faith's seemingly greater comfort inside the classroom, and how that conflicted with Tori and Maggie's backgrounds and educational philosophies. She said:

> I get a feeling that Faith is more comfortable inside, and she doesn't like to go outside. That's deterring for Maggie and me who are more comfortable outside teaching the lesson rather than inside. We have a little difference there.

The role of the garden classroom, as a theme of the research findings, engages in complex ways with additional themes. Learning designed to be place-based, like the learning that occurs in garden-based education, is naturally shaped and determined by the place itself. As such, all elements of student learning are affected when the "place" is transformed from an outdoor garden environment to an indoor classroom.

"That certification seems to carry a lot of weight." Just as the acquisition of the indoor garden classroom marked the most significant change in the physical learning space associated with the MGEP, the hiring of a certified garden teacher to lead the garden-based learning program marked the most significant change in educators associated with the MGEP. Though the two second-year AmeriCorps members, Maggie and Tori, continued to teach with the certified garden teacher through the transition, Faith's presence and job title were defining factors of the school district's control of the MGEP. In conversations with participants about how garden-based instruction, as an extension of the actual instructors, changed over the transition, the teaching certification, and its weight in the eyes of the school district administration, came up repeatedly.

Though Kerry had shifted away from doing much instruction in the garden during the non-profit years of the MGEP because she was occupied with administrative duties, she had at one point expressed interest in applying for the garden teacher position. As co-founder and executive director of the MGEP, she believed that she would have been a natural person to consider for the garden teacher position to carry the organization through this major transition. She shared a story about visiting with the superintendent about the MGEP transition, and said:

> …so as I talked with him and I said, "well I'd be interested in that position, can it be structured in a way that that's a possibility?" and immediately he said, "well no it'll have to be a certified teacher." I mean that certification seems to carry a lot of weight. Doing this [garden education] for ten years doesn't carry any weight at all apparently, but if I had that piece of paper…

Additionally, Kerry believed that the superintendent's approach to creating the garden teacher job description was indicative of his unfamiliarity with the intricacies and magnitude of the program. According to the job description as written, any individual who was certified to teach elementary science was qualified for the garden educator position. She said:

> He wrote the position as a nine-month, typical classroom position, so it's a nine-month job, it doesn't say anything about coordinating a program, supervising AmeriCorps garden educators, oh by the way there's a summer…and weekend stuff, and all this outside of normal teaching contract things.

Faith brought fifteen years of experience as a fourth grade teacher in the district to her new role as garden teacher. Faith acknowledged that her strengths as a garden teacher lay not in extensive gardening or nutrition knowledge, but in years of classroom teaching experience and in years as a community member. She remarked, "Would they be better off with someone who's a botanist and a teacher? Probably! You know, or maybe, a horticulturist, is that the word?" Faith believed that she brought enthusiasm and legitimacy to the position, commenting, "People that already know me know that this isn't just fluff. And they know I'm really teaching things." She also acknowledged that she

was actively learning the gardening side of the work from Tori and Maggie, saying, "I could not do this by myself. These girls work like dogs, and I'm learning so much from them."

When asked if she thought her formal teacher training and years of classroom teaching experience would hinder her creativity in the garden classroom, Faith answered:

> I have always been the kind of person who kind of thinks outside the box, I like to do things a little differently. I want to get my hands dirty, I want the kids to get in and actually do things, my classroom was always the loudest one in the hall, you know, "my gosh what's she doing now?"

"I think they are trying to push the standards more." The act of connecting garden lessons to state learning standards was a frequent topic of discussion among participants, though the framing of the importance of state standards varied depending upon the role of the individual participant in the MGEP. For educators firmly situated in the non-profit era, connections to state standards were viewed as a "bonus" of the garden programming; a hook to get the buy-in of teachers and administrators. For educators on the school district side of the transition, the fulfillment of state standards was essential to the planning, execution, and assessment of garden lessons. In reflecting upon the lesson planning process during his time as an AmeriCorps member before the transition, Mark said:

> We kind of used the [state] standards as a guide for designing our own lessons. We were really more focused on making sure that we were teaching what the state needed us to teach, which I think was probably short-sighted on our part, because we had more freedom than we even thought.

Naturally, the participant who spent the most time discussing state standards and the garden curriculum was Faith. After all, she was the one who was tasked by the school district with formalizing the curriculum and justifying it to the local school board and the Department of Education, through the achievement of state learning objectives. Faith acknowledged that she had inherited a strong curriculum, developed over the previous decade by the MGEP non-profit. She said, "I'm writing curriculum to go along with what's already been taught, and what we're planning to teach, and incorporating those state standards." Faith demonstrated a comfort with the language of state learning standards, and she talked about being able to meet those standards through myriad garden-related activities. Faith said:

> They're learning life skills, but I'm still able to get those standards taught at the same time. When you can kill two birds with one stone in one lesson…that's pretty amazing. We talked about our objective of how to try new foods, and then we're taking it and introducing it through a book, and we're teaching alliteration at the same time because we're reading *Sylvia's Spinach*.

In addition to the explicit discussions of state learning standards, there were subtler signs of curricular standardization and de-contextualization throughout the post-transition period of data collection. Kerry alluded to this during her interview, in which she said, "…already some teachers have said that there have been worksheets. We never did worksheets, but now there have been a lot of worksheets." Numerous observed lessons included worksheets of some sort, which were difficult for students to hold on to during outdoor garden lessons, and indoor lessons often utilized SMART boards to display videos or online learning tools.

Though Faith spoke enthusiastically about the inherent value of hands-on learning experiences in the school garden, there was one discussion that highlighted her standards-based orientation, and perhaps her philosophical commitment to the standardized approach to public education. When asked about her favorite lesson from the non-profit era of the MGEP program, she immediately recalled and eagerly shared her answer. She recounted:

> One of my favorite lessons ever, and Kerry did it, it's been years ago, but we were teaching map skills, and I mean, you know, actual maps that you look at, which we don't all do anymore because we have Google maps…but teaching them north, south, east, west, and latitude and longitude. Kerry had set up a scavenger hunt in the garden and they had to find specific things by going west and going east and turning right and left and…it really resonated with them and they got it.

> However, when asked if, as the new garden teacher and person in charge of the garden curriculum, she would teach the same lesson again, her response was quite different. She said: …well, it depends on if that's something that still needs to be taught. If you're trying to stick with the standards, social studies has changed since then, and science is changing now…we don't standardized test on social studies anymore, which is where those map skills came in, so, to the Department of Education, is that really something that's important?

"There's a lot more STEM." Just as participants from the non-profit days of the MGEP spoke about connections to state learning standards as bonus to high quality, experiential learning, they spoke about engaging science, technology, engineering, and math (STEM) the same way. Non-profit MGEP educators prioritized garden-based learning experiences, and any incorporation of STEM concepts was effortless and constituted an additional perk. In contrast, talk of STEM in the garden was at the forefront of conversations about the garden after transitioning to school district control. Formal teachers often place school gardening and garden-based learning within the STEM "box," perhaps because it is a familiar place for them. However, non-profit MGEP AmeriCorps members, and MGEP individuals more aligned with a non-formal teaching paradigm, viewed STEM topics as but a small slice of the vast content that could be covered in the garden.

When Kerry, who had the strongest personal stake in the earlier iterations of the program and its formerly broad curriculum, was asked how she saw the focus changing under school district control, she said, "STEM, of course, is a big buzzword in education and a big focus right now, so I think that's gonna be a big focus of the program."

As discussed in previous themes, when speaking about the shifting focus of the curriculum, Maggie connected it to changes in both the learning environment with the acquisition of the garden classroom, and the teaching schedule. She said:

> I would say that, especially since we have all these winter lessons now, there's been more of a focus on STEM, so, we try to do garden-related projects in the winter, but they always come back to science, math, technology.

Throughout the history of the MGEP program, there has been a tension over the role of technology. Classroom teachers in the district heavily incorporated iPads, SMART boards, and other technology into their teaching, and encouraged the MGEP to do the same. Simultaneously, members of the MGEP team worked to protect a screen-free garden space, as they believed that heavy technology use conflicted with the organization's philosophies of experiential, place-based learning.

Sue, former second grade teacher and current reading teacher, who was outspoken about her personal teaching philosophy of hands-on education, "kids in muddy boots," and the value of getting students outside, commented critically that "…we spend a lot of stagnant screen time, worksheet time." However, in the same interview, when asked about her vision for the program moving forward, she said:

> I would really like to see more technology. I would like to see them utilize iPads out there, I think you could do all kinds of things out there. Take pictures, write, you could have all kinds of data over time with your iPad in the garden.

Technology use, it has been mentioned, featured heavily in the indoor lessons the garden team led during the winter months, or during poor weather. When the garden educators were unable, for whatever reasons, to expose students to authentic learning experiences in the school garden, they attempted to replicate them by playing videos on the SMART board. In the winter, when pollinators were not active in the garden, the garden educators showed students a high-quality video of pollinators pollinating various plants. The school district garden education team also had older students use iPads to film short "tour" videos in the garden, or to take photos from their point of view in the garden. Faith compiled these photos and videos, as well as photos and videos taken by the educators, into monthly video newsletters to share with the whole school community, showing them the goings-on in the garden that month.

While Kerry recognized the value of technology as a tool to spread the message of the garden program, and even had a more liberal view of student technology use in the garden than others associated with the non-profit era, she expressed concerns about shifting boundaries regarding technology use through the transition of control. These concerns reflected her earlier, broader statements, about the MGEP once serving as a challenger of the school district's way of doing things, but after the transition becoming complicit in their approaches to education. She said:

> From what I can glean from Faith, technology is a big thing for her, so kids are using tablets out in the garden, and they've worked towards getting WiFi out there…because (sarcastically) we needed more technology in the garden. Because we've had so many people say, 'hey, the garden's great but we need more technology!' No. Nobody's ever said that. In fact, people say the opposite. They value it as a place where students are not plugged in.

Discussion and Recommendations

Participants acknowledged changes to the nature of the learning in the garden program over the course of the transition of control. These broad changes could be traced directly to specific changes to the learning environment in the form of the acquisition of the indoor classroom, the increased frequency of garden lessons from six times per year to once every four weeks including winter, and the creation of the certified garden teacher position. Under the umbrella of changes to student learning created by those elements, more narrowly focused changes occurred as well. Student learning was assessed according to the state learning standards and expectations of the school district, the effects of which trickled down into the curriculum. Technology became an increasingly important part of the MGEP's activities, and whereas before the MGEP had seen itself as a protector of unplugged space and time for students, after the transition SMART boards and iPads made regular appearances in garden lessons. These trends towards increased technology reflected broader trends in education (Harper & Milman, 2016). In light of these findings, we present the following recommendations for practice and research. Additionally, we want to note that we have tailored these recommendations to a formal, public education audience, given the transition of the MGEP to school district control, the readership of this journal, and the broad impact of public education (Center on Education Policy, 2007).

Legitimation of garden-based learning

Our first recommendations for practice and research revolve around a concept we have termed "legitimation of garden-based learning." Legitimation of garden-based learning refers to a collection of tangible actions and intangible shifts in school culture that will expand and strengthen the impact of garden-based learning in public schools by establishing it as a legitimate and important feature of an education. Previous research established the benefits of garden-based learning to schools, communities, and students (Berezowitz, Bontrager Yoder, & Schoeller, 2015; Blair, 2009), while the findings from our study used the shifting structure of the MGEP to examine the tensions between formal and non-

formal garden-based education. We propose "legitimation of garden-based learning" as a framework to advance these conversations further by considering how non-formal and formal paradigms might effectively blend through garden-based learning.

Many of the challenges and tensions that were observed and discussed throughout the study stemmed from perceived hierarchies and disconnects that placed garden-based learning, and its facilitators, below or marginal to "real teachers" and formal education. AmeriCorps garden educators experienced barriers to fully integrating into the school culture. For example, they did not get their own keys to the building and they were not part of official school district professional development events. Though the relationship between the AmeriCorps educators and the school district improved over the course of the transition, much of the improvement was attributed to the other teachers' and administrators' respect for Faith and perception of her as "legitimate."

Suggestions for legitimation of garden-based learning among individual educators were seeded by a conversation with Pete, one of the former AmeriCorps educators. After his year of service ended with a different agriculture non-profit for which he was working, Pete planned to enroll in an agricultural education bachelor's program. Pete was going to take his three years of experience in a non-formal, non-traditional school garden setting with him to a formal, traditional teacher education degree program. Pete's epistemology and educational worldview had been constructed by those experiences, which would shape and affect his experiences in the bachelor's program. Perhaps they would shape his peers' learning, too. Another former AmeriCorps garden educator at the MGEP enrolled in an education master's program following his service, and went on to become a third grade teacher. Tori and Maggie both expressed interest in continuing their careers in education of some sort, higher education for Maggie, and perhaps health education someday for Tori. Reflecting on the impact the MGEP had had on their educational philosophies, Tori said:

> I think about how if Maggie or I were to become certified teachers how much we would take our classes outside and how we would start a garden. I feel like after working at the MGEP, I would take my kids out all the time to grow food, just explore outside, find bugs, things like that, just because we have this experience and see how beneficial it is.

Long-term legitimation of garden-based learning must come from teacher preparation programs. Teacher preparation programs, including but not limited to agricultural education, should make a concerted effort to recruit students from non-traditional educational (and agricultural) backgrounds. Pre-service primary, elementary, and special education teachers could be placed with garden teachers of formal and non-formal backgrounds for internships or student teaching. It is unrealistic to expect classroom teachers to integrate gardening into their pedagogy if they are not exposed to garden-based learning in their own education (Carney, 2011; DeMarco, Relf, & McDaniel, 1998; Desmond, Grieshop, & Subramaniam, 2004).

While legitimation of garden-based learning may be accomplished through the avenues outlined above—a legitimation of non-formal backgrounds or non-traditional epistemologies *through* traditional teacher certification—administrators and school districts should consider expanding beyond the teaching certificate as a criterion of singular importance in hiring decisions. As Kerry mentioned, she co-founded and ran the MGEP organization for ten years, and under her guidance it grew to be of such value to the school district that the administration chose to take it over and fund it. However, simply because she did not possess a teaching certificate, she was not qualified for the garden teacher position. This particular view of who is qualified to teach, and who is not, represents a severe constraint on the potential growth of the garden-based learning movement within formal education. One could argue that Kerry was, in fact, the *most* qualified individual for the garden teacher position due to her intimate knowledge of garden-based content, familiarity with the quirks of the program and its history, and identity within the community as a symbolic pillar of school gardening. Because Kerry's

knowledge and background were not valued in the traditional public education paradigm with its prioritization of teacher certification, she was not considered.

We suggest that school boards and administrators consider a more holistic view of candidate qualifications for unique positions such as garden teachers, school garden coordinators, or farm-to-school coordinators, as is done in some states when hiring certain vocational teachers. We suggest that if position descriptions are written to include teacher certification as a criterion it be listed as "preferred" rather than "required." Additionally, administrators could offer alternative qualifications in the position description, such as "teaching certification OR master's degree and three years non-formal educational experience." Finally, if the certification remains non-negotiable to the school board, administrators should forge clear paths to alternative certification for garden educators, and be willing to hire non-certified, non-traditional educators with the contingency that they acquire a teaching certificate within a reasonable amount of time. We make these suggestions with an awareness of the legal and procedural constraints in which public school districts operate, and acknowledge that structural changes may be needed that extend far beyond the control of individual school boards and administrators.

Finally, we suggest that legitimation of garden-based learning can come from garden-based learning professional development. One well-established avenue for this is the Life Lab Growing Classroom workshop, which Sue and other participants mentioned repeatedly. These workshops, which are led by experts from Life Lab in Santa Cruz, California at schools across the country, are tailored to classroom teachers. They expose classroom teachers to the philosophy of garden-based learning, present best practices for outdoor classroom management, share example lessons from the Growing Classroom curriculum, and demonstrate curriculum integration and connection to educational standards. Sue believed that the Life Lab workshops were most effective because they brought in "outside experts," and therefore tempered any classroom teacher hesitation to engagement that emerged from MGEP fatigue or personality conflicts. Additionally, because they targeted and empowered classroom teachers to utilize the garden themselves, they encouraged independent utilization of the garden and reduced the framing of the MGEP as a "special," like music, art, or PE, that was the responsibility solely of the certified garden teacher. Curriculum integration in the school garden is a feature of effective garden-based learning, and one that classroom teachers, with their intimate knowledge of curriculum, are well-equipped to do with proper resources and support (DeMarco, Relf, & McDaniel, 1998).

Legitimation of garden-based learning does *not* mean adjusting school garden activities to fit the confines of the public school system (for example, moving lessons inside as Tori and Maggie were sometimes forced to do). Though non-formal garden educators and garden-based learning advocates must, of course, make compromises in order to support this objective, legitimizing garden-based learning demonstrates that it has inherent value to the health and education of children. The goal is for school districts to see garden-based learning as a legitimate, valuable part of an education and support it accordingly. Future research into legitimation of garden-based learning should work to quantify this legitimacy – legitimacy of educators, programming, and curriculum – and examine connections between legitimacy, program longevity/support, and student learning outcomes.

Keep the garden in garden-based learning

Our final recommendation for practice is to prioritize, above all else, the physical school garden site as the location of garden lessons. This recommendation spans non-formal and formal education alike. Garden-based learning is predicated on an understanding that getting kids outside, engaging them in the production, preparation, and consumption of food, and exposing them to tactile learning experiences, is best for students (Blair, 2009). Scholarship on garden-based learning emphasizes the garden as the learning site, and when learning *about* gardening occurs in a traditional classroom, it is

categorized as STEM and not garden-based learning (Desmond, Grieshop, & Subramaniam, 2004; Graves, Hughes, & Balgopal, 2016). Preserving the school garden as context, in addition to teaching gardening content, further aligns effective elementary garden-based learning with its parallel in secondary agricultural education (Roberts & Ball, 2009). The pedagogical and philosophical shifts that occurred over the course of the MGEP's transition represented a subtle but consistent tug towards standardization and decontextualization, illustrated by increased indoor lessons, worksheets, educational technology. We do not advocate for one particular model of garden-based education program – non-profit, extension-led, or school-funded – but argue that regardless of the structure, garden-based learning experiences must be based in a garden to best serve students.

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