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School Gardens

The Many Benefits of Gardening

by Dr. Gaea Hock

I grew up in a family who loved to garden. My grandma had a large garden where I learned how to grow potatoes, tomatoes, strawberries, cucumbers, and several other vegetables. My father inherited the gardening gene from his mom. He would help her in the garden and had his own at our house. I remember one summer he had 50 tomato plants!

Currently, my children and I enjoy a couple of container gardens. I look forward to when I will have the space to have a larger garden. Until then we are enjoying the benefits of growing our own food in a small scale environment. My children like to check on the growth of their plants each evening, water when needed, and harvest when ready.

There are many benefits to gardening that translate well into a school-based situation. Gardening helps build self-esteem as students learn how to best plant, water, and harvest their crops. Gardening is a form of physical fitness in which you burn calories and strengthen muscles. Student mental health can be improved by reducing the symptoms of depression and anxiety while providing joy and happiness. Students are also more likely to try the produce they grew themselves. Finally, gardening is a great social activity that keeps students focused and off their devices.

While I never had a school garden as a teacher, I had students

who had their own gardens or worked for a local produce farmer. They developed key skills that translated to other occupations and opportunities.

There are many resources available to assist in your utilization of a garden to teach academic content and life skills. Kansas just updated their Garden Guide. It is a wonderful resource for producers and home gardeners throughout our state. Another great resource is the Considerations and Resources for School Garden Design in Kansas document. This resource is targeted to educators who have an existing garden or who are planning to create a garden for use at their school. Your own state Extension system probably has a garden guide of their own. I encourage you to explore those resources and incorporate them in your classes.

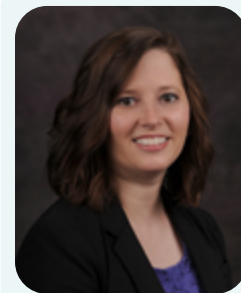
The authors in this issue examine the benefits of school gardens from several angles. As you read, reflect on how you can incorporate or improve the use of a school garden to meet your learning objectives and additional benefits. As I reflect on my own gardening experiences, they are filled with wonderful memories of time spent with family. This is just another of the many wonderful benefits of gardening.



Kansas Garden Guide



Kansas School Garden Guide and Additional Resources



Dr. Gaea Hock is an Associate Professor of Agricultural Education at Kansas State University and Editor of *The Agricultural Education Magazine*.



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Front & Back Cover Photos Courtesy of Dr. Sarah LaRose

School Gardens: Growing Learners and Communities

by Dr. Sarah LaRose

A few years ago, I was asked to share a little bit about myself and my journey into agricultural education. I went on to give the rather abbreviated version of my story: No one in my family has been actively involved in production agriculture since one of my maternal great-grandfathers ran his own dairy farm and milk delivery service in the early 1900s. I grew up in a Navy family, moving all over the world, before finally winding up in Ledyard, Connecticut, where I stumbled into an Ag Ed class. Pretty quickly, I was hooked! Hands-on learning, field trips, competitions, and lots of new friends led me to become involved in FFA as a chapter, district, and state FFA officer, and eventually to be a high school agriculture teacher.

After listening to my enthusiastic story, the person commented, "Wow, it sounds like you had a pretty non-traditional entry into agricultural education!" I was a bit bewildered by that observation; I thought my story was pretty standard fare, minus the whole moving every 2-3 years as a Navy brat. I later came to realize that this person was commenting on how I didn't grow up in a rural setting, on a family farm, as part of generations of FFA members. While I did live in a variety of places, I'm primarily the product of suburbia.

Some of my earliest memories are of helping my Mom in her vegetable garden. No matter where we lived, Mom made sure to have vegetables and flowers, even if it was in patio pots. We had a large garden in Illinois, leased a plot in a community garden in Maryland, and patio plant-

ers of tomatoes in Sicily. I didn't realize it just yet, but gardening would become more important to me as I got older and found my path as an agriculture teacher.

My state's land grant university did not offer a four-year degree in Agricultural Education, so I pursued a degree in Animal Science, followed by a Master's in Education. I was hired at Nonnewaug High School in Woodbury, CT as the newly-added seventh agriculture teacher. There were three other teachers who specialized in animal science, and I was the "jack of all trades" teaching a variety of courses. Over the course of my first few years there, I began to notice a gap in our program's offerings. While we offered a wide variety of specializations within Agriculture, we really didn't teach about vegetable production, farm-to-table, or the local food movement; all things that were becoming increasingly prominent in Connecticut agriculture. After conversations with various Advisory Committee members, community members, and my department head, we launched a new course: Local Food Production. Through this course, students managed a school garden and hydroponic greenhouse, learning methods of vegetable production for both soil-based and

soilless methods. We explored different types of production systems, food labels, farm-to-table, and hunger in our community. Produce from the school garden and greenhouse was donated to our local food bank, appeared in our school cafeteria, and purchased by local restaurants.

One of the things that emerged from this experience was the excitement students had for learning these skills: planning, growing, harvesting, processing, and cooking food. While about 40% of our graduates went on to pursue an agriculture-related career, 100% of our students would need to know how to take care of themselves as an adult. The skills students learned in the school garden and greenhouse helped them better understand the source of their food, and how to prepare it. Since my departure from the school, the course has taken on new life as an active partnership between the agricul-



The author with some of the bounty from her family's garden circa 1989.

ture program and the culinary arts program. The agriculture students raise the produce and work with culinary students to create meals.

The number of school gardens in the United States is growing! As of the 2019 Farm to School Census, there are 12,334 schools with edible gardens across the country, up from some 7,000 gardens reported in 2015 (USDA Food & Nutrition Service, 2021). Research has identified a myriad of benefits of school gardens including exploration of culture and heritage through food, opportunity for experiential learning, healthier eating habits, developing a sense of purpose, and building connections with the community (Ohly et al., 2016). In this issue, you'll hear about Dr. Anna Warner's research that demonstrates school gardens as a restorative natural environment, the benefits of garden-based learning through the Junior Master Gardener® Program, free curricular resources to

teach systems-thinking through the Food Systems Exploration curriculum from Cornell University, landscape garden design tools, resources on how to get started with Farm-to-School, and examples of school gardens in action in secondary and postsecondary settings. While gardens have a way of naturally lending themselves to meeting local needs, you'll also learn about ways that some institutions are using gardens to connect with other cultures and communities across the globe.

The preparation of food, the food itself, and the sharing of a meal, have often been described as the foundations of culture. Participating in the growing of food can be a powerful way for students to connect with each other, their own or new cultures, and their community. How might your programs leverage the power of the garden and help your learners and program grow? The possibilities are endless!

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Glass Gem Corn grown from seeds procured from Native Seeds/SEARCH (NS/S), an organization that preserves seeds to promote sustainability and crop diversity. Woodbury FFA members grew this corn as part of one of their school gardens.



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Lessons Learned: Starting a School Farm

by Alicia Geesey

“Failure is only the opportunity to more intelligently begin again.”
— Henry Ford

Starting a farm-to-school program comes with many ups and downs, struggles, victories, and failures. As with gardening and life, when it comes to farm-to-school programs, you can't simply accept failure, you must expect failure. Failure does not have to be a negative experience; it is through those experiences that we learn the necessary lessons to become successful.

Growing up on a dairy farm in southern Indiana, farm-to-table wasn't really a movement, it was a normal part of life. At a young age, I can remember helping my dad plant the fields and reveling in the amazement and magic of seeing the tiny plants emerge from the ground. They were just seeds a week ago and now they were productive life. My favorite part of growing up on a farm was the cattle. Going out to the barn to see new calves each day, learning how to milk the cows, and helping my dad load feeder steers on the trailer, only to return two weeks later as packaged beef for our freezer, was a wonderfully normal childhood experience for me.

It never occurred to me that this might be a little unique for the 21st century. As I grew, I began to realize that my connection to the food supply was something I was lucky to experience. And while I never planned to work in education, I had an experience as a young adult that pushed me toward my current career.

In 2016, I took on a volunteer opportunity at my daughter's elementary school and created a

small radish patch at the school for all the first graders to plant in the fall. We prepared the flower beds, planted the seeds, watched them grow, and then harvested the radishes and served them in the cafeteria. The teachers were even able to incorporate the radish patch into their reading curriculum. One day, during this project, I was out at the school radish patch on a Saturday morning, when one of the first-grade students came running up the with her dad. “Dad! Look! I planted those! Look at them grow! They are going to become RADISHES! Can you believe it!?” It was the most beautiful moment. I realized that day that the astonishment that I feel watching seeds grow, the love and appreciation I feel towards my beef steers when I trailer them to the processor, is not a unique experience to me; it is a universal one. It just hasn't happened for everyone, yet.

That experience instilled in me a strong commitment to afford young

First graders in Mrs. Stillabowers class at Needham Elementary School pose with their raised bed after planting their radish seeds.

people the opportunity to build a similarly strong connection to their food supply. A few years later, I began my agricultural education career at Franklin Community High School. The students at Franklin are quite a melting pot of agricultural backgrounds. While we have some agricultural families, most students live in the suburbs and are at least two generations removed from the farm. While working as an agriculture teacher, I've learned lessons about building farm-to-school opportunities for my students.

Lesson Learned: An imperative first step to the school farm planning process, is creating a vision. Before we went to our school board for the first time, myself, my fellow Ag teacher, and our FFA Alumni put together a 10-year vision that identified what we would accomplish each year.



The vision is malleable and can be changed as needed, but this cohesive group vision is important to ensure that everyone is working towards the same goals. We approached our school board to request access to a nine-acre field adjacent to the high school campus. It was then the Franklin Agricultural Center for Education was born. Since then, we have created a committee of individuals, from a variety of backgrounds, to serve as the backbone of our School Farm. This has been a huge factor in the success of our program.

Lesson Learned: Seek out a diverse group of individuals to serve as a steering committee for your program. These individuals should be from a variety of backgrounds, representing different interest groups. Our steering committee includes parents, alumni, school administrators, local farmers, and local business owners, along with myself and my fellow Ag teacher. This array of perspectives ensures that your program is serving your community to the best of its ability.

The committee provides input, generates new ideas, and aids in managing the school farm.

Lesson Learned: You must find a passion within yourself for hands-on agriculture. This passion will sustain you through the challenges and struggles of a school farm program. School farm programs must have many champions, but you still must have passion within yourself to drive your program, which can come in many forms. Find yours!

Lesson Learned: To have a successful farm-to-school program you must get others to champion the effort. Having the support of your family, FFA Alumni, parents, business owners, and community members, along with the support of your school admin-

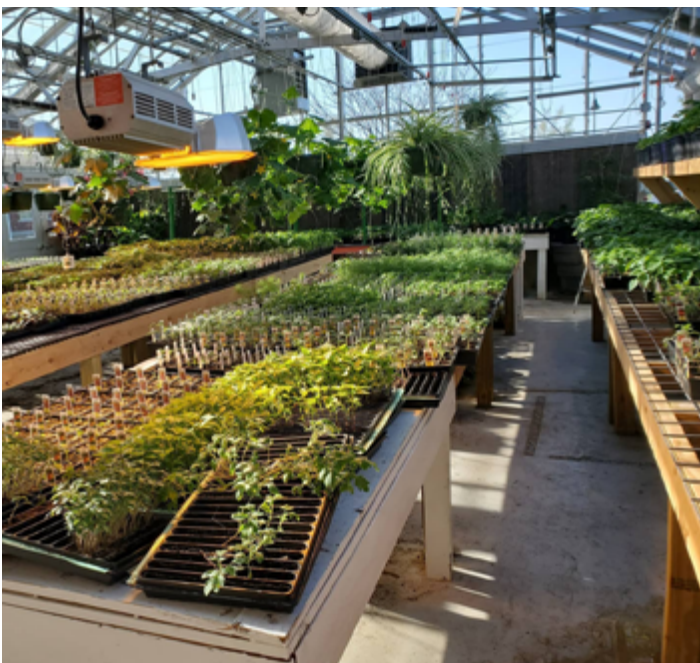
istration is paramount to building a successful program. This support allows the program to grow and develop beyond you.

In our first year, we started experimenting with how to incorporate the school garden into our classroom curriculum. We had students plant the seeds in the greenhouse and also help plan the garden. I would also take my classes out to work in the garden, planting, weeding, and harvesting during the school day. We planted approximately a half-acre garden where we grew tomatoes, peppers, eggplant, sweet corn, pumpkins, and squash. Trying to develop a hands-on program that incorporates a school farm into your day-to-day curriculum takes time and comes with inevitable challenges. Regardless of the ups and downs

“ Let your students learn from failure and see the positivity that can come from being resilient and trying again. ”

(LEFT) The greenhouse at Franklin Community High School with seedlings ready to be transplanted into the school garden. All plants are started from seed by our Plant and Soil Science classes.

(RIGHT) Students in Alicia Geesey's Plant and Soil Science class transplant tomato plants into the school garden.





(LEFT) The Ag Power Students at Franklin Community High School work to create drainage swales in the school garden. Here a student is learning how to use a laser level with Ag Teacher, Dan Batta. (RIGHT) Agriculture students at Franklin Community High School plant, tend, and harvest the vegetables out of the school garden. Here the students have harvested a large amount of butternut squash to be used in the school cafeteria.

we experienced that first year, we were still able to donate over 500 lbs. of produce to our local food pantries along with herbs and radishes to our school cafeteria. This was our first foray into farm-to-cafeteria, and it was a very exciting and encouraging time.

Lesson Learned: Never stop working towards incorporating your school farm into your daily classroom curriculum. This was quite a struggle for us. Attempting to create educational and impactful experiences in an outdoor setting with 30+ students can feel completely overwhelming. Sometimes you feel as though you aren't doing enough and sometimes you feel like you are doing too much. Don't get discouraged. Keep searching for the type of instruction that works best for your program.

One of my favorite ways to incorporate the school garden into my classroom is through project-based learning. For example, in our second year, we needed

to install drainage into our garden. We could have hired out for this project, and taken a 'career' approach to the lesson, having our students learn from the landscaping company. Instead, we challenged our Ag Power students to design and create their own drainage plan. The students worked in teams to research and design a plan. They then had to present their plans to my fellow teacher and I for approval. The best plan was chosen and the entire class worked together to install drainage swales into the garden and plant grass into the waterways. Project-based learning is a long process, and can feel chaotic at times, but it is my personal favorite for working in the school garden. Let your students learn from failure and see the positivity that can come from being resilient and trying again.

As you venture into farm-to-school don't be held back by the fear of failure, move forward with the courage to learn from the failure. We have experienced lots

of failure on our journey and I fully expect to experience lots more. Nothing great comes without any struggle or challenge. Be grateful for the challenges as they will make your program better and your agricultural outlook broader.



Alicia Geesey is an Agriculture Teacher and FFA Advisor at Franklin Community High School, she is passionate about creating farm to table opportunities for youth in Central Indiana. She can be reached at (317)346-8163 or geeseya@franklinschools.org.

Growing Minds and Community Through a Peer-Led Garden Club

by Travis Gonzales & Dr. Bob Williams

The horticulture program at Brenham ISD (Texas) started seven years ago with a vision to grow the secondary program in Agriculture, Food, and Natural Resources and recruit students from non-traditional and diverse populations to mirror that of our community. A low socio-economic population continues to grow, and the student population is increasingly removed from the farm. As a result, the need for an extensive livestock program is dwindling. A recently developed sustainable plant science pathway will expand next year to provide dual-credit opportunities in plant and soil science in partnership with Blinn College.

Due to the increased number of students who were academically at-risk or receiving free or

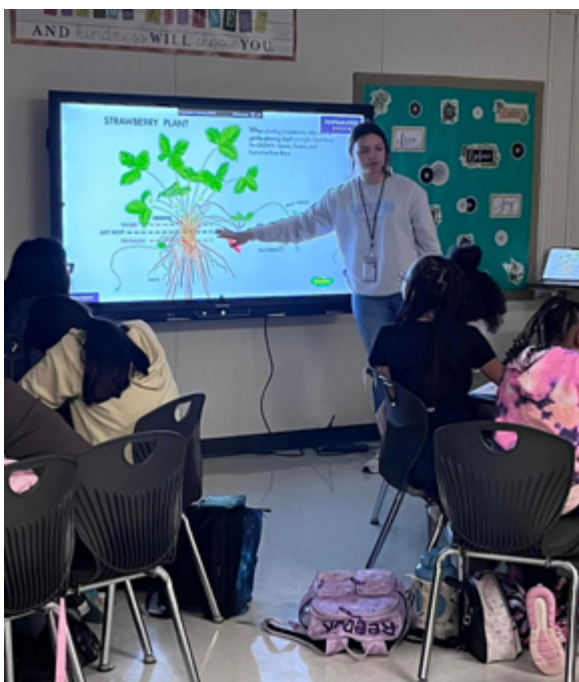
reduced lunches, Travis Gonzales, horticulture teacher at Brenham High School, developed an after-school program that would give students the opportunity to actually grow food in hopes of encouraging outdoor activity, nutritional education and also give students tools to increase food security in our community.

The biggest challenge in getting the program started was funding. The Living to Serve Grant available through the National FFA provided that funding. Horticulture students were able to install twelve beds at Brenham Middle School, a fifth

and sixth grade campus with Title I designation. The Brenham Middle School Garden Club was also established through a collaborative effort between the BMS principal, BMS counselor, Mr. Gonzales, and a select group of FFA members. The principal, Mrs. Thibodeaux, selected an excellent space for use next to parent pick-up so that the entire parent population could see the progress of the program. Mrs. Peschel, the campus counselor, serves as our campus coordinator of the garden club and works closely with students to get them signed up, facilitates

communications between students and parents, and coordinates the campus science department's use of the gardens as an outdoor laboratory to enhance the science curriculum.

“While gardening education is amazing, the interaction between high school students and the younger students in the garden is inspiring.”



(PREVIOUS LEFT) FFA President, Shelby Prazak, presents a lesson over strawberry planting and care. Each week students engage in a lesson about the plants to be planted before going to work in the gardens. This helps students understand the process and expectations of the activities and prevents students from becoming overwhelmed with the excitement of going outside.

(PREVIOUS RIGHT) Brenham FFA Members (right side) providing hands-on instruction on how to plant radish seeds and BMS students (left side) actively planting the seeds. Planting seeds provides a way for students to work through multi-step instructions and ask questions if they are unsure of how to complete the task correctly.

(RIGHT) After several weeks of supervised instruction, students now receive a weekly "job" to complete independently. By offering the students more freedom it assists in building their confidence to care for the plants with hopes that it builds confidence in everyday life.



As the project advisor, Mr. Gonzales provides the technical knowledge such as planting dates, crop selection, and pest and disease identification. He also recruits and coordinates FFA members who serve as student mentors and provide instruction to the fifth and sixth graders. A core group of six FFA members provides the instruction every week to students in the Brenham Middle School Garden Club. Mr. Gonzales and Mrs. Peschel meet with the FFA members at the end of each session to discuss the following week's topics and provide them with resources needed to develop the instructional activities including some type of visual, worksheets, and a hands-on garden experience, as weather permits.

This project began in the spring of 2022 when Brenham FFA applied for and was awarded the *Living to Serve* grant. In September of 2022, supplies were obtained but assembly and installation of the raised beds had to wait until the school district's security director reviewed the plan and was assured that appropriate security procedures were in place. The first BMS Garden Club meeting was held in early December 2022 with 18 BMS students attending. After the first week, the club grew to over 30 students,

and the group ranges from 25-36 students weekly. The BMS Garden Club is a very diverse group of students that is representative of the student population and community.

While gardening education is amazing, the interaction between high school students and the younger students in the garden is inspiring. The high school students look forward to the weekly meeting as much or more than the younger students. Gardening education occurs weekly, but the true magic is the community that has been fostered by giving students a place to socialize, learn, and play outside in a safe

environment with positive role models. Since we have started the gardens, parents have started to come and work with their students in the garden. Those who can, donate things such as small garden tools, seeds, and plants for us to use in these beds. An eventual goal is to host an adult program and provide assistance to families for growing vegetables at their homes as well as at school.



Travis Gonzales is a 15-year Agricultural Educator at Brenham High School in Brenham, Texas. Travis also serves as the Career and Technical Education Coordinator covering three campuses in the Brenham School District and reaches approximately 1,800 students.



Dr. Bob Williams is Professor of Sustainable Agriculture and Food Systems at Texas A&M University-Commerce. One of the graduate courses he teaches each spring semester is Gardening Across the Curriculum.

Dig into School Gardening: Planning and Implementing a School- based Garden into Your SBAE Program

by Rachel Holden

For most students, spring fever means distracted minds, restlessness and the uncontrollable urge to ask to be outside. Luckily for Ag students, they can do just that while they plan and plant their school-based vegetable garden. Here in Connecticut, planning begins in February. My students and I look through seed catalogs and visit local farms and garden centers to see if they have any seed inventory from the previous year they are willing to share, or offer insight to students about starting a garden. My food science students work together with plant science students to plant early cole crops (i.e. broccoli, cabbage, cauliflower) and root vegetables (i.e. potatoes, carrots, radishes) and start seeds for some of the summer crops in the greenhouse. As a suburban school, we have limited

outdoor growing space but are able to make the most of it to provide valuable learning opportunities for our students who may not be able to grow produce at home.

Planning Your Garden

When planning a school garden there are three things to consider:

1. How much space is available;
2. What is the growing season like; and
3. What resources are available to your program in order to complete the garden.

Being in a suburban school district with limited space for a vegetable garden, we opted for a series of raised beds in a fenced-in area. The raised beds are a mixture of donated galvanized water tubs that no longer hold water, purchased 4'x4' cedar beds from our

local hardware store and hand-made beds from 2" x 8" boards. The water tubs are at a good height to work in without bending over but they require more watering. The 4'x4' beds are shorter but hold more plants than the water tubs, however, the center can be hard to reach if not easily accessed on all sides. The homemade beds work well and may be more cost effective but do not have the longevity of the commercial beds. To maximize our use of space, we use trellises arched between beds to grow climbing plants, and employ companion planting to maximize yield. When in doubt, have students map out the area you have and determine the pros and cons of different design options.

One challenge with a vegetable garden is that much of the growing season occurs during the summer months when school



is not in session. While students are mapping out the garden, it is important for them to learn about seasonality and days to maturity for plants. Growing calendars for your state are a great tool to use when calculating when crops are ready to harvest. Early season, fast growing plants such as lettuce, cole crops, snap peas and carrots are great to grow in the spring while the longer season crops grow throughout the summer and into the fall. Choose a variety of plants that are disease tolerant and fairly low maintenance to start then progress into more diverse or specialty crops. During the school year, teach students how to extend growing seasons as well as how to use different growing methods, using the garden as the hands-on tool. I find that even the most stubborn students find the garden a place to relax and have fun while learning. Once the garden is established, students can use the space to experiment with the best growing practices, differ-

ent plant varieties and best pest management protocols.

Managing Your SBAE Garden

School gardens provide great learning opportunities during class time and also potential SAE projects outside of class for students. During the school year, I dedicate class time for fall and spring cleanup, planning, planting and harvesting. Students learn about plant requirements, companion planting, integrated pest management techniques and also harvesting methods throughout the year. They find great reward in harvesting something they started from seed, and even more sense of accomplishment when they make a delicious food product from their harvest.

Students who want to earn SAE hours are assigned garden managers and work after school to water the beds and battle the weeds in the garden, a position that extends into the summer. To get more help over the summer, I offer SAE Days where students can

sign up to help in the garden then use the produce they pick to create dishes to try. Not only does this keep the produce from going to waste, but it also promotes healthy and lo-

cal eating and motivates students to do the work. Plus, it is a fun way to get some SAE hours if they do not have the means to grow their own plants at home.

Finding Funds

Starting a garden can be a big undertaking, both in terms of financing and labor. Begin by researching grants that are available in your region and nationally. National FFA and the American Farm Bureau Foundation offer grants to help set up or improve school gardens. Local Rotary Clubs may offer funding as well and Garden Clubs may be available to help with supplies and labor. Nonprofit organizations such as Seed Your Future and Seed Savers Exchange work with schools to provide funds or seeds and National Ag in the Classroom has great lesson plans related to gardening. Partnering with local farms and garden centers is always a great way to make community connections and there is a chance they will have some extra plants to donate for a good cause.

The possibilities are endless with a school garden, whether it is three raised beds or half an acre. They are great learning tools for any Ag student, no matter if your focus is on sustainability, best farming practices, plant science or even food science. So next time your students are begging to go outside on the nice spring days, let them, and start a garden!

When in doubt, have students map out the area you have and determine the pros and cons of different design options.



(PREVIOUS LEFT) Weeding the herb bed. (PREVIOUS RIGHT) Harvesting lavender from the landscape garden. (LEFT) Harvesting beans and vegetables to cook during summer SAE days.



Rachel Holden is a Food Science teacher at Lyman Hall High School in Wallingford, CT. She teaches students to have a deep understanding and appreciation of safe, local and nutritious food from farm to table, concept to consumer.

Garden-Based Learning through the Junior Master Gardener® Program

by Dr. Kathryn S. Orvis & Lisa Whittlesey

Introduction

Educators of all types know that some of the most effective ways of teaching are through hands-on, experiential learning. Experiential learning, especially by way of garden-based learning, can serve as a mechanism to help students understand and apply new concepts in a meaningful way so that they develop constructs and understandings that are relevant and useful in their lives. Hands-on experiences can offer numerous opportunities to go beyond the obvious and broaden critical thinking and problem solving, key components in STEM learning.

Garden-based learning programs offer many benefits, and sometimes present challenges, such as lack of funding, labor, time, expertise, and lack of resources such as curricula, activity ideas, and lesson-plans, that can play a part in how they are used in schools and community settings (Cramer & Ball, 2019; Dobbs et al., 1998). These studies also show teachers can have concerns such as their own gardening knowledge and how garden-based learning fits into local, regional and national academic standards. One garden-based learning program that can address some of these needs is the Junior Master Gardener® program.

What is JMG?

The Junior Master Gardener® (JMG® www.jmgkids.us) program is an international youth gardening program headquartered at the Texas A&M AgriLife Extension Service and operates nationwide through collaborations within the land-grant extension network across the

Using garden-based education to ignite a passion for learning across all academic subjects can be an asset for schools and communities.

United States. The JMG program impacts youth through a variety of both formal and informal settings, including school programs, after school programs, community programs, and summer camping experiences. Through outreach and direct programming, the JMG program reaches approximately one million youth worldwide per year. The program is offered in some form across all 50 states, and internationally.

The JMG program engages youth in novel, hands-on group and individual learning experiences that provide a love of gardening, develop an appreciation for the environment and cultivate the mind. Children are encouraged to explore their natural world through academically aligned lessons that enhance and integrate science, math, literature and social studies using the garden as a living laboratory. The program mission is to *grow good kids through igniting a passion for learning, success, and service* through a unique gardening education.

A pillar of the program is to utilize the garden as a tool to not only impact academic learning, but to also develop leadership, instill personal pride and responsibility, and to cultivate an environment of youth community involvement. Through the program, youth are inspired to be of service

to others through service learning and leadership development projects related to their gardening experiences and rewards them with certification and recognition. The JMG program utilizes a train the trainer model to train teachers, youth educators, and community volunteers to support program implementation. Additionally, programs are connected to local county Extension programs who can provide local educational support, resources, and assistance related to gardening, 4-H youth development, and nutrition education. Local connections support garden-based programming, by offering resources such as volunteers through Extension Master Gardeners, connections between elementary and high schools, and connections with local community foundations, centers and government organizations.

Evidence of Effectiveness of Garden-Based Learning through JMG

Teachers, programming staff, and youth educators often comment on the positive changes that are seen in youth who participate in garden-based learning. Land grant university researchers and Cooperative Extension faculty across the land grant system have been involved in documenting the positive behavioral changes of the Junior Master Gardener program related to academic

learning, improved health and nutrition, and overall positive youth development. This research is important to increase the growing body of work related to impact of garden-based learning for youth, families, and communities.

No matter the size or complexity of the garden, utilizing JMG with school or community gardens provides an environmental context for interdisciplinary teaching of core academic subject areas. Not only do these stimulating, frequently outdoor environments, offer opportunities to learn math, science, language arts, social studies, health, and art, but also offer a real-life setting that excites youth about learning. To plant and maintain a garden, most of the classroom academic skills must be applied, creating an opportunity for true integration across subject areas, especially STEM content.

Over twenty years of research have demonstrated that youth who participate in JMG programming have increased academic achievement in science, increased knowledge in nutrition and plant science, increased preference and consumption of fruits and vegetables, attitudes towards healthy foods, increased physical activity, increased water consumption and a reduction in body mass index (Dirks & Orvis, 2005; Evans et al., 2015; Evans et al., 2016; Kararo et al., 2016; Koch et al., 2006; Lineberger & Zajicek, 2000). Children participating in JMG programming have increased engagement with their families, including children and families gardening together, cooking together, and having more family meals (Boyer et al., 2011; O'Brien & Shoemaker, 2006; Spears-Lanoix et al., 2015). Research studies have shown that the more experiences children have with natural settings, the more environmentally concerned and active they are likely to become (Karsh et al., 2009). The benefits of garden work also include improvements

in life skills, such as how students communicate and relate to each, and interests in careers (Fleener et al., 2011; Hoffman et al., 2007; Robinson & Zajicek, 2005). Finally, the impact of garden-based education in at-risk populations has also been documented (van den Berg et al., 2020).

Conclusion

Using garden-based education to ignite a passion for learning across all academic subjects can be an asset for schools and communities. The expanding global nature of our society needs to be supported by youth who can understand and contribute to the future of food systems, including healthy eating, that can be demonstrated through garden-based programming. Providing youth with ways to engage in and provide service to their own communities – to make a difference, through garden-based learning sets the stage for growing generations of engaged citizens. The JMG program, with its research-based evidence of impact, is one of the tools in which ag educators can meet the needs of our youth. The myriad of benefits of garden-based learning, in both formal and informal education settings, provide an opportunity for substantial impact on youth in our communities.

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Food Systems Exploration: Teaching Systems Thinking and Incorporating Gardens

by Dr. Mingla Charoenmuang

We live in a world that is full of complex systems. But many researchers have found that instead of preparing students with the skills to work with complexities, the instruction in U.S. schools are typically focusing on simplifying them. Students are asked to solve problems or make decisions by breaking them down (i.e., reductionistic reaction), but are not taught to put the parts back together nor look at the whole picture. Without being adequately taught to think in terms of systems thinking, students lack the skills to deal with complexities.

Systems thinking is a mode of thinking that recognizes the whole and its many levels of interrelationships between parts of a complex system. Because these components in the system are connected, systems thinking also anticipates that when one part of a system is affected, other parts are also affected resulting in intended and unintended consequences. Bawden (1991) discussed several consequences to the field of food and agriculture due to a lack of systems thinking, including the massive food surpluses co-existing with hunger, obesity, unsafe foods, and foods with low nutritional quality. At a community level, systems thinking can be used to understand fundamental causes of a problem and see new opportunities to solve them such as to improve health care, economy, technology, and relationships. At an individual level, systems thinking

“A garden can serve as an example case study that illustrates when a system is carefully designed, it requires minimal external inputs and produces less negative outputs.”

helps reflect on actions such as food choices and contributions to environmental sustainability.

Using a systems thinking lens, my colleagues, Ashley Helmholtz, Dr. Marybeth Mitcham, Jianxin Huo, and I recently put together a curriculum called **Food Systems Exploration**. There are eight experiential learning activities designed for students in grades 7-10 to explore and reflect on the complexity of modern food systems, especially in terms of production, processing, retail, consumption, and disposal, which can all involve transportation. These processes require a lot of people, use a lot of energy, and contribute significantly to several impacts. We encourage students to recognize their role in the system and, at the same time, see the disconnection and think critically about the intensive inputs of energy and resources that contribute significantly to environmental degradation and social injustice.

About the Curriculum

The Food Systems Exploration series introduces students to different aspects of modern food systems. All eight experiential

learning activities encourage students to recognize components and connections within the food system, especially production, processing, distribution, retail, consumption, and disposal. The activities address food systems topics holistically in terms of health, environmental, social, and economic aspects to help students understand a bigger picture, analyze consequences of a food system, and engage in social issues. Students develop systems thinking through the following activities.

1. Mapping a complete journey of a processed food item from production to disposal
2. Determining the resilience of their local food system using a scavenger hunt
3. Identifying inputs required in modern food systems and negative outputs that come out
4. Interacting with key players in the food system while exploring career pathways
5. Learning about changes over time through an interview with an older adult and a reflective exercise



(LEFT) Youth participating in scavenger hunt activity to find different levels of food sources and non-food items around their house and community to determine their food access and resilience.
 (RIGHT) A picture from a youth's presentation after volunteering with Meals on Wheels where she prepared food and delivered meals to seniors in her area and reflected on food security issues.

6. Analyzing discarded items, which are consequences of their consumption, and setting up a waste management system
7. Making an action plan for changes toward a sustainable food system using the Sphere of Influence and Choose Your Own Adventure
8. Conducting a project addressing social injustice and food insecurity in their local community

Garden Experience

Incorporating gardens in the Food Systems Exploration curriculum will help students make connections with a food system at the local level and reflect on several topics. First, a garden is used to raise foods and oftentimes washing and packing them. Students can explore food production and processing activities closely in the garden. Then, depending on the operation, location, and size of the garden, the foods may stay at the same location or get distributed to another

location to be processed (e.g., kitchen, factory), sold (e.g., farm stand, farmers' market, supermarket), consumed (e.g., school cafeteria, house), or disposed (e.g., compost pile, biodigester, waste facility). Students can compare this journey with another highly processed food item. A garden can serve as an example case study that illustrates when a system is carefully designed, it requires minimal external inputs and produces less negative outputs. The carbon footprint of a food item can be smaller, and most energy, money, labor, and other resources can be local, reused, and recycled. In contrast to the modern food systems practices which are much larger in scale, a system around a garden can reduce harmful emissions to the air, land, and water.

Second, through the scavenger hunt activity, students will observe several indicators of food access and resilience at an individual, household, and local level (i.e., direct-to-consumer) around a garden. Through getting to know

key players in the food systems, students identify people whose work is related to production, processing, distribution, retail, consumption, and disposal as well as other organisms who play a role in those processes including pollinators and detritivores. A garden engages people in many roles with skills related to students' various career interests such as landscape design, construction, outdoor education, horticultural therapy, ecology, and plant pathology.

Third, a garden can provide different topics for a food systems-related conversation with an older adult around skills, traditions, and utilization of the gardens. Likewise, it is an opportunity to explore heritage and culture. For example, Cornell Botanic Gardens "Seeds of Survival and Celebration" exhibit highlights how enslaved Africans used their culinary, gardening, and seed saving skills, plants, and resilience to preserve their traditions and cuisines. Students can learn tremendously from a story told about experiences in the garden.

Local Food System Example



This is an example of how a garden can be incorporated in the activities to address a food journey that requires minimal input of fuel and resources, highlight local food access, and emphasize waste reduction.

Fourth, a feedback loop of a food system can be discussed using a compost pile. Organic matter such as discarded plant matter, kitchen scraps, and food waste can be composted and become useful plant nutrients for the garden. This highlights “Rot,” one of the 6Rs of waste management, to teach students to waste as little as possible. Especially if it is a school garden, students could see production all the way to disposal in a closed-loop system where the discards are composted back to feed the production.

Finally, students can incorporate a garden into their action plan where they find ways to influence those in their “spheres” (e.g., family, friends, school, community) to work toward a sustainable food system. The project they work on to address social injustice can greatly benefit from collaborating with Extension and local organizations for resources. A garden can serve as a project site that addresses food insecurity, culturally appropriate foods, land access, and water conservation among other issues.

The Food Systems Exploration curriculum requires minimal preparation for teaching and is publicly available in 2 versions—interactive online and printable.

Email me at mc2794@cornell.edu to receive a free copy.

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Connecting with Your Local Farm to School Initiatives: A Starter Pack

by Jade Frederickson

I did not grow up participating in Farm to School programs or agricultural education. I didn't even know the latter existed in a formal manner until I entered graduate school. Nonetheless, I have worked on a few vegetable production farms and, at some point, learned about 4-H programming and Extension services. Now, as an adult ingrained in this work, I can also recall standing in the cafeteria line as an energetic, inquisitive fourth grader wondering about the signs that read, "Enjoy fresh apples and apple cider from our very own local Pine Tree Apple Orchard!"

As a current graduate student at the University of Georgia, I could spout off any number of facts about Farm to School, but if I had to keep it short, I would tell you Farm to School is an educational program aimed at introducing, familiarizing, and teaching students about the connections between agriculture, food, nutrition, and the environment (National Farm to School Network, 2021). Conceptually, Farm to School operates as a three-component program, where school gardens, local procurement in the cafeteria, and nutrition education work together to disseminate the above mission. For example, agricultural education teachers or science teachers could use the garden to demonstrate the plant life cycle or talk about soil health, while math teachers could use the garden to teach basic counting and measuring skills (DeMarco et al., 1999; Ozer, 2007).

Farm to School benefits more than just students and schools. Farmers and communities profit because farmers can sell their products to schools, which in turn bolsters the local economy (Food and Nutrition Service, 2022). Local farms can also serve as sites for field trips, local produce in the cafeteria can encourage schools to con-

Farm to School is an educational program aimed at introducing, familiarizing, and teaching students about the connections between agriculture, food, nutrition, and the environment (National Farm to School Network, 2021).

duct taste tests, and children can make connections with community organizations. Other Farm to School activities include using local foods in the National School Lunch Program, having farmers visit the schools themselves, and using USDA-provided education materials in programming. More information about other Farm to School activities can be accessed by visiting the Farm to School Census website (<https://farmtoschoolcensus.fns.usda.gov/>).

When I started graduate school at the University of Georgia, I was curious about

Georgia's Farm to School network. I had learned several years earlier that the National Farm to School's website listed who headed the initiative in each state. In Georgia, it's Georgia Organics, a nonprofit farmer services organization based out of Atlanta (Georgia Organics, n.d.). I quickly became engrossed with finding out as much as possible about who did what to further Farm to School in Georgia, but I soon realized it was difficult to track down all the different programs in the state. So, I conducted some research to find the answer and wanted to share that answer below. The remainder of my writing provides a list of top tips you may find useful when you are looking to navigate the conundrum of learning about Farm to School in your area.

8 Tips for Learning about your Local Farm to School Initiatives

1. **Check out the national scene!** As I already mentioned, the National Farm to School Network's website (<https://www.farmtoschool.org/>) is a great place to start because you can find information about who to contact to get involved in your state. You can also find funding and policy information and read others' stories.
2. **Review the Farm to School Census.** The Food and Nutrition Service (FNS) of the United States Department of Agriculture (USDA) con-

ducted a Farm to School Census (<https://farmto-schoolcensus.fns.usda.gov>) in 2013, 2015, and 2019 (Food and Nutrition Service, 2021). The Census report describes the various activities schools participate in and discusses funding opportunities, such as the USDA Farm to School grant program. Consistent funding can often be a challenge for Farm to School programs (Bisceglia et al., 2020), so be on the look-out early on for financial support opportunities.

3. **Take a look at other state organizations.** California and Vermont have several great models for Farm to School. Vermont FEED, for example, aims to extend the program beyond the cafeteria and includes the community in its approach (Vermont FEED, n.d.). Edible Schoolyard, based out of Berkeley, California, is known for its pioneering edible education programs (Edible Schoolyard Project, 2023). A couple of other notable organizations include FoodCorps and The Slow Food Movement.
4. **Join a listserv!** Several different groups have compiled websites, newsletters, and listservs so you can stay in touch with others sharing the same interests. Often, these groups provide free, hour-long professional development webinars that will help anyone of any level improve their Farm to School program. Check out <https://Kids-Gardening.org>, the School Garden Support Organization (SGSO) Network, or Big Green (<https://learn.biggreen.org/>) to start!
5. **Check out the local scene, too.** A good place to start is to research the local food banks, community or botanical gardens, food policy councils, and city beautifica-

tion efforts. Often, gardeners, farmers, and foodies bond together in these places, so they are sure to know of any Farm to School happenings!

6. **Don't forget to stop by the local agricultural and garden hubs.** Especially in Georgia, FFA, Farm Bureau, and Extension Offices are knowledgeable about the various Farm to School or school garden initiatives occurring within the county. They will gladly connect you with the resources you need to start your own Farm to School program. Plus, connections with these local organizations are shown to increase the sustainability of your program (Burt et al., 2017).
7. **Connect with your local gardening store.** Beyond funding, finding supplies for your classroom lessons or outdoor garden may be a bit of a challenge. Be sure to stop by stores such as Lowe's, Ace Hardware, or your town's equivalent to see if they would be willing to donate or provide you with materials. Often these places are also willing to partner later on if your classroom is running a plant or vegetable sale.
8. **Attend a few local events!** The same groups mentioned in numbers 5 and 6 often hold community events, too. Their events are great ways to connect with others of similar interests and passions. These connections might be potential volunteers for your program, or even individuals who can help spread the word about what you are doing, both of which can contribute to your long-term success. So, get out there and make some friends!

The above list certainly is not the end all be all to successfully learning about Farm to School in your area. Rather, it is a list I have

found useful while in my studies. Hopefully, you picked up one or two useful ideas. Sometimes, one idea is all it takes to get going. So best of luck, I can't wait to see what you come up with!

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Getting Started: Using a Site Design Guide to Improve Your Project and Funding Success

by Dr. Rose Judd-Murray, Jake Powell, David Anderson, & Derek Jenson

The Utah Outdoor Classroom Grant was established in 2021 by the Utah Office of Outdoor Recreation (OOR). OOR's mission is to ensure Utahns can live healthy and active lifestyles through outdoor recreation. The Outdoor Classroom Grant was an investment pilot project to encourage growth in the number and geographic distribution of outdoor classrooms. The grant provides up to \$150,000 yearly in matching funds to construct permanent outdoor classroom infrastructure. Depending on the project scope, individual applicants can qualify for matching funds of up to \$10,000 dollars.

A post-COVID perspective boosted interest in outdoor learning nationwide. Utah isn't the only state that has embraced outdoor classrooms, including school gardens, and improved access for funding these projects. Portland Public Schools, in Maine, built 156 outdoor classrooms to accommodate 5,000 students. Colorado, Texas, California, and Washington have passed legislation that would assist in the funding and development of outdoor classrooms. New Mexico created positions in its Education Department to support outdoor learning statewide. Additionally, their budget included professional development and construction microgrants.

Regardless of location and differences, one element of accessing funding remains consistent. Nearly all applications require the submission of a site plan for the proposed outdoor classroom

space. Based on input necessary for the Utah project, it was found that applicants interested in submitting a funding request had little or no experience with landscape design and struggled to know how to craft a site plan. Design guides were available, but they were not specific to the climate and geography of the Intermountain West. Although many of these guides contained content that led to producing a high-quality design, the information they provided was above the beginner level, making it difficult for non-designers to follow the instructions and create site plans acceptable for the Utah Outdoor Classroom Grant. The Utah Outdoor Classroom Design Guide aims to guide users through 1) defining a vision, 2) building a team, 3) getting to know your site, and 4) creating your site plan. The how-to guide walks applicants through the process and ensures the development of deliverables necessary for grant applications. It includes case studies, design resources, and information for generating community involvement. Furthermore, the 50-page workbook is digitally interactive and free on [OOR's Utah Outdoor Classroom Grant website](#).

Utah State University (USU) Extension Landscape Architecture and Environmental Planning (LAEP) program faculty members David Anderson and Jake Powell, and Applied Sciences, Technology, and Education faculty member Dr. Rose Judd-Murray, directed Master's graduate student, Derek Jenson, in the year-long review of existing outdoor

A reliable design guide can keep your team focused on the vision and next steps for project and funding success.

classroom design guides, case study review, and grant application analysis to develop the final design guide. As a component of his graduate work, Jenson worked alongside the school garden development committee, administrators, and teachers at a Salt Lake City charter school to intentionally pilot-test the guide. Their feedback acknowledged barriers and led to student-centered improvements that refined the final design guide product. The finalized framework can best be used for 7th-12th grade classes but can be applied more generally to anyone interested in designing an outdoor space.

Using the Workbook for Site Design

The design guide was developed using a format that can be used as a step-by-step instruction manual for school gardening development teams. Generally, these advisory councils are groups of teachers, administrators, school staff (e.g., facilities, janitorial), and community stakeholders. These councils are typi-

Utah Outdoor Classroom Grant
DESIGN GUIDE



(TOP LEFT) The design guide can assist school garden development teams in crafting a site plan that is high-quality and ready for grant submissions. (TOP RIGHT) Support and input from students and community stakeholders will strengthen your outdoor classroom design. (BOTTOM) Case study examples help design teams identify outdoor classroom and school gardening components that increase the sustainability and usability of a proposed location.



ally an assemblage of individuals with little to no formal design experience. This makes developing the required site design for a grant a daunting task. Once the guide is downloaded from the website, the fillable PDF document allows the group to develop a vision statement, craft goals, identify partnerships, and create a “wish list” of program elements that would be desired for the garden. These beginning steps help the group center their vision and plan before they attempt to draft a site design. The perks of using an interactive PDF include additional digital resources, such as a ready-made Google Form survey that provides good questions to ask when gathering public input for the outdoor classroom.

The next steps in the guide lead the team through a series of tasks that help them better understand their school grounds. The group will gather geographical information about maintenance, weather, access, and ground slope and combine it with sociocultural information about the students using the area. Once a defined site boundary is determined, the guide uses a simple and straightforward approach to drawing a site plan grid to scale. Accurate and effective drawings can be frustrating and intimidating without a clear tutorial. The workbook provides base grids, scaled concept exploration cut-outs in three different sizes, numerous examples, a video tutorial, links to ADA standards, and tips

for grant application success. The features in the guide provide the path forward without overwhelming the development group with the process.

Using the Case Studies for Inspiration

Making the most of an outdoor classroom space requires exploring how to maximize the region’s natural resources, climate, and geography. The Utah design guide highlights five outdoor space case studies to show how different environments can provide educational experiences. Other Western, particularly Intermountain West educators, may benefit the most from gleaning elements from these site designs, but plenty of ideas can be incor-

porated nationwide. For example, the Wasatch Community Gardens was able to preserve wood from felled trees, stones from an old fireplace, and soil from the fertile ground when their outdoor classroom was built. Those elements now have created whimsical, winding paths for exploration. The Conservation Garden Park, located in the southwestern area of the Salt Lake Valley, was designed to educate the public about water scarcity and best practices for utilizing water-wise landscape. The case study approach highlights some of the Park's biggest maintenance challenges to prevent future developers from making similar mistakes. The guide also provides links to the Park's water-wise plant database, pre-made planting plans, and a virtual tour for non-resident visitors. The final case study highlights the extensive public participation achieved by the Greenwood Charter School and its "Back 7" project. The school developed a seven-acre parcel of agricultural land owned by the charter. The study shows how they used public participation and a landscape design class for their 7th-8th grade students to create a concept plan for their outdoor space. Students became experts in drafting conceptual and schematic designs. They worked in groups and practiced setting and meeting deadlines to incorporate soft-skill practices.

Each case study provides graphics of site design ideas that can enrich a project. Project development groups that identify similar interests should reach out to the contacts provided within the guide or, more importantly, outdoor classroom program leaders in their state. Outdoor programs in your area may be willing to share planting lists, irrigation providers, maintenance schedules, and information about discounted equipment rates. These case studies can help your stakeholders envision the potential impact of a small or large school garden.

Whether your outdoor classroom team is well-seasoned or new, getting started is a big step. Developing school gardens or outdoor classrooms is an iterative process; there will be steps forward and back again. A reliable design guide can keep your team focused on the vision and next steps for project and funding success.

Visit the OOR website:



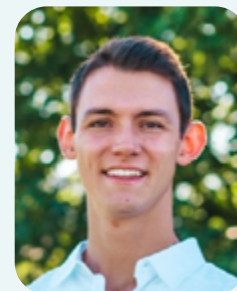
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Implementing Global Service-Learning Through School Gardens

by Samuel Ikendi, Dr. Michael S. Retallick, & Gail R. Nonnecke

The Uganda service-learning program is embedded within a partnership of institutions, including Iowa State University (ISU), Makerere University (MAK), and non-government organizations: Volunteer Efforts for Development Concerns 2004-2014 and ISU-Uganda Program (ISU-UP) 2014 to date (Butler & Acker, 2015; Ikendi & Retallick, 2023). The ISU-UP is an implementer of the livelihood programs of the Center for Sustainable Rural Livelihoods (CSRL) based in the College of Agriculture and Life Sciences (CALs) at ISU with programs being implemented in Kamuli District, Uganda. Service-learning is an education program of the CALs led by an Associate Director of the CSRL who doubles as an ISU faculty.

Conceptualized in 2005, Uganda service-learning arose out of a participatory needs assessment between ISU and MAK colleges of agriculture, and national and local stakeholders in Uganda (Nonnecke et al., 2015). The needs assessment identified

school gardening as the most feasible activity that could fulfill the learning objectives of the university students and their curricula. School gardening was also identified to meet the CSRL's goal of helping with agricultural education programs in communities which has also helped in solving the invisible hunger in schools in Kamuli using garden proceeds for school lunches. Since 2005, the program has expanded over the years. However, in this article, the focus is on the summer program named **Creating a school garden: Service-learning in Uganda**, a name derived from its main activity. The adoption of this school garden approach was as a result of the emphasis by the United Nations' Food and Agriculture Organization in 2004 of the school garden concepts (FAO, 2005).

Implementation of service-learning began in 2006 with the original setup as a course-based academic program led by ISU CALs faculty who also served as instructors (Nonnecke et al., 2015). The initial stages included participating students

from not only CALs but also other colleges like Engineering and Human Sciences. In the early years, the program was four weeks, and it gradually grew to six weeks for ISU students. In 2007, the program was expanded to 10 weeks for MAK students to meet their college curricular requirement of 10 weeks field attachment. The ISU and MAK students work together for the first six weeks. After the ISU students return home to the U.S., MAK students continue to advance their work and work closely with the local stakeholders.

The service-learning program currently works with five elementary schools and two high schools in Kamuli, Uganda on school gardening and related projects and activities (Ikendi, 2022, pp. 125-137). Major projects include assisting with teaching in bi-national teams of ISU and MAK students in subjects including Agriculture, Integrated Science, Mathematics, and English. Establish school gardens of vegetables, cereals, orchard trees, woodlots, herbaria, and



(LEFT) Figure 1. ISU-UP Outreach Coordinator teaching service-learners and pupils about amaranths. (RIGHT) Figure 2. Bush clearing to establish a school garden.



(LEFT) Figure 3. Service-learners, pupils, and school garden master mulching eggplants.
 (RIGHT) Figure 4. An established keyhole garden with spinach, collards, and spring onions.

other food crops. Work on bi-national team projects addressing community issues including agroforestry, beekeeping, sanitation, composting, irrigation, grain storage, livestock, and school feeding. Students also participate in co-curriculars with their peers, pupils, facilitators, and community with indoor and outdoor sports and games including soccer, volleyball, netball, music, dance, and dramas improve students' talents. They also take part in tours and travels to national parks, cultural sites, source of the Nile, and many other places for adventures and socialization to fulfill their study abroad and tourist adventures.

School Gardens

School gardens are outdoor learning laboratories for students to connect classroom concepts with hands-on experience in the field (Fig. 1). Service-learners work with the ISU-UP outreach coordinators, school teachers, and faculty to establish gardens of vegetable and food crops, and orchard and tree gardens. An average of 3.2 acres of land is available for school gardens in each of the five elementary schools supported by CSRL/ISU-UP (Ikenndi, 2022). Students work on land mapping to design rotation plans on the land.

Several crops are grown in the rotation including collards, grain amaranths, eggplants, pumpkins, pigeon peas, cowpeas, tomatoes, Orange Fleshed Sweet Potatoes (OFSP), onions, bananas, pepper, garden eggs, and beetroots. Student service-learners set up nursery beds and multiplication gardens for OFSP to raise planting vines. For vegetables, nurseries and shades are erected as seeds germinate. Materials like sticks and grasses for shade are collected from trees and bushes around schools.

Student service-learners also prepare the main planting gardens (seedbeds) through bush clearing and plowing together with the school children (Fig. 2). Planting of seedlings is done carefully after watering them in the nursery to avoid damaging the tender seedling. Routine agronomic practices are done including watering, weeding, pest and disease control, mulching (Fig. 3), and cover cropping. Because of limited land area, sack gardens and keyhole gardens (Fig 4) are also established, and seedlings are shared from the established nurseries.

For Orange Fleshed Sweet Potatoes, mounds are made from loosened soil to establish OFSP gardens, and 4-5 cuttings

of sweet potato vines are planted per mound. Potatoes are a major staple in school lunches. In planting bananas, holes of 3x3 feet are dug at a 10x10-foot spacing, and compost manure is mixed and added to the hole. Banana corms are obtained from established schools and farmer banana plantations through careful digging of corms from the mother plant which are then soaked overnight to kill weevils. These bananas are foods for school parties, weekend and holiday programs, and sources of shade for vegetables by using their leaves and pseudo stems as mulches.

Protecting the Gardens

School gardens incorporate agroforestry projects that help to protect the gardens as fences and conserve the environment. High tensile barbed wire fences are established under which a living fence is planted. *Euphorbia* species are used as living fences because of their bitter white sap that most animals like goats and sheep do not eat. *Euphorbia* has a high growth vigor to quickly establish itself within the barbed wire fences and creates a continuous intertwined fence. Kei-apples are also planted because of their thorny structure and are good for attracting both honey and native bees who love their flowers, an

School gardens provide learning platforms for students to practice the principles learned in their classrooms related to agriscience.

important aspect of the beekeeping project in schools.

Additionally, *Calliandra calothyrsus* are planted to provide firewood, fodder, soil improvement, and stabilization through nitrogen fixation. Acacia trees are also planted to establish fuelwood lots for school lunch programs. Other tree species planted include eucalyptus, *Markhamia lutea*, and *Terminalia*. Similarly, an herbarium with assorted herbs like Oregano, Basil, Mint, and Tobacco are also established to serve as local herbs for tea and also herbal medicine for poultry projects. Orchards are established with fruits including papaya, avocado, mangoes, guava, oranges, and jackfruits which are harvested and served with school lunch.

Learning Aspects

School gardens provide learning platforms for students to practice the principles learned in their classrooms related to agriscience. The principles including land use planning, nursery and seedbed management, propagation, agroforestry, and postharvest handling are demonstrated to pupils, linking classroom teaching to school gardens and related projects. These hands-on experiences make lessons learner-centered which improves the grasp and knowledge acquisition leading to the development of a learner as a whole as espoused by (Dewey, 1918). This is also what Situated Cognition Theory emphasizes that knowledge is constructed within and linked to the activity, context, and culture in which it was learned (Brown et al., 1989). Linking teaching to a specific activity, place, and/or social situation

enhances the learning process because of learners' familiarity with that situation.

Epilogue

School gardens not only provide opportunities for students to conceptualize the agriscience knowledge of food production, but also provide produce from the garden to the school lunch programs to contribute to the CSRL goal of overcoming hidden hunger in schools in rural Kamuli District, Uganda. This aspect improves school attendance and keeps pupils in school which improves their academic performance and motivation to continue participating in school gardening. Service-learners work with pupils in various agricultural clubs including school gardens, agroforestry, beekeeping, livestock, school feeding, postharvest, and soil to maintain the gardens to achieve sustainability of food production and learning. Pupils have transferred knowledge back home by implementing vegetable production to improve household food supplies and income to meet scholastic materials like books, pens, and uniforms.

While this experience occurs in Uganda, the lessons learned and the types of activities can be applied to local agricultural programs in the U.S. using a service-learning framework. If we look around our communities there are pockets of our friends and neighbors who struggle with food insecurity, access to highly nutritious food, and economic challenges. Local school or community gardens scattered throughout the community could make a significant impact on

those who need it, build interest in plants and agriculture as well as a sense of community. For our students, it's an opportunity to learn as well as teach community members about production agriculture and empower them to have a positive influence on our homes and communities.

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Teaching Cultural Heritage Using the Morningside University Garden

by Dee McKenna, Dr. Annie Kinwa-Muzinga, & Dr. Thomas H. Paulsen

The majority of our Morningside University Applied Agricultural and Food Studies faculty members grew up on traditional farms in Iowa and Nebraska. Most of us had the experience of “walking beans” or participating in other manual methods of weed control in our gardens, pastures, and crop fields—usually on the hottest days of the year! So, by the time we reached secondary agricultural education courses as students ourselves, we already had a pretty good working knowledge of weed identification. As we started a new Applied Agricultural and Food Studies program at Morningside University in 2015, the Agronomy curriculum soon became one of our most popular areas of study—with weed identification and control being an important component of the curriculum. Velvetleaf, lamb’s quarter, smartweed, bindweed, spurge, hemlock, cocklebur, and pigweed topped the students’ weed identification collections each year.

Then in 2018, Dr. Annie Kinwa-Muzinga joined the department to lead our agribusiness curriculum. Possessing several years of experience teaching at another midwestern institution, Dr. Annie brought with her tremendous agribusiness knowledge as well as some new cultural experiences from being raised in the Democratic Republic of the Congo (DRC) in Central Africa. It didn’t take long for us to learn that one of the “weeds” that midwestern farmers spend literally billions of dollars annually to control is a food staple in the DRC and other countries around the world. *Amaranthus viridis*, other-

Amaranthus viridis, otherwise known as Congolese *Bitekuteku*, Guatemalan *Plebo*, Aztec *Huauhtli*, and Japanese *Amaransu* has an interesting history and is still commonly consumed in numerous cultures around the world today.

wise known as Congolese *Bitekuteku*, Guatemalan *Plebo*, Aztec *Huauhtli*, and Japanese *Amaransu* has an interesting history and is still commonly consumed in numerous cultures around the world today.

What is Amaranth?

Amaranth can be found on every continent except Antarctica and has a multitude of uses. Considered a non-grass pseudocereal, the grain can be used whole or ground into flour. Species vary in color and are also valued for ornamental purposes. Their pigments have been used in a variety of ways from ancient cultural ceremonies to their current use as a natural food colorant. The primary use of amaranth that our students have enjoyed learning about most is as a leafy green. Amaranth leaves are safe to eat and very nutritional, rivaling that of spinach and surpassing it in Vitamins K, C, and Calcium.

Amaranth as Context for Cultural Heritage Exposure

Cultural heritage has been defined by Rouhi (2017) as “all cultural significance belonging to different cultures in different geographic locations of the world...created [by] connections

between different social values, beliefs, religions, histories and customs” (p. 7113). Haines and Haines (2021) suggested that “in order to strengthen our understanding of others, opportunities for cultural exposure are necessary” (p. 232). Battista (2019) shared five reasons why cultural heritage should be taught to high school students. We believe the same reasons apply to our students at Morningside University. These reasons include

1. understanding leads to appreciation,
2. exposure encourages students to connect to their own culture,
3. integration will help students look inward and forward,
4. awareness provides ways to connect to one another, and
5. encourages students to work together to protect cultural heritage.

As we began to understand the importance of amaranth to the quickly growing local Congolese community, we saw the opportunity to teach Morningside students about a cultural heritage different from what many of them had previously experienced,



(TOP LEFT) Dee McKenna (L) and Dr. Annie Kinwa-Muzinga (R) develop numerous experiential learning opportunities for students in the Morningside Garden. Students learned about vegetable production, food safety protocols, and were introduced to amaranth as a leafy green popular with the local Congolese community in Sioux City.

(TOP RIGHT) Dr. Annie showed students several production methods for amaranth. Here she is with a bunch of amaranth in front of the department's grow towers in the new greenhouse.

(BOTTOM) Jerry Kapesa, a Congolese agronomist who now lives in Sioux City, demonstrates traditional amaranth harvest methods and displays his harvest in the Morningside Garden.

while at the same time providing a service to those in the local community. Further, this project gave us the opportunity to provide experiential learning opportunities for our students through the Morningside Garden and newly constructed Rosen Ag Center and Lagaschulte Greenhouse, as they developed an agribusiness enterprise and implemented marketing skills.

In the summer of 2021, Dr. Annie and garden manager Dee McKenna decided to try their

hand at growing amaranth in one raised bed of the garden. The project was a success, and the production of the amaranth was donated to the Congolese community in Sioux City. As amaranth was added to the garden, there were a lot of curious questions from our traditional agricultural students, mainly wondering why in the world we would plant amaranth? These questions and conversations allowed us to begin bridging the gap between cultures.

In spring 2022, as a class project in Dr. Annie's Ag Entrepreneurship class, five students were tasked with growing amaranth in the greenhouse, and as part of the project, marketed it to JMV, a Sioux City African grocery store. Through the project, students were able to connect with and interact with many Africans in Siouxland in need of fresh ethnic produce! For one student, Josh Tibbits, this project led to a summer 2022 research project. Tibbits, a Morningside senior business

major with a minor in Agribusiness, investigated amaranth yield in grow towers in the greenhouse, versus in the garden with and without vermi-compost. A larger area of the garden was allocated to grow amaranth, due to the increasing demand! Jerry Kapesa, friend of Dr. Annie and a Congolese agronomist in Sioux City, agreed to help out with his tremendous experience of growing amaranth in the Congo. Our students watched Jerry prepare the soil, sow the seed and harvest the leafy greens. Even though there was a language barrier between them, they were able to learn traditional African production methods. This process was much different than how we had been growing vegetables in the garden and through a successful harvest, we learned that there is more than one way to raise a crop.

As the summer research continued, Congolese families excitedly lined up at JMV to purchase fresh amaranth, compared to the alternative frozen variety typically purchased from Omaha or Chicago. The excitement and demand have not let up. Since January 2022, the Morningside University Garden and Lags Greenhouse has shipped more than 400 pounds of the delicacy to local Congolese families and JMV. The students have also expanded their ethnic food production work, with sour sour and gustavo leaves and are in the beginning phases of a cassava experiment. In addition to ethnic foods, Ag students are also using their business plans to donate or sell other produce harvested from the Morningside University Rosen Ag Center and Morningside Garden to Sodexo for the Morningside Caf', Table 32, The Hard Rock Casino, Kahill's Chophouse, the Up-from-the-Earth program, The Gospel Mission, and many more.

As a department, students, faculty, staff, and administration have come to appreciate amaranth for more than just a



(TOP) Dr. Annie with her Agricultural Economics class in the Morningside Garden. Note the traditional amaranth and cassava plots at the right of the photo.

(MIDDLE) Dr. Annie with Agricultural Entrepreneurship students packaging amaranth and basil for delivery to a local ethnic grocery store.

(BOTTOM) Dr. Annie with Agricultural Entrepreneurship students loading amaranth into vehicles for delivery to a local ethnic grocery store.

weed found in the farmland surrounding our area, but also for the importance of the vegetable to the local Congolese. As a result, we have strengthened our connections between different cultures and worked together to grow a crop that will continue to expand the perspective our students have toward different cultures. With this project, students learned another aspect of globalization, previously concealed in their own backyards.

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Cultivating Student Restoration Through School Gardens

by Dr. Anna J. Warner

School gardens are known for their ability to cultivate knowledge, skills, and food. A less well-known benefit is their ability to cultivate student restoration. Our students are overwhelmed by stress and demands on their attention daily. Fortunately, exposing students to the natural environments offered in school gardens also exposes them to the therapeutic effects of stress reduction and attention restoration. School gardens can serve as a restorative learning environment for students and teachers.

Benefits of Restorative Environments

Restorative environments lead to physiological, emotional, and cognitive responses which are beneficial to individuals (Hartig et al., 1991). Exposure to natural environments initiates an unconscious response to stress by lowering heart rate, respiration rate, and stress hormones, allowing the body to return to homeostasis (Ulrich, 1983; Ulrich et al., 1991; University of Minnesota, 2016). Additionally, they lead to restored energy (Ulrich, et al. 1991), increased positive emotion (Rose, 2017), and improved mental health (Gilbert, 2016). These impacts take place within minutes of being exposed to natural settings (Ulrich et al., 1991). Restorative environments also reduce mental fatigue and lead to restoration of attention capacity (Kaplan, 1995; Kaplan & Talbot, 1983). Immersive time in natural settings in connection with disconnection from electronic devices has been shown to increase higher-order problem solving and creative thinking (Atchley et al., 2012). When agriculture students were taught the same lesson in

the classroom compared to in a greenhouse or shade house, students in restorative environments were more likely to see no change or an increase to their attention capacity, while nearly 85% of students taught in the agricultural classroom experienced a decrease in attention capacity (Warner et al., 2020).

Restorative Environment Characteristics

Knowing key characteristics of restorative environments will allow you to identify, create, or take advantage of restorative learning environments with your students. The Attention Restoration Theory (Kaplan & Kaplan, 1989) defines 4 characteristics of natural environments that lead to restoration:

- **Being Away** – different from the normal environment or routine, physically or conceptually.
- **Fascination** – naturally occurring attention that does not require effort.
- **Extent** – enough space or coherence for an individual to become immersed.
- **Compatibility** – aligning with an individual's inclinations.

When we take students to school gardens, they get a break from the classroom and experience being away from their typical school atmosphere. In school gardens, there are many stimuli, including plants, animals, and natural characteristics, that arouse a natural fascination for students. When students are outdoors or in school gardens, they can become immersed in the larger, natural environment. Finally, consciously or unconsciously,

the basic inclinations of humans are aligned to nature.

Practical Ways to Cultivate Restoration in Students

Only approximately 10% of American teenagers are spending time outdoors daily (Nature Conservancy, 2011) leading to negative impacts on their mental and physical health (Balmford & Bond, 2005). Less time outdoors also means students are not reaping the restorative benefits that natural environments provide. As teachers, we can begin to cultivate restoration in our students through many easy strategies.

- **Bring natural elements, such as plants, into the classroom setting.** You don't need to take students outside every day to provide restorative benefits. They can benefit from natural elements becoming a part of the classroom atmosphere.
- **Arrange your classroom so students can view natural elements outside of the room easily.** How are the seats arranged in your classroom? Can students easily look outside the windows to take advantage of seeing natural aspects of the school campus? How can you rearrange the classroom so students can easily see natural elements through windows?
- **Create natural areas that are pleasant to view from classroom windows.** If the view from your windows is not particularly restorative, make it a class project to make a more restorative view from your classroom. Create a school garden or landscape project that allows students to apply

content from your classroom while creating restorative areas on campus that will serve all students.

- **Paint natural scenes or post pictures of nature in the classroom.** Even if you don't have windows in your classroom, students can benefit from viewing images of nature. Whether you add permanent visual elements to your classroom walls or deliberately integrate pictures of nature into your slideshows, even this small action can lead to restoration in students.
- **Teach lessons outdoors.** As Ag teachers, we have plenty of opportunities to teach content and skills in outdoor environments. Take full advantage of these opportunities and intentionally plan for opportunities to teach outdoors.
- **Take students to restorative environments regularly.** Take full advantage of the school resources you have. Visit greenhouses, shade houses, school gardens, school forests, school farms, outdoor classrooms, or other natural settings on campus with students regularly.
- **Establish restorative learning environments on campus.** If your campus does not have many learning environments that encompass the characteristics of a restorative environment, work with school administration to create these environments so all teachers and students can take advantage of them.

As you take students to your school gardens or plan your next lesson, I encourage you to consider how you can intentionally make the most of the restorative characteristics of the learning environment. Engaging students in these environments not only leads to relevant learning experiences, but also cultivates restoration and healing from the stress and attention demands students are experiencing.

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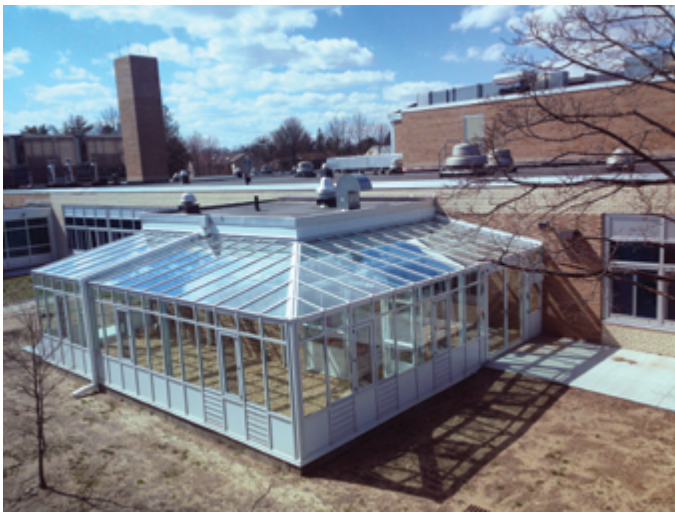
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