

Integrating Sustainable Agriculture with K-12 Curriculum through School Garden/Orchards: a Pre-Service Teacher Training

Final Report for GNC12-152

Project Type: Graduate Student

Funds awarded in 2012: \$9,987.00

Projected End Date: 12/31/2014

Grant Recipient: University of Minnesota Duluth

Region: North Central

State: Minnesota

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Project Information

Summary:

Teachers play the important role in our society of educators of the next generation. The goal of this project was to develop a experiential curriculum to educate pre-service teachers about sustainable agriculture. The pilot test of this project took place in three stages. First, pre-service teaching students participated in a training. This training included classroom lessons, a site visit, and a field trip to local sustainable agriculture locations. During the second phase of this training, participating pre-service teachers completed student teaching assignments at schools with access to a garden. These pre-service teachers then reflected on their experiences. The final piece of this pilot test was a school orchard training. Due to interest in this type of training, this phase of the project was open to pre-service teachers, teachers and community educators. The final product of this project, informed by the pilot test, is a revised curriculum to teach pre-service teachers how to educate their future students about sustainability, sustainable agriculture and food systems through the lens of school gardens.

Introduction:

This project, originally titled "Integrating Sustainable Agriculture with K-12 Curriculum through School Garden/Orchards: A Pre-Service Teacher Training," educated pre-service teachers sustainable agriculture principles and skills using school gardens/orchards. Through experiential learning, pre-service teachers developed the necessary skills to educate future generations about the benefits of and supporting the development of sustainable agriculture food systems. This pilot

project took place in three phases. During the first phase pre-service teachers participated in a four-day workshop. The training included visits to local farms and opportunities for hands-on exploration of sustainable agriculture practices. Pre-service teachers also had the opportunity to develop a plan for implementing sustainable agriculture to their own lesson plans and curricula. The second phase of this project took place during a student teaching experience. Pre-service teachers were placed in a mentor relationship with experienced teachers who can model the use of the school gardens and explore strategies for integrating sustainable agriculture practices in the K-12 curricula. Pre-service teachers documented their learning and accomplishments through reflective communication with the project coordinator. Project effectiveness and learning by pre-service teachers was accessed through this reflective communication. The third phase of this project was a full-day workshop focusing school orchards offered to pre-service teachers and current educators. Further, obstacles and opportunities for successful integration of sustainably designed and managed school gardens/orchards into K- 12 student curriculum were identified, and the project modified to ensure future viability.

Project Objectives:

This project created an opportunity for K-12 teachers to start their careers using sustainable agriculture practices as a teaching method through school gardens/orchards, setting the stage for systemic changes in the ways K-12 students, teachers, and parents view sustainable agriculture. Project participants defined and identified sustainable agricultural practices compared to conventional practices. They gained an understanding about how sustainable agriculture practices can increase the quality of food produced, food security for their communities and improve the ecological systems upon which sustainable living is based. Experiences with local farmers, and the integration of sustainable agricultural practices in their school garden/orchard curricula will increase K-12 students, teachers and parents knowledge of and access to sustainable farmers and farm products. This cycle of education will likely improve economic viability, enhancing the quality of life for farmers/ranchers, rural and urban communities, and society as a whole. Students will gain the skills, knowledge, and understanding that will lead them to seek out sustainability in their daily choices including growing their own food, buying from local farmers, and pursuing sustainable farming as a career. Short-term outcomes of this training included changes in the knowledge, awareness, skills and attitudes of pre-service teachers. Project participants:

- Gained experiential understanding of the concept of sustainability (the balance between environment, society and the economy).
- Applied their understanding of sustainability through a real-life sustainable agriculture experience.

Intermediate outcomes included changes in pre-service teachers' behavior and practices by:

- Learning to use a school garden/orchard to integrate teaching of sustainable agriculture concepts and practices with student learning in math, science, and other subjects.
- Using school gardens/orchards to engage K-12 student in active learning about the ecological principles, knowledge, and skills related to specific sustainable agriculture practices (i.e. holistic planning, organics, IPM and beneficial insects, soil and water quality improvement, crop/landscape diversity, proactive weed control, etc.).

Long-term outcomes of training pre-service teachers in sustainable agriculture school gardens/orchards as a vehicle to actively engage students are expected to include:

- Successful and ongoing education of K-12 students through the use of sustainable agriculture concepts and skills integrated with the main subject areas.
- Teachers, students, and the community will increase their understanding of the importance of sustainable agriculture to their personal and their communities' health.

Cooperators

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Research

Materials and methods:

Integrating Sustainability Education into the University Pre-Service Elementary Teacher Curriculum through the Use of School Gardens (Pre-Service Teacher Curriculum)

Additional Materials:

- School Orchard Resources - Available to participants in a Google Drive Folder: <https://drive.google.com/drive/?usp=folder#folders/0BzeZRJW050qIZ21YbIJUNHQ5YWs>
- SARE Resources and Grants
- School Garden and Orchard Resources
- Sustainability and Sustainability Education

- [SARE Resources and Grants](#)
- [Sustainability and Sustainability Education Resources](#)
- [School Garden and Orchard Resources](#)

Research results and discussion:

2013 Results/Milestones:

- During the spring 2013 semester, two education classes participated in a school garden training: Inquiry Social Studies & Science Learning: Birth-Age 8 and Teaching Science and Environmental Education II. These students were part of several class periods, ranging from 1 hr to 3 hrs, focusing on learning about sustainability and sustainable agriculture, school gardens as a learning tool, and hands-on learnings experiences (both in the classroom and in gardens).
- In order to place students in a teaching experience with current classroom teachers who have access to school gardens (as part of this project), this project

needed to work very closely with the University of Minnesota Duluth (UMD) Office of Field Experience in the UMD Department of Education. The project also relied on connections made between the Duluth Public Schools and the Duluth Community Garden Program. Over the course of the spring and summer 2013 semesters, the project lead worked to identify connections, promote communication and elicit feedback from pre-service teachers and cooperating teachers participating in the project. These experiences have helped to create a timeline and process through which to work in the future.

- During the fall 2013 semester, one education class participated in a one-hour training on school gardens. Additionally, most of these students participated in another one-hour training during the UMD Department of Education Professional Day.

2014 Results/Milestones:

- During the spring 2014 semester, one full-day workshop on school orchard was offered to UMD pre-service teachers, UMD Environmental Education students, and northeast Minnesota teachers and community educators. This workshop was co-sponsored by the UMD Department of Education, the Duluth Community Garden Program, the UMD Sustainable Agriculture Project, and Clover Valley Farms (see attached poster and participant feedback).
- Feedback from student experiences, both during the trainings and the student teaching experiences, was analyzed (see student teacher comments attachment).
- Review the draft curriculum developed for this project, and revise based on student feedback, instructor feedback and experience.

[Student Teacher Comments](#)

[School Orchard Training - Participant Feedback](#)

- [School Orchard Training Poster](#)

Participation Summary

Educational & Outreach Activities

PARTICIPATION SUMMARY:

Education/outreach description:

The final pre-service teacher curriculum developed as a result of this project will be available at the end of this report. In addition, the final curriculum will be shared with the many collaborators and partners who participated in this project. These partners include: University of Minnesota Duluth (UMD) Office of Sustainability, UMD Facilities Management, UMD Department of Education, the Sustainable Agriculture Project at UMD, the Duluth Community Garden Program, Clover Valley Farms, and local schools.

Project Outcomes

Project outcomes:

This project had the following impacts over the course of 2013:

- Two classes participated in the training during the spring 2013 semester. The total number of training participants was approximately 42 students.
- Of these two courses, 7 students participated in a Urban Farm tour of Duluth (students from the two participating classes).
- 8 students did their student teaching experience at 5 Duluth area schools with gardens or interest in developing a school garden (students from the two participating classes).
- Approximately 30 students participated in a one hour school garden training during the fall 2013 UMS Pre-Service Teacher Professional Day.
- One class participated in a hour long training on school gardens during the fall 2013 semester. The total number of participants was approximately 24 students (most of these students had also participated in the Professional Day training).

A total of approximately 72 students participated in some aspect of the school garden training during 2013.

Several area organizations also played some role in the 2013 trainings, including: the University of Minnesota Duluth (UMD) Office of Sustainability, UMD Facilities Management, UMD Department of Education, the Sustainable Agriculture Project at UMD, the Duluth Community Garden Program, Seeds of Success (a project of Community Action Duluth), the Hillside Public Orchard, the Grant Community School Collaborative (now Myers-Wilkens Community School Collaborative), and the Duluth Grill.

This project had the following impacts over the course of 2014:

- 15 of pre-service teachers, environmental education students, and current educators participated in a full-day workshop focusing on school orchards. The workshop covered the following topics: introduction of growing apples, discussion of tree varieties, pest management, and integration of school orchards into the curriculum. The workshop also included hands-on activities at the UMD Sustainable Agriculture Project community orchard, including a discussion of site selection, preparation and management.
- Revision of the school garden pre-service teacher curriculum integrating lessons learned from the pilot training.

Several area organizations also played some role in the 2014 training and curriculum revision, including: the University of Minnesota Duluth (UMD) Office of Sustainability, UMD Facilities Management, UMD Department of Education, the Sustainable Agriculture Project at UMD, the Duluth Community Garden Program, Clover Valley Farms, and Piedmont Elementary School.

Final Impacts:

- 72 pre-service teacher students participated in some aspect of the training in 2013.
- 15 students, teachers and community educators participated in a school orchard

training related to the school garden training from 2013.

- Approximately 87 people participated in some aspect of the pilot training between 2013-14.
- A curriculum was pilot tested and revised with the goal of educating pre-service elementary teachers about sustainability, sustainable agriculture and food systems through the lens of school gardens. The curriculum is intended to prepare future teachers who will use school gardens and sustainable agriculture as teaching tools.

Selected Participant Comments:

A pre-service teacher who completed the training commented on using school gardens to educate students:

"After participating in this training I can see how agriculture can be integrated into math (measurement), health/physical (physical movement through planting), and social studies (the history of agriculture). These cross curricular activities would allow students to gain a larger understanding of how much of a role agriculture plays in their daily life. Using these cross curricular activities also allows students practice using different learning styles that may be similar to or different from their own which ultimately benefits the student's learning."

A pre-service teacher commented after completing a student teaching at a school with a garden:

"Overall, I'm really happy with the experience that I had at the garden but I wish more teachers would have been involved in the garden. A school garden is absolutely an asset to any school and all children. My students came from a variety of backgrounds but there's no doubt in my mind that their experiences in the garden helped them to understand where food comes from and that foods from the garden taste great! I hope that with more time and experimenting, teachers find more ways to be involved in the garden."

A participant in the School Orchard training commented:

"I learned more about orchards and caring for apple trees in those few hours than I thought possible. My number one take away was how to care for trees and keep them healthy."

Economic Analysis

Although this project did not intend to document any economic impact, project participants (pre-service teachers, cooperating teachers, instructors and community partners) likely developed a greater understanding of the connection between sustainable agriculture (including school gardens) and the local economic benefits of sustainable agriculture as a result of this project (see Areas Needing Additional Study section).

Farmer Adoption

Although farmer adoption was not part of the scope of this project, an anticipated long-term outcome of this training is that project participants will continue to be engaged in local agriculture. This engagement could possibly involve further collaboration between local farmers and local educational institutions (see Areas Needing Additional Study section).

Recommendations:

Areas needing additional study

Obstacles, Opportunities and Resources

The following is a list of lessons learned, reoccurring issues and potential solutions (obstacles and opportunities for successful integration) identified as part of this project. These obstacles and opportunities must be addressed by additional study in order to ensure future viability pre-service teacher school garden training programs. An additional list of resources is included (see attachment) for university faculty/staff and community educators who are interested in developing sustainable agriculture and school garden trainings for teacher education programs.

General Training Suggestions:

- The intended audience of the final curriculum shift from K-12 pre-service teachers to just pre-service elementary teachers. This shift occurred because of feedback gathered from the participating instructors. According to feedback, elementary school teachers have more flexibility than middle school or high school teachers. As a result, school gardens are more easily incorporated into the elementary setting, where the same teacher covers multiple topics.
- Future projects could focus on the process of integrating a school garden curriculum into middle and high school teacher education programs, taking into account these unique challenges. Solutions to challenges include: collaboration between subject teachers and within departments, collaboration across grade levels, and more applied learning (work-study) opportunities for students.
- Collaborative programs are difficult to implement over the course of one school year. Instructors who intend to implement this training or similar school garden trainings for pre-service teachers will need to work closely with their education department, office of field experience (or similar office managing student teacher placements) and cooperating teachers over the course of at least a year to ensure all parties understand the intended outcomes and know what is expected. This also give the office of field experience and cooperating teachers the time necessary to adjust requirements and revise/re-order lesson plans and units in order to align with the timing of the school garden training.
- A school orchard lesson would be too complex to include in a school garden training, as orchards require more specialized knowledge. It is suggested that school orchard trainings occur as separate components with the larger pre-service teacher education program.

Guidelines for Designing a School Garden Training

Before hosting a school garden training for pre-service teachers:

- Read up on case studies
- Make contacts with area farmers and sustainable food system organizations (institutes and non-profits)
- Identify school garden resources for your geographic area
- Talk with instructors who have done similar trainings to know what to expect
- Collaborate with cooperating teachers who are already using school gardens to develop the training for pre-service teachers. These cooperating teachers may already know farmers and resources. They may know what a functioning school garden looks like at their unique site.

Farmer and Economic Impact Suggestions:

- Economic impact could be explored as part of the training with pre-service high school teachers, as economics is a high school subject. Partnerships could be established between the instructor, education department, and university economic development research institutes and/or university extension services. For example, university extension could track the awareness of and participation in the local food system by both pre-service teachers who participate in the the training. Extension could also track the behaviors of high school students who participate in the training beyond high school.
- An alternative approach would be to place pre-service teachers with area farmers. During this placement, pre-service teachers would create and implement outreach programs for local students about sustainable agriculture at the farm site.

School Garden Obstacles and Opportunities:

The following is a list of obstacles and opportunities identified by pre-service teachers who completed the training and then completed their student teaching experience at schools with gardens.

Obstacles Identified by Student Teachers in School Gardens

- Time and person-power in the garden
- Support (funding and maintenance)
- Classroom Logistics
 - Coordination of classroom schedules
 - Coordination of use of the garden
 - Class size (time it takes to manage many children)
 - Student behavior
- Teacher Knowledge and Confidence
 - Teachers lack confidence in the garden
 - Improvised lessons
 - Struggle to incorporate state standards into garden lessons

Opportunities Identified by Student Teachers in School Gardens

- Create tangible goals for the garden
 - Garden design (what is the purpose)
 - Garden use (specific lessons and outcomes – ex. Salsa garden)
- Continuing Education for current teachers in new school gardens
 - Encourage familiarity and confidence
 - Provide lesson materials and time to incorporate lessons
- Involve parents or other volunteers
- Create a buddy program between grades to encourage peer-to-peer teaching and appropriate behavior
- Host a Harvest Fest to get everyone involved in the garden

Thoughts on making this training more successful

- Further buy-in and involvement from department and university administration. Increased involvement would help to address issues.
 - Better embed the training into the program curriculum and requirements for pre-service teachers.
 - Aligned with standards.
 - Create a training that is not an “add-on” but instead a new way to learn and teach the necessary topics and skills
- Different approaches to learning
 - Internships
 - Service-learning projects at local farms and/or at schools with a garden
- Begin training pre-service teachers earlier in their program (the pilot training took place in the semester directly before the student teaching experience, the third year of the program), and integrate aspects throughout.
- Spread the training out over the course of an entire year. This would require a sequence of courses and/or independent study options.
 - Winter – school garden funding, design and lesson plan development
 - Spring – building the school garden and planting, lesson plan integration
 - Summer – garden maintenance, lesson plan integration
 - Fall – harvest and process produce, lesson plan integration, year-in-review and lessons learned, plan for the next year

Funding Trainings for Gardens and Orchards

General issues to be aware of:

- Restrictions on funds.
- Who needs to be at the table?
- Where to look for funding?

Where to look for funding:

- Grants through university extension and institutes
- Funding options through grocery stores, food co-ops, and agricultural-related businesses
- Private foundation grants
- Economic development grants
- Civic and community organizations (Rotary, Chamber of Commerce, fraternal organizations) – these are also a good source of potential volunteers

[School Gardens and Pre-Service Teacher Training Research and Resources](#)

Information Products

- [Integrating Sustainability Education into the University Pre-Service Elementary Teacher Curriculum through the Use of School Gardens \(Course or Curriculum\)](#)

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This site is maintained by SARE Outreach for the SARE program and is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under award No. 2019-38640-29881. SARE Outreach operates under cooperative agreements with the University of Maryland to develop and disseminate information about sustainable agriculture. [USDA is an equal opportunity provider and employer.](#)