GROWING WONDER

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The Role of Awe and Wonder in Education with Practical Applications Through Garden-Based Education

By Zoe Giles

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Growing Wonder:

The Role of Awe and Wonder in Education with Practical

Applications through Garden-Based Education

By Zoe Giles

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To the wide eyed and curious child within us all



"And so it is that most people have no idea how beautiful the world is and how much magnificence is revealed in the tiniest things, in some flower, in a stone, in tree bark, or in a birch leaf. The grown-ups, going about their business and worries, and tormenting themselves with all kinds of details, gradually lose the perspective for these riches that children, when they are attentive and good, soon notice and love with their whole heart. And yet the greatest beauty would be achieved if everyone remained in this regard always like attentive and good children, simple and pious in sensitivities, and if people did not lose the capacity for taking pleasure as intensely in a birch leaf or a peacock's feather or the wing of a hooded crow as in a mighty mountain or a splendid palace. What is small is not small in itself, just as that which is great is not—great. A great and eternal beauty passes through the whole world, and it is distributed fairly over that which is small and that which is large; for in such important and essential matters, no injustice is to be found on earth."

- Rainer Maria Rilke

It's late September and the air is becoming crisp, filling with the scent of newly fallen leaves and damp earth as the summer finally gives way. School is back in session, and my first grade class has just been released for recess. The first tinges of reds and yellows are beginning to emerge in the leafy canopy surrounding the playground. Little feet stampede the ground and excited shouts erupt as children disperse and begin to play. One group, myself among them, heads not toward the play structures, but toward the Burning Bush. Always one of the first true signs of autumn, its leaves are aflame in vivid red. Laughter and joy abound as small hands reach for the branches. With delicate care, we begin to pluck the seeds from the tree, splitting the dark maroon casing to reveal a bright orange core. Gingerly, we separate the casing from the seed. The delicate, fleshy orange lining begins to stain our palms and fingertips as we carefully peel it away, revealing hidden, pearl-like seeds at the center of it all, tinged with pink and glistening in the autumn sunshine. Time passes, and our busy hands slowly amass a collection of pearls atop the fence rails next to mashed purple pokeweed berries and various other greenery we have foraged for later use as currency in a vast trading system that we have devised.

My love of learning and school developed early, encouraged by numerous wonder-filled moments like this. I was beyond lucky to have this level of freedom and curiosity so openly cultivated. This memory from fifteen years ago has continued to be a guiding force throughout my educational journey: a reminder of the power of connection and wonder in the learning process, and a source of inspiration for the sorts of learning environments I believe all students deserve. It is because of these formative moments that I decided I wanted to dive deeper into understanding the transformative powers of awe and wonder in education, and the ways that turning to the natural world as a source of these emotions and experiences can be harnessed to encourage deeper learning and engagement in the classroom. Throughout this thesis, I will be exploring the role of awe and wonder in the classroom with practical applications through garden-based education. I will begin with a literature review, providing background from the research of scholars in the fields of awe and wonder and impacts of garden-based education. From there I will offer an introductory guide for curious educators who are interested in integrating these practices into their schools and communities. I will include a couple of ingredients lists for starting a school garden that give examples of important materials and set ups for educational garden infrastructure. I will then provide example lesson plans for each subject area that connect to national learning standards. I will also provide a list of ways for teachers to gauge whether their students are experiencing awe and wonder in the classroom. That will be followed by thoughts and experiences from observations and partnerships I've had within the field of garden-based education, and finally a brief aside on the practice of awe and wonder as an act of resistance. At the very end of this thesis, I will also include a set of helpful resources for educators to refer back to, including databases, reading material, books for reading aloud, and more.

My hope in compiling this resource is to create a one-stop-shop for educators to find the information they need to offer garden-based educational programming, rooted in awe and wonder, at their schools. Oftentimes, what prevents these programs from starting up (aside from necessary funding, district support, and constraints posed by testing and curricular standards) is an inability to conceptualize how to move forward, and a lack of access to helpful resources or visibility into what successful programming can look like. Even if educators read this work and don't start a school garden program, my hope is that they start to consider the role of awe and wonder in education, and consider ways to incorporate it into their classrooms, and their own lives, a bit more.

Literature Review

Introduction

To truly understand the importance of awe and wonder, and how these two emotions tie into garden-based educational practices, it is necessary to refer to the wider network of scholars who are thinking about and considering these topics. In this literature review, I will begin by exploring current literature in the broader field of awe and wonder research and its applicability and importance in everyday life. Then, I will look into the issues barring awe and wonder in the classroom, and ways that people have found to counter this. Finally, I will explore the history and benefits of garden-based learning approaches, and some current issues facing nature-and garden-based education.

The basics of awe and wonder

Awe and wonder have become popular topics for research in recent years. The emotions themselves are quite fleeting, and providing a definition for them can be subjective. However, there are some scholars who offer definitions for the two emotions that I resonate with. One such scholar is Dacher Keltner, a leading researcher in the field of awe and wonder. In his book, *Awe: The New Science of Everyday Wonder and How it Can Transform Your Life*, Keltner writes "awe is the feeling of being in the presence of something vast that transcends your current understanding of the world" (2023, pg. 7). Wonder is a slightly different, but deeply related emotion. Educational researchers Pearce and Maggie MacLure provide a definition of wonder as "a liminal experience—a sort of shimmering apprehension on the threshold between knowing and unknowing, in which aesthetic, cognitive, and spiritual experiences are simultaneously mobilized" (Parker, pg. 162).

When thinking about my own personal understanding of awe and wonder, I find myself looking back to an episode from the John Green podcast *The Anthropocene Reviewed* titled "Our Capacity for Wonder and Sunsets." The episode opens with a quote from F. Scott Fitzgerald's *The Great Gatsby* in which the narrator is imagining the moment that Dutch sailors first saw New York, writing that they would have been "face to face for the last time in history with something commensurate to [their] capacity for wonder" (Fitzgerald, 1925, p. 193). This statement mirrors some of the language that Keltner uses to describe the sensation of awe; experiencing a moment that challenges and brings curiosity to our understanding of the world we live in. As the podcast continues, Green critiques Fitzgerald's view that the moment he wrote about was the last moment in which humans came in contact with such a wonder-filled experience, countering that in fact, we have opportunities to experience wonder in the tiniest of moments of our everyday lives.

Keltner highlights this as well, underscoring that the opportunity to encounter feelings of awe is always close at hand. We simply need to make a little time for those moments, whether that means going for a walk in nature, engaging in collective movement, exploring a new music genre, or even just taking a different route to work (Reese, 2023). Anders Schinkel makes a similar point, arguing that "wonder's temporary arrest of our movement and gaze, 'bidding us to stand before objects with still attention or to lean closer to dwell on them more intently' is indeed only temporary and may move us to express in ever new—because ever-imperfect ways—why the world is worth attending to for its own sake" (2017, pg. 550). Near the end of his podcast, Green emphasizes this need to actively attend to the world around us as well. He states, "the wonders do not cease. It is our attentiveness that is in short supply, our ability and willingness to do the work that awe requires" (2021). In a society that values work and money and constantly striving towards a "better" future for ourselves, making the active choice to carve out "non-productive" time in the here and now to instead attend to the beauties of the world around us is not often seen as an option. However, finding these moments of awe and wonder is incredibly important. John O'Leary in his book *In Awe: Rediscover Your Childlike Wonder to Unleash Inspiration, Meaning, and Joy* poses a very related question: "what if in exchanging what we actually love today for some vague notion of a perfect tomorrow, we forfeit the joy of living immersed in this moment and the chance to live In Awe each day?" (pg. 98, 2020). Although reaching toward some "great perhaps" is enticing and encouraged in our society, it is also important to attend to the current moment and experience those world-pausing moments of inspiration and awe that can only be found when given the time to pause ever so briefly.

Beyond simply inspiring stillness or mindful moments, awe and wonder can also encourage relationship and community building. Researchers David Fessell and Karen Reivich (2021) explain that although feelings of awe often occur in solitude, they tend to "draw us out of ourselves and towards others" while inspiring prosocial behaviors such as compassion and generosity. Keltner expands on this idea further. He emphasizes that negative self-talk can be silenced in moments of awe and wonder, and moments such as these empower us to collaborate with others and become more open to questioning and grasping for understanding of the miraculous and unexplainable world around us. In this search for understanding, coupled with a reverence for the unknown of our surroundings, the desire to think outside of ourselves and tune in to others becomes ever stronger (Keltner, 2023).

Circling back to the Green podcast, he describes a moment on a walk with his son, attempting to point out the sky in the middle of an oak grove. As Green pointed to the sky through the trees, his son Henry's attention was called to a rustling brown oak leaf directly in

front of him. At first Green was disgruntled in his son's inability to see the wonder in the moment he was attempting to share, but as Green looked closer at the leaf his son was marveling at, he began to notice details that he had never truly seen before, rendering him, like the narrator in Gatsby, face-to-face with something commensurate to his capacity for wonder (2021). In addition to the desire to look outward and connect with others after experiencing a moment of wonder, engaging in awe and wonder filled moments in community can bring about a greater awareness for the world and highlight elements of things that we have never even thought to pause and marvel at.

The role awe and wonder can play in education

Making a connection from the importance of awe and wonder in everyday life to the role that awe and wonder can play in educational settings is not a difficult task. Various scholars have emphasized the importance of the two emotions in learning scenarios. Researcher Yanns Hadzigeorgiou has described wonder as 'the engine of all intellectual inquiry' (Schinkel, 2017, pg. 538). Rachel Amin of Pentagon Play, a UK based outdoor learning playground facilities installation operation, describes wonder in a child as "an inner desire to learn that is ready to be awakened" (2017). Rabbi Michael Lerner has stated that "awe and wonder should be the first goals of education" (Miller, 2022, pg. 27). Monica Parker (2023), who also emphasizes the role of awe and wonder in the classroom, describes the building blocks of wonder as "openness, deep curiosity, absorption, expectation violation, the closing of a cognitive gap, making room for new information resulting in a new perspective" (pg. 163). These are all sensations and lenses through which we hope our students will experience the material that is being presented to them, and thus emphasize the importance of finding ways to inspire wonder during the learning process.

Connecting to Parker's building blocks, researcher Anders Schinkel in his essay "The Educational Importance of Deep Wonder" writes that "to be curious means, in essence, to want to know, and this is obviously a desirable condition in a student. Wonder can be similar" (2017, pg. 541). He further explains that the area in which wonder branches away from curiosity is in its ability to encourage deeper thinking, as wonder itself is "an experience or state of mind signifying that something that so far has been taken for granted is incomplete or mistaken" (2017, pg. 542) He specifically talks about this in relation to deep-wonder, which is a more existential form of the emotion that causes a philosophical wondering about questions related to the world and experiences that may not ever have a concrete answer. An additional benefit of deep-wonder in particular is that it heavily relates to or may subsequently lead to a love of the world (Schinkel, 2017). When we experience this deep connection to the world around us, not only do we feel more excited to learn about it, but we become more likely to respect it and care for it in the ways that it so desperately needs. Expanding upon these principles, authors of Wonder-full Education: The centrality of wonder in teaching and learning across the curriculum emphasize that wonder holds an essential place in the process of learning as the very state of puzzlement that it inspires is what can lead to a longing for the truth (Egan, Cant & Judson, 2013). This would suggest that wonder can in fact inspire curiosity, or a yearning for a deeper understanding of a topic, whilst also continuing to maintain a more open-ended sense of wonder for the less definable or answerable portions of a scenario. Evidence of this appears in the rigorous academic pursuit of scientific inquiry. The root desire to gain deeper knowledge and understanding of the world around us which prompts inquiry and subsequent scientific breakthroughs often comes from an experience of wonder or awe. Dacher Keltner has also made a statement about the importance of awe and wonder in education, writing that as development

progresses, children's innate feelings of awe inspire their curiosity in school and can even predict better academic performance (Keltner, 2023).

The awe and wonder crisis in the classroom

Clearly, awe and wonder are important not only in our everyday lives, but in the learning process as well. They play a pivotal role in our ability to relate to one another and appreciate the world around us, encourage us to question our world while existing in a space of not knowing, and have research to back their positive impact on academic performance. And yet, the educational system that we currently have in place is not often conducive to the two emotions. Scholar Jim Garrison articulates numerous ways in which our school systems are actually working directly against awe and wonder. With a system that is designed "not around questions" but around facts you need to know and tests which ascertain how well you memorize them...curiosity, subjectivity, [and] personal growth is irrelevant to whether you get a 98 or 99 percent" (Parker, 2023, pg. 173). How then would we justify practices that ask us to slow down and make time for moments of collective noticing and wondering, when we are expected to be spending those class minutes teaching to rigid exams and curricular standards? Because wonder is "slow," people feel it is not of clear utilitarian value, and thus time and space that could be devoted to wonder often come under pressure (Schinkel, 2017). A system like this, Garrison believes, creates a lack of cooperation and encourages unhealthy competition that then results in poor mental health of the students (Parker, 2023). This entire process starts as early as kindergarten, and thus we discourage the curious, wonder-filled tendencies of humans from the very beginning, cementing within them that school and learning are not areas that allow for or encourage curiosity, creativity, inquisition, and wonder.

Keltner believes that wonder-based schooling has the potential to positively impact children's learning, emotional capacity and well-being throughout their lives (Parker, 178). Garrison goes a step further, suggesting that a more wonder-filled education has the power to foster more cooperative cultures in school. Beyond that, he believes awe and wonder are "linked to the willingness to imagine something different" (Parker, 2023, pg. 177). In a world that is facing so many pressing issues, having this ability to view our world with a critical lens and question information that has been given to us is becoming an ever more valuable and important skill to hone. Monica Parker, author of The Power of Wonder: The Extraordinary Emotion That Will Change the Way You Live, Learn, and Lead states that an education system that pushes wonder away in exchange for rigidity and standardization ultimately "impacts not only our ability to learn, but also to unlearn as well" (2023, pg. 173). Scholar Laura Piersol expands on this, highlighting that by discouraging wonder, "instead of guiding students to dismantle existing assumptions and gain the courage to consider 'strange' new ideas, we lead them to concrete answers and present most subjects as static entities in which there is little left that is unknown" (Parker, 2023, pg. 179-180). Not only does this leave little room for imagination, it also makes finding solutions for our pressing societal and world issues feel more impossible, as we become unable to foresee opportunities for change within systems that appear to be static.

Teachers observe this lack of wonder and difficulty engaging with imaginative activities in their students as well. Sharon Shelton-Colangelo, in her essay entitled "Joy in the Classroom," reflects on her experience of teaching composition in a community college. She explains that she sees many learners whose innate childhood sense of awe, curiosity, and pleasure has been entirely overridden by years of traditional schooling that evoked fear of failure and self-doubt (2007). She goes on, however, to emphasize that the way out of such situations is through

helping students to "look at the world with the awe and reverence of a child," which oftentimes helps them to exist in the present moment and eventually to experience joy in the classroom (2007, pg. 114). Thus, teachers play a large role in encouraging and facilitating these wonder-filled moments for their students. Of course this is not easy to accomplish, given the previously outlined barrier of strict curricular standards and tests to teach towards, but there are still educators who are finding a way.

As author Rachel Carson points out, in order for a child to keep alive their natural sense of wonder, they must have at least one adult who can share it with them, and excite in the moments of discovery within the mysterious world we live in (Egan, Cant & Judson, 2013). Shelton-Colangelo (2007) emphasizes a similar point, stating that in order to create joyous classrooms, teachers must start with themselves by cultivating their own love and compassion, specifically for their students. Educators must make time in their own busy lives to actively practice the outlooks that they wish for their students to embody so that they can help to model them for their students. In terms of awe and wonder, this means making time for slow moments of looking and wondering as one goes about their day. The authors of Wonder-Full Education expand on this, stating that not only do teachers need to have experience with these wonder-filled moments, they must also approach their subject of instruction as full of mysteries that they themselves find interesting (Egan, Cant & Judson, 2013). In order to do this, they must be willing to make mistakes and admit, both to themselves and to their students, that they do not and cannot know everything (Egan, Cant & Judson, 2013). Finally, teachers must make the time to engage in moments of wonder alongside their students and learn from one another. Egan, Cant & Judson (2013) provide an example of such a scenario: A teacher took his sixth grade students on a walk through the woods, and early on paused to point out the patterns that beetles had made

on the bark of an old log. After looking at it briefly, they moved on, but for the rest of the walk his students continued to bring him pieces of nature that caught their attention, and thus both the students and the teacher were able to engage in collective moments of awe throughout. By simply sharing a lens through which to examine the world, and demonstrating that taking the time to pause and look deeply is valued and respected, the students were able to connect back to that innate sense of wondering that often feels so unique to early childhood.

Embracing the wonders of the outdoors for educational purposes

The benefits of incorporating nature into learning spaces have been thoroughly researched, and much of them are closely tied to wonder and awe. Some research has shown that simply living closer to nature increases the odds that children will experience it as a source of awe, wonder, and joy (Wilson, 2012). The philosopher Rousseau had similar feelings, believing that children ought to be raised in nature to avoid the negative influences of society (Änggård, 2010). By living in harmony with nature, they would then learn through experience rather than instruction as they could interact with the physical materials around them (Ånggård, 2010). As ideal as it may be to raise children in and amongst nature, free from the constraints of society, it is not particularly realistic in this day and age, as we often start schooling young and many people live in urban environments. Due in part to these concerns, various approaches have been taken throughout history that attempt to incorporate nature into the classroom. Some of these include outdoor learning initiatives, garden-based education, and nature schools. Despite their differences, all three of these approaches make an attempt to address the need for nature integration into schools using hands-on learning approaches while continuing to reference or connect to the frameworks of curricular standards and state mandates.

A brief history of the school garden movement

Researchers Dilafruz Williams and P. Scott Dixon highlight two initial concerns that the school garden movement sought to address. One is a concern related to obesity, food insecurity, and health, while the other is greatly impacted by the book *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder* by Richard Louv, which highlights the urgency of offering children an opportunity to exist in and interact with nature (Williams & Dixon, 2013). The implementation of the school gardens and garden-based education that came out of these concerns has ebbed and flowed over time, sticking more in some states than others. For example, recent reports record more than 4,000 school gardens in the state of California alone (Skinner et al., 2012). The recent momentum surrounding this movement began to accelerate in the early 1990s, but gardens themselves have been a part of the school landscape of the United States since the late 19th century, and grew in popularity during World War I and World War II (Williams & Dixon, 2013).

Definition and Benefits of garden-based education

There are various definitions of garden-based education, but most hold similar themes. Williams and Dixon (2013) provide a definition of garden-based learning as "programs, activities, and projects in which the garden is the foundation for integrated learning, in and across disciplines, through active, engaging, real world experiences" (pg. 213). Skinner et. al. (2012) highlight some defining features of garden-based programs, including "holistic, integrated, hands-on, project-based, cooperative, experiential learning activities" (pg. 19). The elements that are repeatedly highlighted, and perhaps what sets garden-based programming aside from traditional classroom teaching strategies, are the full immersion and hands-on elements that are required in the activities. Most of the work children are assigned in schools keeps them seated indoors at a desk, dealing only with paper and pencil, and the occasional small group

project or peer discussion. Garden-based education can provide a way out of this rigid format, unlocking the opportunity for numerous benefits for both children and teachers alike.

These programs can have a number of different features and purposes, and have been demonstrated to be greatly beneficial for multiple reasons. Some common purposes of school garden programming are more personal, impacting socioemotional learning and moral development, and others are more communal, developing a stronger sense of empathy and connections with classmates and even parental involvement, while other programs serve to create more positive attitudes toward the environment or deeper awareness surrounding food literacy and healthy eating habits (Williams & Dixon, 2013). Murakami et al. (2017) highlight similar purposes and aims for garden-based programming in early childhood education, emphasizing that it can help learners become more aware of "their connection to each other, their food system, and the broader environment" (pg. 18) and that the hands on elements of caring for the plants and soil can encourage the development of prosocial behaviors toward people and nature. Beyond these personal and societal implications, there has been a lot of research demonstrating positive impacts on academic and classroom-based experiences thanks to garden-based education strategies.

Many studies demonstrate increased performance, engagement, and motivation from students involved in garden-based programming. One review of research states that garden-based learning had positive impacts on students' attitudes, knowledge, grades, and behavior (Williams & Dixon, 2013). In a synthesis of a broad array of literature, "the effects on several of the indirect outcome measures were 100% positive, including motivation, curiosity and wonder, discipline, study habits, problem solving, life skills, and academic attitudes" (Williams & Dixon, 2013, pg. 222) An additional study looking into the role of intrinsic motivation and engagement

in garden-based education found that students in garden-based programs showed more interest and enthusiasm related to learning activities, maintained better attendance with fewer disciplinary issues, and attained higher achievement in standardized tests and overall GPAs (Skinner et al., 2012). This study also reported "delight, enthusiasm, and vigorous participation in gardening activities" (Skinner et. al, 2012, pg. 19). An analysis of teacher narratives in early childhood garden-based education included a teacher's report that the children were excited and engaged when it came to incorporating the garden into their literary lessons (Murakami et al., 2017). The studies reported numerous potential reasons behind these benefits. Williams & Dixon (2013) credited the hands-on element of garden-based learning, emphasizing that experiential learning has been found to promote higher-level learning and positive attitudes toward learning in general. Skinner et al. (2012) point to self-determination theory, with its focus on the human need for relatedness, as well as intrinsic motivation, as useful foundations through which to explore the motivational impacts of garden-based educational programming.

As the field of garden-based learning has been in existence for over one hundred years, there are a range of different approaches. A few in particular stand out amidst a deeper analysis of texts on the subject. Oftentimes, approaches that highlighted the role of authentic participation in the physical garden work were observed by teachers to be the most effective for driving learning and development (Murakami, 2017). There is certainly a connection to draw between this practice and the importance of hands-on learning that Williams & Dixon (2013) highlight in developing positive attitudes and deeper learning. Murakami (2017) also highlights a quote from a teacher that underscores practices that rely on and instill a sense of community and reciprocity in their lessons, specifically ones that give back to the larger community. Demonstrating to the children that they are capable of producing food that they can consume and also feed those

around them, enables them to construct an understanding of the networks of support that exist around them from an early age. This is a lesson that they can carry with them throughout their life. Williams & Dixon (2013) found in their review of literature that curricula for science and math were the most frequently connected to gardens, but there was huge variety in the topics that were covered across research. Sometimes making connections between the garden and subjects outside of the STEM fields can feel like more of a stretch, but Murikami shared some interesting approaches teachers have taken to implement work with literacy and reading into garden-based curriculum as well. One specific example was focused on the book The Three Little Pigs where they used materials they found in and around the garden to build the sorts of houses they were reading about in the book and then reenact characters and scenes from the story (2017). This got kids moving, but also helped to aid in connecting more with the characters by feeling as though they were a part of the story, while also instilling a sense of community as they worked together to build the houses. Later in this article, Murakami makes the point that it is important for early childhood garden programs to widen the scope of what sorts of teaching can occur related to garden-based education, looking beyond simply food- or science-based knowledge and into other subjects as well (2017).

Alongside all of the benefits and practices in the garden-based education sphere, there are also some issues which are preventing it from serving and helping as many students as it ideally could. It is difficult to find much literature related specifically to issues in the garden-based educational field, and even in the wider field of nature schools and nature-based educational programming, but what research does exist points to a lack of diversity and steep tuition costs. In the North American Association for Environmental Education's 2022 National Report on Nature Preschools in the United States, it was reported that children who are Black or Latino are less

likely to attend nature preschools than children who are white (2023). Although the proportion of white children in nature preschools decreased since 2017, they are still greatly overrepresented. Additionally, racial diversity of staff in nature preschools mirrors these trends, with white educators being over-represented and Latino and Black educators being underrepresented (NAEE, 2023). Outside of demographics, not all nature schools are available to students from a financial perspective. The NAEE reported that "virtually every nature preschool operates with tuition" (2023). About 56% of the nature schools surveyed did offer some sort of aid/scholarships/sliding scale based on income in order to increase accessibility of the programming (NAEE, 2023). Although this is helpful, it still presents itself as a major barrier. When there is an option to choose between a school that is free or a school that has tuition, however small, if money is a concern for a family it would be the easier choice to simply take the free option.

Conclusion

As demonstrated by current literature, the benefits of awe and wonder in everyday life and education are numerous. Both emotions increase joy and mindfulness, help bring connectedness and a sense of community, and make people feel more closely related to the world we inhabit. When cultivated in schools, awe and wonder can help to counter the pressure-filled practices that have become commonplace, and increase student engagement and interest in the subjects at hand, while facilitating closer bonds amongst classmates and teachers alike. Garden-based learning shares many similar benefits to those of awe- and wonder-based schooling practices. This thesis endeavors to synthesize these three fields, in hopes that I can draw some connections between awe and wonder and garden-based learning and propose ways in which garden-based learning practices can be a vehicle through which awe and wonder can be incorporated more effectively in the classroom. "To witness wildness and beauty is one thing. To watch it bring its tenderness to something you love and care about is something different. The moment was fleeting. So full of light and motion. So small, really, in every way. But huge. Grace, unearned, changes you. Yesterday, I walked into my garden one person. And I walked back into the house, another."

- Gretchen Schmelzer

Ingredients to Start Your School Garden

One of the biggest barriers to starting a garden-based education program in a school can simply be not knowing where to begin. In an attempt to demystify this process, I've chosen to include a couple of ingredient lists to help garden-curious educators identify what they're getting into before taking the time and finding the funds to officially dig in.

These lists of ingredients are quite general, and are designed as a jumping off point as opposed to a be-all-end-all comprehensive list of materials you might need. There are numerous organizations that offer more in-depth guidebooks and instructional manuals on how to start a school garden, so if after looking over these lists you're feeling excited to get started, I'd urge you to turn to one of those resources. One that I can highly recommend is Land to Learn's Garden Education Resource Package: <u>https://landtolearn.org/toolshed</u>

Of course, one of the most important, though less tangible, ingredients for starting a school garden is the element of human support: from school leadership, maintenance staff, volunteers, students, garden committees, etc. There are a lot of moving parts that allow for a school garden program to be successful and having the support of a community to help you out will make all the difference. If gaining that support is proving difficult, the research and resources presented in this thesis could be a jumping off point for making a persuasive argument in favor of garden-based educational programming.

Basic Ingredients of a School Garden







Tool shed



School Garden Layout Options



Maximum space option: Raised beds with paths in between

**take into account the number of students you have in your average class to inform how many beds (~4-6 students per bed)



Medium space option: Indoor/Outdoor Window boxes



Minimum space option: Cup planters

"...a crucial characteristic of being educated is coming to realize what you don't know, what you only think you know, and what you cannot know...without deep wonder we might without noticing it lose something crucial: our interest in the world."

- Anders Schinkel

Lesson Plans

Once you have committed to incorporating garden-based education and the outdoors into your classroom routine, the next step is figuring out how to build it into your daily flow. Given the rigid curricular standards that teachers are required to teach to, it can feel challenging to diverge from a more traditional teaching model. Further, it can sometimes be difficult to find ways to connect outdoor/garden-based education with non-STEM courses. Thus, I have designed six lesson plans as inspiration for you, each teaching to one of the core subjects and tied to national learning standards. The overarching theme throughout the six lesson plans is to ask your students lots of questions and ensure you don't give too many "answers" to the assignments at once, so as to make room for discovery and wondering along the way.

The learning standards I've connected these lesson plans to are from a number of different locations. I've referenced the Next Generation Science Standards for Science curriculum, Core Standards for ELA and Math, UCLA National Center for History for Social Studies standards, and National Core Art Standards for the Arts lesson.

An additional important note regarding the formatting of these lesson plans: I've opted to fully script each individual lesson, primarily because I'd like the information necessary to teach them to be as accessible as possible. Oftentimes, garden-based subjects and the related minutia are less familiar to teachers than their typical course material. Therefore, if there are teachers interested in trying these lessons out, I hope to provide all necessary details without requiring additional searching before executing the lesson. With that being said, if there is wording or structuring that you'd like to shift to better suit the needs of your class, please do so! You know your students and teaching style best.

Math Lesson Plan: Learning Germination Rates Time: approx. 50 minutes



Learning Standards, 6th Grade (Math)

6RP: 3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations

- a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- b. Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?
- c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
- d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Objectives:

- Students will explore various seed germination rates
- Students will use their knowledge of ratios and proportional relationships to determine the proper quantity of seeds to plant in the garden
- Students will learn how to sow seeds in the garden (e.g. spacing, depth, etc.)
- Students will gain an appreciation for the amount of planning that goes into planting a garden/growing food

Materials:

- Various seed packets
- Pencil, highlighters
- Printed worksheets (included at the end of the section)

Introduction – 5 minutes

- Ask the class: "Have you ever planted seeds before?" "When you planted seeds, how many did you plant?" "Did all the seeds that you planted grow?" Wait for responses. 3 minutes
- "Today we are going to be planting seeds! But before we can begin, we have some preparations we need to make. I'd like you all to work in groups of 3-4." Count off students into randomized groups. Pause for reorganization – 2 minutes

Group Work – 33 mins

- "Now that you are in your groups, I'd like you to take a moment to talk about the seeds we'll be planting. When we get started, your group will be planting in one fourth of the garden bed. How many seeds do you think you should plant in order to have 3-4 total plants grow? How come?" Pause for discussion 3 minutes
- "What did your group decide?" Pause for answers 2 minutes
- "Believe it or not, different seeds have different growth success rates! What do you think this might mean?" Pause for responses 2 minutes
- "Thank you for your guesses. The seed growth success rate, otherwise known as the germination rate, is the percentage of seeds that will grow into plants. This is an important rate to know for farmers or gardeners, because it allows them to be more certain of how many plants they will end up with. Each bag of seeds that you get from the store will have a germination rate written on the back. I'd like you all to take a look at the bag that I'm going to hand out to you and try to find the germination rate. Once you find it, use your highlighter to highlight it so you can reference it later." Pause for distribution and inspection 3 minutes
- "Ok, now that you've looked at your bag I'd like someone from each group to share with me what the germination rate is." Pause for responses 2 minutes
- "Now that we know the germination rate, we can start to do some calculations. Let's practice all together first. For step one, we have to decide how many total plants we'd like to grow. I have a bag of _____ (seed type) seeds. How many _____ do you think it makes sense to grow?" Pause for responses 2 minutes
- "Ok great, so we know we'd like to grow ____ plants. Now we're going to look at the germination rate. This type of seed has a germination rate of ____. What do you think we can do with this information now?" Pause for responses 2 minutes
- "That's right! We can do some mathematical calculations to figure out the perfect number of seeds to plant. So if the germination rate is ____, how many seeds out of 100 does that mean would grow?" Pause for responses 3 minutes
- "Yep! So because we know that _____ out of 100 seeds will grow, we can figure out exactly how many seeds we should plant. Do you have any idea how we might do that calculation? Take a moment to try and sort it out with your group. Once you think your group has figured it out, turn to the group next to you and share how many seeds you

think you'll plant and how you got to that conclusion." Pause for practice + conversation - 5 minutes

- "Now that you've given it a shot, I'm going to show you the steps you need to take. All you have to do is divide the total number of plants you'd like to have by the germination rate. So since we want ____ total plants, we are going to divide ___ by ___. And that means that we should plant ____ total seeds! Now, as you can see, this doesn't always equal an even number of seeds. If you have decimal points at the end, you can just round up! You can always discard an extra plant, but you can't always plant more later."
- "Now that you've seen an example, I'd like you all to try and work through the problem for your own seed packets. I'll be here if any questions come up! Go ahead and get started." Pause for calculations – 5 minutes
- "Great work everyone! So now we know how many total seeds we're going to want to plant! The final step is figuring out how many seeds to place in each hole. The information you're going to need for this will also be on your seed packet. Each packet will tell you how far apart each seed needs to be planted. Based on this information, and your allotted ¼ of a bed of space, you can determine how many seeds to put in each hole. As you can see, my seeds need to be placed ______ inches apart and we need to plant a total of ______ seeds in order to get ______ plants. If I divide the total number of plants by the inch spacing between them, I can see that I need ______ total holes. Then I can divide ______ total seeds by ______ holes, and now I know that I need to put ______ seeds per hole."
- "Go ahead and calculate how you'll need to distribute your seeds and holes! Again, if you have any questions, I'll be right here." Pause for calculations 5 minutes

Planting – 12 minutes

- "Amazing job everyone! Now we're ready to plant! I'd like each group to go to the garden and choose a section of each bed. Once you've chosen your spots, I'll show you how to plant the seeds." Pause for reorganization 3 minutes
- "The final step of planting is pretty easy. We're just going to dig a little well with our finger and tuck the allotted number of seeds into each hole. Sometimes your seed packet might even have specific instructions on how deep your hole should be. Before you begin, take a look at the bag and see if there's any specific depth you need to follow. If there's not, you can put your pointer finger into the ground up to the second knuckle. And don't forget to cover up each little hole and give them a pat once you've placed in your seeds. You can even say some kind words of encouragement to your freshly planted seeds once they're all tucked in, if you'd like." Pause for planting 8 minutes
- "Amazing job everyone! Our garden is now all planted! We're going to water them today and keep an eye on them to see how the growing goes!"

Closure:

"I'm so proud of your hard work today! I've always found it surprising how much planning goes into just the simple process of getting the seeds into the ground before any growing can even begin. Imagine what kinds of math and planning are required to run a full scale farm! Over the next few weeks, I urge you to come out into the gardens and take a peek at the beds. Keep your eyes peeled for some little sprouts coming up soon!"

Evaluation:

- I will listen to student conversation as they discuss with their groups how they are going about solving the problems. I will take note of specific elements that seem like sticking points, to make sure to emphasize them in later lessons.
- Collected worksheets will provide insight into the level of understanding that students have reached.

Differentiation:

- If there is no school garden, this plan could be adjusted for planting in window boxes or individual pots that students could leave on a windowsill in the classroom or bring home to take care of. If students took the plants home, they could share weekly progress photographs or something of the sort to ensure they are being taken care of.
- For students who speak a language other than English, the entire lesson could be taught in small groups rather than large groups with one group being conducted in the language the child/children use.

Additional math lesson concept:

- Graphing seed growth progress \rightarrow number of sprouts per day, average sprout height, etc.

English Lesson Plan: The Missing Piece Time: approx 50 minutes



Learning Standards, 1st Grade

RL: 1. Ask and answer questions about key details in a text

RL: 2. Retell stories, including key details, and demonstrate understanding of their central message or lesson

RL: 4. Identify words and phrases in stories or poems that suggest feelings or appeal to the senses.

RL: 7. Use illustrations and details in a story to describe its characters, setting, or events.

Objectives:

- Students will explore mindful movement
- Students will learn to connect themes from reading to their own activities
- Students will learn to consider the feelings and perspectives of others

Materials:

- Text: The Missing Piece by Shel Silverstein

Introduction – 3 mins

- Ask the class, "Do you like to explore?" "Where are some of your favorite places to explore?" Wait for responses. If there are no responses, then follow up with, "Do you prefer exploring in forests, fields, or through towns and cities?" "Who do you like to go exploring with?"
- "Today we are going to go on an exploration. But this won't just be any old exploration. We're going to have a couple of different challenges and extra special super power senses to pay attention to along the way."

Instructions – 5 mins

- "When we leave the classroom, we are going to exit the building and all explore together for 10 minutes."

- "While we're exploring, I'd like for you to use some of your 5 senses as a superpower.
 Can you all remind me what those senses are?" Pause for responses 3 minutes and write down the senses on the board as students say them.
- "Nice job, that's right. Your five senses are touch, taste, sight, sound, and smell. I'd like you to pay extra special attention to sight, sound, touch, and smell (underline these on the board as well). So be sure to tune in to what you're hearing in your ears (draw an ear next to "sound"), and what you're seeing with your eyes (draw an eye next to "sight"), and don't be afraid to reach out and gently touch something you see (draw a hand next to "touch") or take a smell of a plant (draw a nose next to "smell")."
- "I'd also like you all to listen carefully for instructions from me while we go on this walk, because I'll have some extra challenges for you all along the way."
- "Let's head out! Make sure to stay nice and quiet in the hallways so we don't disturb the other classes on our way past. When we get out of the building I want you to pause so I can give you your first challenge." 4 minutes

Mindful Walk Activity - 15 mins

- "Ok, now that we're outside, I'd like for you all to begin the walk quietly, walking nice and slow. Just take note of the things you're seeing as you walk past them, and feel free to stop for a moment to examine something that caught your eye if you'd like. What's the tiniest think you can see? The biggest? If you see anything extra special that you'd like to point out to your classmates, feel free to share!" 3 minutes
- "Ok, now that we've done some slow exploration, I want to try the exact opposite. Being careful not to run into your fellow classmates, I want you all to move quickly along our path. You can run, or skip, or jog. Go ahead!" Pause for quick exploration 2 minutes
- "Phew! That's a lot of work! Let's take a little pause and catch our breath. Did anyone see anything interesting this time around?" Pause for responses 2 minutes
- "Thank you for your answers and observations! Now, we're gonna head back to the classroom at our normal pace. When we get back, I'd like you all to find a seat in a circle for a read aloud." 5 minutes
- "Based on our explorations, what do you think the read aloud might be about?" Pause for answers 2 minutes
- "Thank you for your amazing predictions! Let's find out what it's all about together! At a few points in the story, I'm gonna have you make some predictions and participate a bit, so be ready!"

Interactive Read-aloud - 20 mins

- Begin the story, starting by reading the title and author name.

Read the story and stop at the following places for input or participation:

throughout the story, invite the children to sing along to It's song.

P. 21 – When a butterfly lands on their head, ask the class "what is happening in It's best moment of all?" "have you ever had a similar experience?" Invite them to come up and point at what is happening in the imagery (pause for responses)

P. 33 – When the first missing piece talks to It, ask the class "how do you think It is feeling right now?" "what would you do if you came across a missing piece that didn't want to be yours?" (pause for responses)

P. 66 – When It stumbles across the piece that they think might fit, ask the class "do you think the piece is going to fit?" "what would you ask the missing piece?" (pause for responses)
P. 83 – When It realizes they can't sing with their new piece, ask the class "how do you think It is feeling now that It realized It can't sing?" "What might you do about this?" (pause for responses)

<u>Closure</u> –

"Now that the story is over, I want you to take a moment to think back to our exploration today. What do you think we can learn from the story we just read when we go on more adventures in the future?" (pause for 2-3 responses). "Thank you all for exploring with me. I hope we can walk slowly and find beautiful things together again soon! -4 minutes

Evaluation -

- I will take note of what students were excited to look at outdoors. Perhaps there are ways to incorporate these interests into future lessons.
- I will take note of student interaction during the movement portions of the activities. Are any students struggling with personal space/boundaries? If there were any run-ins, how were they handled? This bodily and spatial awareness will be an ongoing project throughout the year.
- I will pay attention to eye contact and body language during the story and take note if a student is not paying attention.
- I will take note of which students chose to share out with questions or comments after the lesson is over.

Differentiation -

- If a student has a physical barrier related to moving/walking freely outdoors, the initial activity could be adjusted to entail a 10 minute observation out the window, or seated outdoors (or in the school garden if there is one).
- For students who speak a language other than English, the text could be translated and the entire lesson could be taught in small groups rather than large groups with one group being conducted in the language the child/children use.
- If the weather is poor and students do not have adequate gear to exist comfortably in the given weather conditions (eg. no snow pants/raincoat, etc.) some or all students could spend the mindful walking period performing an observation out the window.
Social Studies Lesson Plan: Three Sisters Crops Time: approx 50 minutes



Learning Standards, 4th Grade

6A: Describe regional folk heroes, stories, or songs that have contributed to the development of the cultural history of the U.S.

6A: Draw upon a variety of stories, legends, songs, ballads, games, and tall tales in order to describe the environment, lifestyles, beliefs, and struggles of people in various regions of the country

Objectives:

- Through stories and images, students will uncover the history and benefits of the three sisters crops
- Students will gain an appreciation for symbiotic relationships amongst plants, animals, and humans alike
- Students will gain a deeper understanding of the process of active listening and storytelling

Materials:

- Printed stories (1 copy of each story; 3 total)

Introduction – 5 minutes

- "Today we are going to learn about the three sisters' crop plantings that were popularized a long time ago by indigenous farmers."
- Ask the class: "Has anyone heard of these crops before?" "Does anyone have any guesses what the "three sisters" might be?" Pause for responses/write down a brainstormed list. If no responses, follow up with "What sorts of food do you think indigenous people were growing and eating?" 4 minutes

- "Great brainstorming everyone. I'm not going to tell you the answer quite yet. Instead, I'd like you to all find out together. I've printed out a few different stories for you all to read."

Group work – 15 mins

- "I'm going to randomly assign you each to a group. If you are in group 1, you will collectively read story 1, group 2 will read story 2, and group 3 will read story 3. Once you have read your stories, I want you all to come up with a short play to share with the class as a way of recounting the story to all of us. Once you've been assigned to your group, find each other and come grab a copy of your story and get started!" Count off students into three groups and send them on their way 3 minutes
- While students are reading their assigned stories, walk around and listen in on their read-aloud/discussions of the story as they construct their play. Check in with each group after they complete their readings and have them share a few key points that they noticed/are thinking about and write some down for your own records. 15 minutes for the full process
- Check in with students to see how things are going. Ask "is everyone feeling ready to share your stories, or would you like a bit more time?" 2 additional minutes if needed
- "Okay everyone, we are going to wrap up and come together to share our stories! I'm really excited about the work I've seen you all doing so far."

Story re-telling – 13 mins

- "As you all watch each other's retellings, I'd like you to think about how the story being shared is similar to or different from the one you read in your group. Feel free to write down any thoughts that are coming to mind as the stories are shared. Is there a group that would like to share first?" Pause for response. If no group volunteers, begin with group 1.
- Leave time for each group to perform 10 minutes

Reflection – 8 mins

- "Wow, thank you all for sharing your stories! That was really fantastic. I'm curious to hear what other people noticed. How were your stories similar? How were they different? What seems to be the common thread across them all? Turn and talk to a partner close by and then let's come back together to discuss." 3 minutes
- "Now that you've had a chance to turn and talk, I'd love to hear some of your thoughts.
 What were some of the things you talked about?" Pause for student responses, and record them on the board in a big list 5 minutes

Mini-lesson – 5 mins

- "You all noticed some really interesting details of these stories. I'm going to tell you all a little bit more about the way these plants work. It's super fascinating!"

- "As you all have figured out by now, the three sisters' crops are corn, beans, and squash. These three crops have been planted together for hundreds of years! Ask the class "does anyone have a guess of when the earliest recorded plantings of these crops were?" Pause for responses – 1 minute
- "The earliest recorded plantings of the three sisters in North America date back to 1070 CE! That means that these plants were being grown in harmony long before Europeans came to the place we live now, known as America. Early European settlers in America were pretty confused when they first saw these three plants together, because they were used to a very different model of farming. They generally grew their plants separately. But as we've learned today, when the three sisters are planted together, they all grow better than they would on their own! This type of planting is called companion planting."
- "In terms of how the indigenous people grew the three sisters, the corn was generally placed in small hills, with the beans planted around them, and squash interspersed throughout the field. The three plants work so well together because they each have special traits that contribute to the other two's survival. Beans naturally take nitrogen, an essential nutrient for plant growth, from the air and turn it into nitrates in the soil which act as a fertilizer for the corn and squash. In return, the bean vines are supported by the tall strong corn stalks. Meanwhile, the squash leaves help to provide a ground cover between the beans and corn which prevents weeds from growing."
- Ask the class "Does anyone have any questions about this process? Anything you're feeling confused about or that you might like to know more about? Can you think of other things in your life that or that you've learned about in nature that work better together than on their own?" Pause for responses 3 minutes

Closure:

- "Thank you all so much for your beautiful storytelling today. I had a really fantastic time listening to and learning from you all. I hope this lesson can serve as a reminder of the incredible amount of important knowledge that we can learn from indigenous practices and relationships with nature. I like to think of these stories as a reminder to consider how interconnected everything is within nature. Plants and animals, us included, are always interacting with one another, and it's important to pay attention to the ways in which they interact to recognize the relationships that bring about a stronger whole."

Evaluation:

- I will listen to student conversations and refer back to notes from these conversations for clues on what to teach more in the future, and potential interest pathways to follow up with.
- I will take note of how students performed in their story-retelling. Did any students seem uncomfortable? Were any vital pieces of information left out? What were they picking up on as key themes? These notes/observations will serve as a reminder to revisit later on if

necessary. If any students seem to be having a difficult time with the storytelling portion of the activity, I will find a time to check in with them.

- I will take note of which students chose to share out with questions or comments after the lesson is over.

Differentiation:

- With additional time, students could make corn husk dolls to act out each of their skits (<u>https://youtu.be/Km0bStY1D2U?si=FYKvsLI0D057s79-</u>)
- If the weather is nice, the story reading and play performances could happen outdoors. Students could also use materials they find outside as props in their plays.
 - If the weather is bad, this could be a great option for an indoor garden related class.

Additional Resource for students:

 <u>https://www.nal.usda.gov/collections/stories/three-sisters</u> → helpful background information on the three sisters' plants (if a student seems particularly interested, you could refer them to this site to dig deeper).

Science Lesson Plan: Creepy Crawly Critter Counting Time: Approx. 50 minutes

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Learning Standards: 3rd grade

- LS2.A: Interdependent Relationships in Ecosystems Plants depend on animals for pollination or to move their seeds around (2-LS2-2)
- LS4.D: Biodiversity and Humans There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)
- LS4.C: Adaptation For any particular environment, some kinds of organisms survive well, some less well, and some cannot survive at all (3-LS4-3)
- LS4.D: Biodiversity and Humans Populations live in a variety of habitats, and change in those habitats affects the organisms living there (3-LS4-4)

Objectives:

- Students will gain a deeper awareness of the number of different species living in their environments and some of the many roles they play in the ecosystem at large
- Students will gain experience with careful observation and the level of attention needed to notice the little things

Materials:

- Magnifying glasses (optional)
- Bug identification sheet (included at the end of this section)
- Clipboards/firm surface to write on outside

Introduction – 6 mins

- "Ask the class: "Do you like bugs?" "What is your favorite bug?" Wait for responses. If there are no responses, follow up with "What bugs do you see a lot of when you go outside?" "Do you know what role these bugs play in their environment?" If students say bugs are gross, ask them what it is about them that is gross. Encourage them to bring curiosity to the things that make them uncomfortable 4 minutes
- "Today we will be going on a bit of a scavenger hunt to track down as many bugs as we can! I've put together an explorer's guide for you to fill out as you search."

Outdoor exploration – 22 mins

- Once we get outside, I'm going to give you all 10 minutes to find as many critters as you can. The sheets that I'm going to hand out have images of 8 different critters that you might spot on your exploration. I'd like you to keep a running tally of how many of each kind of critter you find. If you find any that you don't see on the list, feel free to write them down or draw them as well! Don't be afraid to really look closely: try different perspectives like kneeling down or standing on your tip-toes, and don't be afraid to flip over logs or look under leaves to see what's underneath! I also want you to take note of the sorts of things that the critters you find are doing. How are they moving? Are they eating anything? Are they traveling in a pack or alone? Anything that feels interesting to you is worth writing down! You're also more than welcome to draw the critters that you're observing if that feels exciting to you."
- "Does anyone have any questions about what we're about to do?" Pause for responses 2 minutes
- "Ok, well I don't know about you but I'm feeling pretty excited to get exploring. I'm gonna pass out your explorer's guides now and then we're going to make our way outside. Make sure you have a pencil with you!" Pause for distribution and transition to outdoors 5 minutes
- "Alright, can I get a thumbs up if you've got a pencil and your explorer's guide and you're feeling ready to get started?" – 2 minutes
- "Amazing! Ok, I'm going to set the timer. On your marks...get set...go!" 10 minutes for observations (give a 2 minute warning to let them know to start wrapping up)
- "Ok everyone! Your exploration time is up! Finish writing down your last things, and when you're ready, come back to me." 2 minutes to rejoin

Outdoor Reflection – 5 mins

- "Now that we're back together, take a moment to turn and talk with someone near you.
 What observations were you surprised by? What critter did you see the most of? What was your favorite critter to observe?" 3 minutes
- "Did anyone have any observations or tallies in common with their conversation partner? Anything else you'd like to share about your observations?" Pause for responses – 2 minutes

Critter parade – 7 mins

"Before we head back into the classroom, I have a fun challenge for you. As we walk back towards the building, I want you to think about your favorite critter that you found and try to walk or move like them! Let's get going on our critter parade." – 7 minutes

Indoor Reflection/Observations – 10 mins

- "That critter parade was absolutely outstanding! Way to put on a show. Now that we're back in the classroom, let's learn a little bit more about the critter friends we were

observing earlier! Let's compile a list of what we observed each critter doing. Which critter should we start with?" Pause for choice -1 minute

- On the board, write down 2-3 observations students made for each critter type. If students need prompting, bring them back to the questions from the beginning: How are they moving? Are they eating anything? Are they traveling in a pack or alone? 8 minutes
- "Now that we've got this list up here, does anyone see anything similar or glaringly different between the things we observed about these 8 critters?" Pause for responses 2 minutes
- "Thank you all for your careful exploration and observation today! We've collected some really interesting data on the critters outside. As you've all seen, there are so many little critters out there that contribute to the environment that we see.
- "Each critter has a different important role in the ecosystem. Some of them, like the bees and the moths, help flowers and vegetables to grow by pollinating them. Others, like ladybugs, help to eat other bugs off of the plants to protect them. Worms and roly polys help to break down organic matter in the ground such as dead plants and return important nutrients to the soil which improves the overall soil quality. On the other hand, some critters, like beetles and grasshoppers, eat holes in the leaves and flowers of plants which can be hard for people like farmers and growers who need to sell their produce or have enough food to sustain themselves."

Closure:

- "Despite their miniature size, these critters all play an instrumental role in the world we live in. Just because they're smaller than you, doesn't mean they're any less important. I encourage you to use your exploration and observation skills more in the future, and see what all you can learn about the world around you! There's so much to see and learn even just from looking around your feet."

Evaluation:

- I will listen to and record notes on student conversations and refer back to them for future lesson planning ideas
- Collected worksheets will provide insight into the sorts of things that students were noticing. If there are similarities or certain critters that the class seems particularly interested in, I could try to make lessons focusing on them in the future.
- I will take note of student interactions during their observation period and critter parade. Are students communicating respectfully? Is space being shared well? Are students staying focused? I will follow up with students if necessary after the lesson is over if I notice any conflict.
- I will take note of which students chose to share out with questions or comments after the lesson is over

Differentiation:

- If any students have physical barriers related to moving freely outdoors, they could work with a partner or do a smaller scale exploration in a more stationary location.
 Additionally, students (or the teacher) could try to collect a few critters to bring over for the student(s) to observe.
- All observations could be done on a smaller scale in the school garden itself (if there is one available). If this was the case, due to size of the space, students could work in teams to observe and record information.

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<u>Additional science lesson concept</u>: Life cycle of a seed \rightarrow sprout seeds in paper towels as an ongoing project (sprout them, plant them, take care of them, grow them, harvest them, observe the full life cycle from sprouting until death!)

Art Lesson Plan: Cyanotyping

Time: approx. 50 minutes



Learning Standards (2nd Grade)

VA:Cr1.1.2: Collaboratively brainstorm multiple artmaking approaches to an art or design problem.

VA:Cr1.2.2: Create art or design with various materials and tools to explore personal interests, questions, and curiosity.

Objectives:

- Students will learn about the variations in leaf and flower shapes
- Students will learn about ways to make art with items found in nature

Materials:

- Cyanotyping paper → or make your own with cyanotype ink and paper (be sure to let it dry before using//have it prepared before class time; to amp up the blue color of the final print, you can add a capful of hydrogen peroxide)
- Some pressed flowers
- Clear plastic/glass to place over cyanotype sheets
- Binder clips to hold down glass/plastic on top of cyanotype sheets
- Large basin of water for rinsing prints (ideally with a hose keeping water moving)
- Strung up line with clips to dry prints
- Pencils to write names on the paper

Introduction – 5 mins

- Ask the class, "What plants do you see when you look around you?" "What is your favorite plant in the garden?" "Do you have a favorite kind of leaf from a tree nearby?" Wait for responses.
- Today we are going to get a bit more familiar with the different plants we have growing all around us. The first thing I'd like you to do is explore our outdoor space a bit. Find some different plants, flowers, or leaves that are catching your eye and bring 3-5 back with you. It's best if the items you bring back are relatively flat, so try to avoid things like sticks or bark. Also, try to avoid taking living things, and anything you do take, take it

gently. Plants often drop leaves on the ground, and those can be a perfect thing to use. We don't want to take any fully blooming flowers, but those that have already fallen down are a great option. If you really really want to take a leaf from a green living plant, just remove it gently and only take one! We want to leave enough of the plants and flowers behind to make sure they stay happy and growing."

Exploration/Material Collection – 12 mins

- "Go ahead and begin your exploration!" Pause for exploration/collection 10 minutes
- "I want everyone to show off what they've collected! Take a moment to look at what caught everyone else's eye. Do you notice any similarities? Feel free to share anything coming to mind." Pause for viewing and comments 2 minutes

Printing process – 28 mins

- "Now we're going to begin making sun prints, otherwise known as cyanotypes. Does anyone have any guesses as to what this might mean?" Pause for responses 2 minutes
- "Cyanotypes use a special chemical applied to paper that turns dark blue when exposed to sunlight, thanks to the UV rays. By placing different objects on the paper, you can protect certain portions of it from turning blue, thus creating the print of whatever object you placed on the paper. In a moment, I will hand you the supplies you will need to begin. Does anyone have any questions so far?" Pause for questions and material distribution 3 minutes
- "Ok, now that you have your cyanotype paper in front of you, take a moment to write your name on the back of your page. Once you've done that, begin positioning the items you found on the paper. You can place them in whatever order or orientation you'd like. Take your time and try out some different orientations and see what feels best!" Pause for arranging 5 minutes
- "Now that you've got everything situated where you want it, you're going to carefully place the plexiglass in front of you on top of your paper, and use the binder clips to hold them together. If you need a hand with this, let me know. I find that keeping my paper flat doing this slowly helps to make sure the different plant parts don't slide around too much." Pause for plexiglassing 3 minutes
- "Ok! Now we're all set up to make our prints! We're going to take our plates and bring them outside and set them in the sun for between 2 and 5 minutes. Once they've sat in the sun, we're going to remove the objects on them and rinse them in water to finish the process" Take time for getting outside, printing, and coming back indoors – 13 minutes
- "Now we're going to hang our prints to dry! Let's all work together to hang up your prints on the drying line."

Closure – 5 mins

"Now that all your prints are hung up, let's wrap up with a little gallery walk to see what everyone did. You all did such beautiful work today! You're more than welcome to bring these home or give them as gifts to others. I hope you can share the wonders of nature that you captured so beautifully with others in some way." End with time for gallery stroll – 5 minutes

Evaluation:

- Take note of what objects students were interested in making art with and different art forms that students suggested in the brainstorming process to inform future lessons
- Document or display cyanotypes that students made to look back on and use as inspiration for the future

Differentiation:

- For a more involved/time intensive version of this lesson, students could make their own sun-sensitive paper using turmeric. Here is a helpful video on how to do so: <u>https://www.youtube.com/watch?v=pU-NwhSsh7Q</u>
- If a student has a physical barrier related to movement outdoors, they can use the additional dried/pressed plants that the teacher supplies, or students can be asked to bring a few plant items to share.
- If there is no access to binder clips and plexiglass, the process can be done without. Just instruct students to find the spot they would like to make their print, arrange their found objects on top, and then stand (or sit) still behind it while they're exposing it to the light. Just make sure their shadows aren't obstructing the paper.
- If students have extra time after completing their sunprint, you could offer them the option to do some writing. Some prompts: What did you like about the plant pieces you chose? How does this piece make you feel? Write a love letter to the earth/plants, etc.

Life Skills Lesson Plan: Vegetable Soup-Chefs Time: Approx. 50 minutes



English Language Arts Learning Standards, Kindergarten

- CCSS.ELA-Literacy.SL.K.2: Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
- CCSS.ELA-Literacy.RI.K.7: With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).
- CCSS.ELA-Literacy.RI.K.10: Actively engage in group reading activities with purpose and understanding.

Objectives:

- Students will engage in an active read aloud and then apply the story to real life
- Students will use imagery in the text to draw connections between the story and the cooking activity
- Students will practice valuable life skills related to cooking, including following a recipe (from verbal prompting) and basic chopping/cutting

Materials:

- Text: Growing Vegetable Soup by Lois Ehlert
- Ingredients for the soup (refer to recipe from book)
- Safe cutting utensils**
- Cutting boards
- Pot
- Cooktop
- Bowls/spoons to consume the soup

Introduction – 7 mins

- Ask the class "What are some of your favorite foods to eat?" "Do you like to cook?" Wait for responses. If no responses, follow up with "Where do the ingredients for food come from?"
- "Today we are all going to be chefs! Before we can get cooking, we need some inspiration. We are going to read a book all about making soup, starting from the very beginning. Does anyone know what the first step of making soup might be?" Pause for responses 2 minutes
- "Believe it or not, even before you can gather your ingredients or cut up your vegetables, all of the ingredients need to be grown! This process starts with planting a seed in the ground, and that seed takes months and months until it can finally be picked to use in your soup."
- "What types of ingredients do you think would be good to plant for growing ingredients for soup? What do you think the plants the ingredients grow on would look like? Bushes? Trees? Under the ground?" Pause for responses and record answers on the board 3 minutes
- "There's lots of different kinds of soup out there, and you can put pretty much anything in it. But today, we're going to be making vegetable soup. Let's find out what our ingredients are!"

Interactive Read-aloud - 20 mins

- Begin the story, starting by reading the title and author name.
- Read the story and stop at the following places for input or participation (15 minutes total):
 - Ask the students what ingredient they see on the front cover
 - P. 5-6 "Does anyone recognize any of the seeds being planted? What vegetables or ingredients do you see?"
 - P. 17-18 "What ingredients are they picking in this image?"
 - P. 21-22 "After they wash the ingredients, what do you think they're going to do next?"
 - P. 23-24 "Let's identify all of the ingredients on the page!" Write down all the ingredients on the board
 - Final page "Do you all feel ready to make some vegetable soup? Do you have any questions before we start?"
 - Draw attention to the recipe at the back of the book and ask, "Have any of you ever followed a recipe before?"

Cooking – 20 mins

- "We are going to follow along with the recipe from the book! Before we begin, we're all going to wash our hands." Pause for hand washing – 5 minutes

- "Now I'd like you all to get into pairs or groups of three and find a cutting board to work at. We are going to be cutting up vegetables and taking turns with the knives. Please be extra careful and conscious of your surroundings. Make sure to keep your fingers out of the way of the blade and try not to get too close to the people next to you when you are holding your knife. If you're not actively using the knife, you can place it on the table in front of you with the blade pointing away from your body." Demonstrate proper knife holding and then guide students through the recipe with verbal and visual prompting. - 15 minutes
- "Now that we've chopped everything up and put all the ingredients in the pot, all we have to do is let it cook! Great work everybody! I'm going to set a timer, and when it goes off, we can all try the soup."
 - Continue with another brief lesson or activity as the soup cooks (could be effective to do this lesson before recess/lunch time)

Closure:

- Serve soup in cups to students and have them sit together (arrange the desks as one big table if possible so that they can enjoy it as a community).
- "This soup is so delicious! Thank you all for your hard work chopping up and preparing this meal. As you eat your soup, I encourage you all to chat with your friends next to you about what you're tasting, feeling, and smelling and how the experience of cooking this soup felt for you. What sorts of smells are you noticing? Do you like the big chunks or little chunks of vegetables? "

Evaluation:

- I will monitor student activity during the chopping exercise to ensure that everyone is being safe and sharing the tools. If there are any safety concerns, I will intervene on the spot. If any conflict arises, I will check in with students after the lesson to make sure they are ok.
- I will pay attention to eye contact and body language during the story and take note if a student is not paying attention.
- For students who speak a language other than English, the text could be translated and the entire lesson could be taught in small groups rather than large groups with one group being conducted in the language the child/children use.
- I will take note of which students chose to share out with questions or comments after the lesson is over

Differentiation:

- If the school has a garden, a certain bed could be devoted to some of the crops in the recipe. This would require some advanced planning, but could make for an exciting year long project with lessons devoted to growing and caring for the plants, then harvesting,

and then preparing the soup. Little excerpts of the book could start each lesson and build up to the culminating event of the soup preparation.

- If there are any dietary restrictions or allergies, certain elements of the soup ingredients could be changed/adjusted.

Additional life skills lesson concept:

To build on this food preparation concept, an additional lesson could include putting together a harvest festival/farmer's market. Students could work together to set up a farmer's market stand with produce they harvested from the school garden and have a community event in which they sell or share the produce with families. Students could also have the opportunity to display other garden-based projects (eg. art, performances, etc.) during this community event The event could end with a potluck feast in which students prepare different dishes from the harvested ingredients, and families could have the opportunity to bring in a home-cooked meal that is important to their family as well. If produce/art was sold at this event, funds could be used to purchase seeds/equipment for future years of the school garden

**Important note on safety: Though not always common practice in the United States, many cultures and alternative educational models throughout the world teach children the mechanics of cooking from a very young age (eg. Denmark, Sweden, Norway, Montessori, Waldorf, etc.). Although using sharp utensils comes with some risks, if you provide child-safe cutting utensils, use easily choppable ingredients, and give clear directions and help along the way, even kids as young as kindergarteners are capable!

Printable Lesson Planning Materials

Germination Rate Worksheet

Names:
Names.

Date:

1. How many seeds do you think you should plant in order to have 3-4 total plants grow? How come?

- 2. Looking at your seed bag, what is the: Seed type_____ Germination rate_____
- 3. a) *Example problem*: If my seeds have a germination rate of _____, how many seeds do I need to plant in order to have 3-4 total plants grow? *Follow along with the work at the board and try the calculations here.*

Seed type:	Germination Rate:	Ratio (x/100):

Calculations:

b) *Your turn!* Now try and figure out how many seeds your group should plant using the germination rate you found on the back of your seed packet.

c) *Pair* + *Share:* What seeds are the other group you talked to planting? How many seeds does the group you talked with need to plant in order to grow 3-4 total plants?

The Three Sisters stories

Adapted from: <u>https://nsuok.edu/heritage/three-sisters-legend.aspx</u> and <u>https://kimberlyus.com/thanksgiving-native-american-stories-recipes-and-crafts/#:~:text=In%20the%20S</u> pring%2C%20the%20Mohawk.they%20could%20live%20together%20forever.

Story #1: There once was a family of a mother, father, and three sisters. The parents worked hard at providing for the family, but constantly had to beg the daughters for help. They also had to continually stop them from arguing and fighting.

The three sisters were each unique in their own way. The eldest was tall and slender with long, silky, shiny hair. The youngest was small but muscular and attractive. The middle sister had an average height and looks but was beautiful in her giving nature.

For whatever reason, although they loved one another as sisters, they would disagree on every little thing, and these disagreements would distract them from doing any work at all. The parents tried and tried to get the sisters to help in the gardens and with the other chores, but no matter what task they had, all they did was fight. And when they were apart, they would spend their time complaining about the others.

The work wasn't getting done and the parents were worried that if this kept up, they wouldn't make it through another winter. It was planting time and the work had to be done, but as usual the sisters were too busy fighting.

The parents needed help, and they eventually got it, but not in the form they had imagined. One day, as the sisters whirled around in a circle, chasing each other and arguing in the field, they were transformed into three plants. The first a long, tall plant with silk tassel-like hair, the second a broad-leafed plant low to the ground, and the third a medium-height plant with gentle vines. The plants, of course, were corn, squash, and beans, the three sisters.

Story #2: Long ago, before the earth was created, there was an island in the sky populated by the sky people. Sky Woman, pregnant with her first child, was on a walk one day. She saw that an uprooted tree had created a hole and light shined up through it, out of the ground. Curious, Sky Woman knelt down and stuck her head in the hole.

"There is another world far below made of water," she murmured to herself. The light glinting off the waves and the salt smell of the air enticed her. She leaned further into the hole to get a better look. Her hand slipped on the muddy side and she fell into the cavity and out the other side. She plummeted through the air. Down. Down.

Sky Woman cried out and the animals in the ocean looked up and saw her falling. They asked a giant turtle to catch her on his shell. Then the animals dove deep and brought up mud and earth from the bottom of the sea and spread it on the shell of the turtle to create a cushion. The birds flew up and helped soften Sky Woman's fall. Squelch! Splosh! Splat! Sky Woman landed

without injury in the mud on Turtle Island. Many years later, Turtle Island came to be called North America.

Sky Woman gave birth to a daughter and the two of them lived happily on Turtle Island. Her daughter grew into a beautiful woman, and soon enough she became pregnant with twin boys. The birth of the twins was traumatic. With her last breath, the daughter whispered, "My body will grow the plants that will sustain the people." Sky Woman wept as she buried her precious daughter in the earth of Turtle Island. But her daughter's dying wish came true. From her grave, sprouted bean plants, corn stalks, and squash vines, the three plants which later became known as the three sisters.

Story #3: Long ago, there were three sisters who lived in a field. Even though they were very different, they loved each other so much that they couldn't imagine living apart. The youngest sister couldn't walk yet, but crawled along the ground. She dressed in shades of green. The middle sister was sturdy and strong. She dressed in orange, yellow, white, and green. Her sisters teased her about how she loved to ramble and take over. The oldest sister was tall and graceful. She wore green and yellow. Her silky blonde hair blew in the wind.

One day, a handsome boy came into the field. He was from the Mohawk tribe and could speak to the animals and birds. Enchanted, the youngest sister followed him home.

The two sisters cried and searched for their lost sister. But, the next day, when the Mohawk boy appeared again, the middle sister couldn't help but admire his handsome face. She watched him and, when he smiled at her, she followed him home.

The youngest and middle sisters were warm and cozy in the boy's home. They were mesmerized by the Mohawk boy and forgot their older sister. The older sister stood in the field waiting for her siblings. She didn't droop or cry. Instead, she dried out. She became brittle and lost all of her color. Still she stood in the field and her teeth chattered as the weather grew colder.

In the Spring, the Mohawk boy returned to the sisters' field. He felt guilty when he saw what the older sister had become. It was his fault for bewitching her sisters. The boy brought them back to the older sister and transformed them all into plants so they could live together forever.

The older sister became a corn plant, who stood tall and watched over her sisters. The youngest sister became a bean plant and wrapped her tendrils around her older sister. The middle sister became a squash plant.

From that day on, the Native Americans have planted the three sisters together on a mound so that they will support each other and nourish the tribe.

Date:

Hello explorer! Today you're on the hunt for some cool bugs and critters: there's some images below to help you identify some that you might come across on your exploration. Tally the number of each critter you find!





Signs of Wonder in the Classroom

Awe and wonder are emotions, and thus can be hard to assess. Although difficult to measure in quantifiable or reliable ways such as tests or worksheets, there are some actions and behaviors that you can look out for as evidence of your students experiencing awe and wonder. It is also important to note that these reactions and responses can be indicative of a number of different affective states, but this list can be somewhere to start/return to in the ongoing pursuit of bringing awe and wonder into the classroom.

This list is compiled from life experience and descriptions from readings I have done, as well as through conversation with other educators who aim to incorporate awe and wonder into their classroom experiences as much as possible.

Here are some signs to look out for:



Expressing curiosity/ asking questioning



Sharing things they're noticing with one another (pointing things out)



Turning to make eye contact with someone near them



Emphatic expressions ("Wow" or "oooh" or "gasp")



A desire to dig deeper (both physically and metaphorically)



Smiling/laughing



Silence/reverence (wide eyes, heads turned upwards)



Head shaking (eg. in disbelief)



Absorption and desire to stay in the present moment

"I sincerely believe that for the child, and for the parent seeking to guide him, it is not half so important to know as to feel. If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow. The years of early childhood are the time to prepare the soil. Once the emotions have been aroused—a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration, or love—then we wish for knowledge about the object of our emotional response. Once found, it has lasting meaning. It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate."

- Rachel Carson

Thoughts and reflections from the field

The connections I've made within the world of garden-based education as a result of this research have been imperative to the production of this thesis. Two organizations in particular have provided me with important knowledge, resources, and opportunities to explore and expand my understanding of garden-based education.

Amherst Elementary School Garden Program

The first organization that has been a source of great inspiration and helpful guidance is the Amherst Elementary School Garden Program in Amherst, Massachusetts. I had the opportunity to meet up with and talk to the brilliant and kind directors of the program, Jennifer Reese and Leila Tunnell. I initially found out about this program through word of mouth from my high school AP World History teacher, Christopher Gould.

Background Information

The Amherst Elementary School Garden Program was created out of a need for more structured programming to put school garden infrastructure, built with district funds in 2015, to use. Jennifer Reese was contacted by the district asking for some sort of curriculum to be made, and luckily, having met garden educator Leila Tunnel just weeks before at a garden-based education conference, the process of creating the program started quite organically.

With the program now in its ninth year, Jen and Leila have really mastered their craft. They serve over 65 elementary school classes, reaching over 1,100 students in total, with 30-40 minute lessons taught 5-7 times per school year in each class. In the beginning, the program was funded 50% by grants and 50% by the district. Over time, they have reached a point where all the work they do is district funded. They began with \$10,000 allocated to them and worked that amount up by applying for a series of grants and then requesting that the district match that

funding once the grants expired. They have also benefited from volunteer work from parents, as well as partnering with college students to help out with teaching lessons and maintaining the gardens, both during the school year and throughout the summer.

Curriculum Breakdown

At the outset, the program started with a curriculum for kindergarten students, and with each year of operation, they have incorporated an additional grade level. The curricula that they've created follows a scaffolded approach, connecting and building off of concepts from past years to create a continuous thread that connects them all. All of their lesson plans are designed based on state science curriculum standards. They've found that tying the lesson plans to these standards can be a useful way to ensure teacher support, so they don't feel like time spent in the garden is causing them to miss out on vital instructional time. Connecting with state science standards also helps to secure grant funding. That being said, they don't follow the standards to a tee, they simply use them as a jumping off point from which to design engaging lessons.

Each grade level has a different theme, ranging from plant anatomy, to soil health, to ancestral food connections, to connecting with indigenous populations, and more. The lesson plans are structured, but still leave quite a bit of room for students to have agency. For example, in the 4th grade curriculum, students ask elders in their family to talk about what sorts of foods were important to them and their culture. They then use this information to decide on nine different crops to grow over the course of the year in the school gardens. Due to crop selection often consisting of plants not natively grown in the U.S. (rice, okra, wheat, etc.), this specific curricular decision has led to a much lower yield in terms of harvest, but the kids are much more emotionally invested in the garden and crops as a whole.

Advice for Garden-Education Curious Educators

Given that Leila and Jen have been fine-tuning this garden education program for 9 years, I knew they would have some valuable advice for teachers and administrators who might be interested in incorporating garden-based education into their school curriculum or system at large. In terms of the steps a teacher can take if they're interested in starting a program, they listed the following: Ask the superintendent, ask other teachers, gain parental support, apply for grants, and choose a few children's picture books to use as scaffolding for the lessons. They wanted to really highlight the sheer number of grants that can be applied for in order to fund equipment purchases. In situations where building a physical garden is not in the cards, there are alternatives such as using window boxes or some other form of growing space within the classroom. They also emphasized that there is a whole community of teachers out there doing it, regardless of the support or infrastructure that is available. There are accessible message boards and online communities to connect with that can suggest helpful resources and answer questions, and lots of example lesson plans to look through and find inspiration from. At the end of the day, students will be excited to learn from a passionate teacher. If garden-based education is feeling like an exciting pathway to pursue, pursue it! It is bound to be exciting and has the potential to reinvigorate a love of learning in the students.

Land to Learn Partnership

An additional fruitful connection I made through the garden-based educational web is with Land to Learn. Land to Learn works with public elementary schools throughout the Hudson Valley of New York, building and teaching in school gardens. Through my advisor, Erin McCloskey, I was put in contact with Co-Director Nicole Porto, who was looking to form a connection with Vassar students to increase awareness and understanding of garden-based educational skills, particularly for students in the Education Department.

Nicole came to me with a vision to design a full semester course on garden-based education to be taught by a Vassar faculty member. However, due to various timing and staffing constraints, the project morphed into a new form, and over the course of the past semester, we've worked together to create a mini-course partnered with Leonisa Ardizzone's seminar Science, Spirituality, & Peace Education: Addressing Climate Change. As a part of this class, students partner with different community organizations who are doing the sorts of transformative work they spend time thinking and learning about in class. The Land to Learn partnership consists of a two part course, the first six weeks serving as an introduction to garden-based education with introductory readings and videos, as well as an opportunity to think through and design some garden-based lesson plans with the intention of teaching them later on. The following six weeks are the hands-on period, working with a local K-2 elementary school to finalize renovating their run-down school garden and begin to plant and teach within it. In small groups, students have the opportunity to trial run their lesson plans with students from a number of different classes from the school.

The process of designing and teaching this course has made a huge impact on my knowledge and understanding of garden-based education. As I've stated previously, before making this connection, I had never really heard of garden-based education or even considered it as a potential field of work. Thus, my knowledge base and level of understanding of even the most basic ways in which programs like this run was limited to assumptions alone. After doing some initial readings, I gained a better sense of the basics, but Nicole has taught me so much about what it looks like to run a garden-based education program and what sorts of things are important for garden educators to be thinking about when teaching and designing their lessons, as well as what they hope students will get out of such programs.

Week 1 Reflection

In the first in-person meeting of the mini-course, we talked about the basics of garden-based education and Land to Learn's role as an organization, as well as some helpful tips and tricks for facilitating a democratic style of education. Democratic education is at the core of Land to Learn's philosophy, and works alongside principles that are highlighted in a lot of the awe and wonder research I've been doing as well. The tips and tricks on implementing democratic education into lessons consisted of specific ways of communicating with students, things to look out for, and general classroom management strategies to encourage all students being heard and having an active role in the class.

Week 2 Reflection

The second in-person meeting of the mini-course was devoted to brainstorming potential lesson plans for the upcoming sessions at the local partner elementary school. Nicole and I initially planned for these lessons to be taught in a couple of small groups, but given the smaller than anticipated total participating group size, we decided it would be best for the three students from Leonisa's class to work together.

We began our brainstorming session by looking over a Land to Learn garden-based lesson plan. From there, we let our imaginations run wild and started brainstorming. I found this communal brainstorming session to be really fruitful and inspiring. Having the chance to think things through in a group setting with individuals who had a range of teaching experiences and perspectives made for an engaging and creative set of ideas. One lesson plan we settled on was a station-based lesson that would allow everyone a chance to work with a smaller group of students while covering a broad range of subject material in the allotted 40 minute class period.

After this initial brainstorming session, the three students from Leonisa's class got together the following week to flesh out and formalize the lesson plans.

Week 3 Reflection

Our third in-person meeting took place on site in the brand new school garden. Nicole and I arrived early to meet with one of the kindergarten teachers who helped to orchestrate the construction of the renovated garden space. The school had previously had a learning garden, but it had been abandoned and overrun with poison ivy. Thus, when Nicole came to them with the proposition to help renovate and begin teaching in the space, they jumped on the opportunity to do so. In addition to some planning and careful saving of regularly allocated funds, the school was lucky enough to secure a grant which aided in the material and construction costs of the garden. Before construction began, Land to Learn provided them with a sample garden layout to take inspiration from, giving them options of different sorts of learning and growing spaces that they've incorporated in their 10+ other learning gardens throughout the Hudson Valley.

The garden we entered consisted of a waist-high chicken wire fence enclosing eight trough-style garden beds with wide paths in between. After our conversation with them in which we discussed the layout and seeds/planting schedules, they plan to add some pollinator friendly wildflower pots on either end of the garden, with the added benefit of discouraging deer from entering the garden space, as well as an exploratory digging space outside of the fence.

Once the three Vassar students from Leonisa's class arrived, the five of us worked together to plan out the flow for our in person lessons over the next few weeks. In our two teaching days, we will work in teams of two, implementing the lesson plans that we created together with two rounds of kindergarten classes in 40 minute increments. We also made sure to

plan rainy day activities in case of inclement weather, since we will not be able to reschedule the outdoor time due to our busy schedules.

"But wonder's temporary arrest of our movement and gaze, 'bidding us to stand before objects with still attention or to lean closer to dwell on them more intently' is indeed only temporary and may move us to express in ever new because ever-imperfect—ways why the world is worth attending to for its own sake."

- Anders Schinkel

Awe and Wonder as an Act of Resistance

It would be an oversight to discuss garden-based and outdoor education without addressing the very real inequities that are embedded in the field. As mentioned previously in my literature review, there are numerous barriers preventing these educational opportunities from being equitably accessible. In the United States, white people, both as staff and as students, are vastly overrepresented in the field of outdoor education (NAEE, 2023). These programs are also difficult to access from a financial standpoint, as virtually all nature preschools require a steep tuition payment (NAEE, 2023). Although around 50% of these programs offer some sort of financial support, the populations that they are serving are very specific and skew much wealthier than the national average (NAEE, 2023). It's important to recognize these inequities because, although garden-based education can be beneficial to all students, it is often only serving a very miniscule portion of the population at large, and thus the many benefits that come along with this kind of learning are being gatekept from the majority of students and families.

Finding an exact reason for these inequities is challenging, but increasing equitable access to education resources ultimately comes down to funding. As I've continued to consider the various confounding variables that may be contributing to these funding inequities, I find myself returning to the fact that the forms of education which actively encourage awe and wonder in their students are in many ways actively anti-capitalist. Time spent outdoors, and specifically time spent in wonderment of the world, does not provide any monetary value. Thus, in a capitalist system, these activities are simply wasted time that could be spent on more "profitable" and "productive" pursuits such as working, or preparing to work at, a 9-to-5 job. Additionally, as demonstrated by numerous studies, awe and wonder as emotions often lead to active questioning of the world. Whether that be curiosity about the system of a plant's function,

or curiosity about "the system" at large, this level of questioning presents a direct threat to the hierarchical, capitalist, consumer-driven system. If people begin to find joy in these moments of awe and wonder, they may be led to question why such moments need to be so fleeting or why their usual daily schedules are not conducive to more moments like these. At the root of it all is the never-ending list of demands that capitalism asks of us, in which people become cogs in a machine, continuously working for a "better" job or more money while simultaneously being encouraged to spend more money on material goods, instead of focusing on the small moments of joy and wonder that exist in the present moment. On top of all of that, experiencing awe and wonder and engaging with nature in garden-based or outdoor education programming requires a level of restfulness and spaciousness that a busy capitalist system, an exhausted poverty-wage worker, or an education system devoted to teaching for tests and preparing students to become "dependable" workers, does not allow for.

Identifying these slowed moments of mindfulness ties into a much longer history of the practice of rest as resistance. Author Tricia Hersey in her manifesto *Rest is Resistance* discusses this rich history and urges readers to engage more actively with rest. Hersey ties the practice of rest as resistance to the Maroons, a historic group of African descendents who found a way to avoid enslavement by escaping plantations and jumping from slave ships to live in community in densely forested areas (2022, pg. 141-142). By resisting the inhumane labor of slavery, they reclaimed their time and their right to rest. Hersey brings this practice into the present day by emphasizing why and how resting is important as a movement in the larger scheme of dismantling systems of capitalism and white supremacy. She explains that because capitalism may not collapse in our lifetimes, we must not wait for the time for rest to present itself, and instead choose to actively make time for rest, and resist "the daily grind" (2022, p. 136). Rest as

a practice puts us more deeply in touch with ourselves and our communities. It allows for the spaciousness required of deep thinking and consideration that exists and the foundation for building acts of resistance that can, over time, make massive societal impacts. Awe and wonder have many of the same benefits, and require a slower pace of life and heightened awareness or state of mindfulness in order to occur. Thus, by acting in these manners of resistance, we are not only carving out time to rest our tired bodies and mind, but making space to allow awe and wonder to enter our awareness more deeply as well.

In times of great social, political, and economic divides, it is all the more important to find and lean into systems that allow us to reclaim the power that our capitalist society is attempting to take away from us. Practices of resistance have been in place for as long as humanity and society have existed, and I believe that awe and wonder have the potential to be key components in the ever-growing desperation for serious change to occur. The practices of rest, awe, and wonder are truly radical in their free availability to everyone. By finding moments of rest and moments of awe and wonder, we open the door to deeper connectedness with ourselves, our communities, and the natural world. As adults and students who have been raised in a culture that breeds competition and values the climbing of the corporate ladder over the basic right to personal agency and moments of joy, it can be hard to imagine a future in which moments of rest are not few and far between, but an active and frequent practice. However, by uplifting outdoor and garden-based programming in schools and emphasizing awe and wonder in curriculum from an early age, we have the opportunity to set up future generations with a much healthier, more balanced approach to existing within the world. If students begin engaging with these emotions and connecting with the natural world from the beginning, they will come to recognize it as a basic human right and will be more equipped to fight for it in their lives.

"...everything smelled sweet and green, and I felt—not for the first time, and not the last—a sense of what can only be called wonder: that I was getting to live in this beautiful place, at least a little while longer..."

- Hanya Yanagihara

Conclusion

Awe and wonder are basic human emotions that are incredibly vital for everyday life. Unfortunately, our current educational system, and global capitalist system in general, is not conducive to these emotions. But, for our schools, there is a way out: garden-based education provides easy access to moments of awe and wonder and can be relatively simple to implement. The benefits of awe and wonder and garden-based educational practices in the classroom are manifold: they lead to higher student engagement, deeper learning, stronger community bonds, and deeper curiosity about the world in general (Egan et al, 2013; Keltner, 2023; Schinkel, 2017).

Educators can incorporate awe and wonder and garden-based practices into their classrooms without diverging from national standards. By simply changing the ways that assignments are phrased, where lessons are taking place, or what sorts of questions are being asked of the students, the door can be opened a little wider to allow awe and wonder to enter the classroom. With proper funding, these practices can take place within school garden infrastructure, but they can also be adapted to occur outdoors, in a wilder natural or urban space, or even within the classroom itself with a little creative planning.

The sections I've included in this thesis seek to work together to provide readers with a comprehensive overview of the information they might want to know related to awe and wonder, as well as the basics of beginning to implement those practices in a classroom setting. The fields of awe and wonder and garden-based education are growing every day, with an ever-expanding network of educators and scholars sharing helpful resources. Whether you are an educator, policy maker, parent, or student, there are numerous barriers to starting new programming like this, especially in the rigid and demanding public school system that we have in the United States.

With busy schedules and little funding available, people may be discouraged or simply lack the time to start dreaming up a new approach to curriculum. Therefore, by including lesson plans tied to national curricular standards as well as introductory lists of important elements for school gardens, my hope is that these ideals become a bit easier to experiment with and implement, hopefully kickstarting the process to a more joyful, engaged, community-oriented classroom experience.

I firmly believe that awe and wonder hold the potential to transform the future for our children, and our society at large. When invoked, the two emotions have been demonstrated to encourage mindfulness, build community, and create a deeper sense of connectedness with the natural world (Keltner, 2021; O'Leary, 2020). In this disconnected and deeply divided world that we live in, finding ways to connect with one another is more important than ever. Encouraging awe and wonder in schools allows children to become familiar with what it means to be connected to each other and the world around them from the very beginning. My hope is that encouraging these feelings of interconnectedness will follow them into adulthood and foster empathy which will grow into positive community relationships by breaking down some of the barriers that arise between people who make sense of the world differently. Regardless of political belief, age, class, or anything else, awe and wonder can be shared. The curiosity and beauty of the simplest things in the natural world are available to anyone at any moment, and if we are able to slow down for long enough to look around, we are bound to be confronted by the wonder that sits around every corner.

At the end of the day, even if none of these practices end up being formally implemented in your classroom, I hope that you, whoever you are, choose to seek moments of awe and wonder more actively. That you take the time in your ever so busy schedule to pause and attend to the
little things: the call and response of birds on those first warm mornings of spring, the ever-changing v-shaped formation of geese as they fly through the sky, the tessellation of branching trees, the pattern of veins in the browned leaves that crunch under your feet, and the earthy smell that those leaves give off. This world is brimming with objects upon which to focus our attention at a deeper level. Regardless of age, socioeconomic class, or geographic location, wonder is available to everyone and here for you always. May you seek it out, be met with it readily, and begin to share it with those you hold dear, or whoever is near.

Helpful Resources

Scholarly Sources:

Impact of Garden-Based Learning on Academic Outcomes in School

 Williams, D. R., & Dixon, P. S. (2013). Impact of Garden-Based Learning on Academic Outcomes in Schools. *Review of Educational Research*, *83*(2), 211–235. https://doi.org/10.3102/0034654313475824

Intrinsic Motivation and Engagement as "Active Ingredients" in Garden-Based Education: Examining Models and Measures Derived from Self-Determination Theory

Skinner, E. A., Chi, U., & The Learning-Gardens Educational As. (2012). Intrinsic
 Motivation and Engagement as "Active Ingredients" in Garden-Based Education:
 Examining Models and Measures Derived From Self-Determination Theory. *The Journal of Environmental Education*, *43*(1), 16–36.

https://doi.org/10.1080/00958964.2011.596856

Analyzing Teacher Narratives in Early Childhood Garden-Based Education

 Murakami, C. D., Su-Russell, C., & Manfra, L. (2017). Analyzing teacher narratives in early childhood garden-based education. *The Journal of Environmental Education*, 49(1), 18–29. <u>https://doi.org/10.1080/00958964.2017.1357523</u>

Wild Leaves on Narrow STEMS: Exploring Formal and Non-Formal Education Tensions through Garden-Based Learning

 Cramer, S. E., & Ball, A. L. (2019). Wild Leaves on Narrow STEMs: Exploring Formal and Non-Formal Education Tensions through Garden-Based Learning. *Journal of Agricultural Education*, 60(4), 35-52. http://libproxy.vassar.edu/login?url=https://www.proquest.com/scholarly-journals/wild-le aves-on-narrow-stems-exploring-formal-non/docview/2396844522/se-2

Tongue-Tied No More: Diversity Pedagogy and Sense of Place in the Learning Gardens

 Williams, D., & Anderson, J. (2015). Tongue-Tied No More: Diversity Pedagogy and Sense of Place in the Learning Gardens. *Canadian Journal of Environmental Education*, 20, 25-45.

http://libproxy.vassar.edu/login?url=https://www.proquest.com/scholarly-journals/tonguetied-no-more-diversity-pedagogy-sense/docview/1913351415/se-2

Websites/Databases/Curriculum Inspiration:

Land to Learn: https://landtolearn.org/

Amherst Garden Based Education:

https://sites.google.com/arps.org/amherstschoolgardens/garden-videos-and-interactives?authuser

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Life Lab: https://www.lifelab.org/resources/2019/08/education-outside

Cornell Garden-Based Learning: https://gardening.cals.cornell.edu/lessons/

 Some great free lesson plans → can act as a good structure/format to model after for teachers

Kids Gardening: https://kidsgardening.org/for-educators/

Kids Gardening Community: https://community.kidsgardening.org/home

Garden City Harvest: https://www.gardencityharvest.org/gardening-with-kids

Shelburne Farms: <u>https://shelburnefarms.org/educators</u>

- They even have a "cultivating joy and wonder" curriculum!

Backyard Growers: <u>https://www.backyardgrowers.org/</u> Island Grown Schools: <u>https://islandgrownschools.org/</u> Mass Farm to Schools: <u>https://www.massfarmtoschool.org/</u>

Ripe for Change: Garden Based Learning in Schools:

https://hep.gse.harvard.edu/9781612507712/ripe-for-change/

Videos:

- @KidsGardening.org YouTube channel → lots of nice brief videos and some sweet testimonials from students
- Garden-based Learning in Urban School Vlog -14:
 https://youtu.be/zs-EgGo8XAU?si=gazKdpEXSFy4MsAn
- Building a Better World with Garden-Based Education | Becca Elder | TEDxTrumanStateUniversity: <u>https://youtu.be/goMot08We1s?si=7i8ISoPp6Q2Dsc83</u>
- Growing minds by growing school gardens: Laurie Brekke at TEDxNavesink:

https://youtu.be/PGoPtkNFybk?si=_G7-lfGVbriUxy_q

— @lifelab YouTube channel → similar to their website, lots of helpful and easily digestible resources

Books for Read-aloud

- What Will Grow by Jennifer Ward
- A Seed Grows by Antoinette Portis
- Planting the Wild Garden by Kathryn Osebold Galbraith & Wendy Anderso Halperin
- What's inside a flower: and other questions about science & nature by Rachel Ignotofsky

- Bee: a peek-through picture book by Britta Teckentrup
- Growing Vegetable Soup by Lois Ehlert
- How to Say Hello to a Worm: A first guide to outside by Kari Percival

Additional Inspiration:

The Anthropocene Reviewed by John Green – Sunsets and Capacity for Wonder *Sense of Wonder* by Rachel Carson *Braiding Sweetgrass* by Robin Wall Kimmerer (Specifically the chapter Sitting in a Circle) *Wonderstruck* podcast by Elizabeth Rovere - Dacher Keltner Awe is for Everyone The Ron Finley Project – <u>https://www.ronfinley.com/</u>

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