Growing Greener: A Collaborative School Garden Project with Meadville Area Middle & Senior High Schools

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Garden-based environmental education programs have the potential to benefit schools, students, teachers, and local communities in a variety of ways, from teaching students how to work in teams to making them more receptive to trying new fruits and vegetables. School gardens can also be an asset to teachers by providing them with a space to engage students in hands-on learning outdoors. The positive feedbacks resulting from involvement in school garden programs can also help students to more fully understand principles of sustainability and include them in their daily lives. Although the logistics become more complicated, a garden program geared towards students in special education classes would provide teachers with an asset for engaging students in interactive learning. To begin assessing the feasibility of implementing a school garden program, a broad sample of middle school teachers were surveyed. Qualitative data on autistic students' ability to be involved in garden activities added to the information gained from the survey by showing that autistic students could be involved in this project but would require a very thoughtfully designed program. Principles of garden management, including recommendations for setting objectives and goals, implementation, evaluation, and creating a realistic budget, can provide a foundation for the proposed school garden at MAMS.

Introduction

"Plant sequoias. Put your faith in the two inches of humus that will build under the trees every thousand years."
~Wendell Berry

School gardens are not a new idea – they have been integrated into school grounds and curricula for over a century. Early on, their positive effects on students and schools were recognized by the U.S. Bureau of Education Commissioner. He expressed his belief that interaction with natural systems was a useful addition to classroom-based learning (Claxton 1916). In 1906, the U.S. Department of Agriculture estimated that over 75,000 school gardens existed throughout the country (Lawson 2005). However, school gardens are often semi-permanent and do not last over the long term. Reasons for ending garden programs include a lack of permanent access to land, school expansion, lack of teacher training or interest, loss of key garden coordinators, and lack of funding (Ozer 2007). Throughout the past century, school gardens have gone through several cycles. They seem to be established during times of need. After the initial school garden movement of the 1890s, school gardens experienced popularity resurgences during World War I, the Great Depression, and World War II. As theories of place-based, experiential education for schools were developed, school gardens began reappearing in the 1990s. Today, over 3,000 school gardens exist in California alone (Ableman 2005).

Gardens serve as an outdoor classroom that teachers across all disciplines can integrate into their curriculum. These programs benefit students, teachers, administrators, and communities. They also create an alternative learning environment that aims to develop an environmental ethic in students, as well as instill values of sustainability, community, inclusivity, and teamwork that are so often missing in today's fast-paced, technology-driven world (Berry 1984). Student learning will be enhanced by this opportunity to gain hands-on gardening experience and spend time outdoors, which also helps to remedy kids' Nature-Deficit Disorder ("Edible Schoolyard" 2010, Louv 2005).

Including kids who are in special education classes can create an inclusive environment, breaking down the barriers that often exclude this population from participating in school activities. Effectively utilizing existing community resources can also contribute to the success of school garden programs.

In the research for this study, I focused on students with autism and other developmental disabilities. A traditionally underserved population, students in special education classes can benefit from school garden projects in a number of ways. Additionally, school gardens can serve as assets to special education teachers because they provide a space where students can engage in hands-on learning and improve social skills while also working on physical tasks, like harvesting crops, that can improve motor coordination (Buzzell and Chalquist 2009). Autistic students can especially benefit from garden programs because of the opportunities they provide for social interaction and mastering new skills. Although changes in routine can be stressful for students with autism, thoughtfully designed garden programs can be tailored to students' individual gifts. Through this project, I aimed to assess the feasibility of starting a school garden geared toward special education students at the Meadville Area Middle and High Schools. To decide if the project was feasible, I had a series of conversations and meetings with teachers and administrators who would possibly be involved in the garden program. I obtained quantitative data by surveying Middle School teachers to assess their level of interest in this project. The survey showed that enough teachers were interested in the project to make it a sustainable program. Since many logistical considerations are necessary in planning a school garden that also involves special education students, I collected qualitative data by coordinating a trial of garden activities for high-school autism support classes. This data helped to inform the "Recommendations" section of this study by providing feedback about how engaged students were in garden activities, how many teachers are needed to coordinate garden activities, and which activities would be most engaging. This section also includes management guidelines that could provide a foundation for the garden program to grow from.

Background

Systems Thinking for Educational and Ecological Systems

Today, kids are spending much less time in nature than they did a generation ago. This situation is an inadvertent and unanticipated side effect of our increasing use of technology, hectic schedules, and changing values. The lack of a strong connection with nature affects kids' emotional and physical health, preventing them from gaining the restorative benefits of time spent in nature. Richard Louv calls this new phenomenon Nature-Deficit Disorder (Louv 2005). Lack of time spent in nature impairs kids' abilities to develop a naturalist intelligence. Key

aspects of this intelligence are acute sensory skills, attachment to animals and plants, and strong observation skills (Louv 2005).

Skills like these are valuable, but our current educational systems focus on producing high test scores. In his essay "Raising Whole Children", Ableman compares schools to factory farms that are concerned with producing outcomes like test scores instead of nurturing an appreciation for relationships and values in kids (Ableman 2005). National policies such as No Child Left Behind have contributed to school districts' focus on raising test scores in order to avoid funding cuts, job losses, and government intervention in schools. Federal funding for education was increased from $42.2 billion to $54.4 billion in 2007, but this extra funding came with many provisions that often negatively impact teachers, administrators, and students. For example, to help students score well on tests, teachers often need to adjust their lesson plans to focus on test-taking skills instead of interactive projects or critical thinking. The act has also been criticized for setting unrealistic goals, such as 100% achievement of state standards that have been declared impossible by schools around the country (Pederson 2007).

To re-value naturalist intelligence, educational programs should strive to foster ecological literacy. Ecological literacy is a concept that assesses students' understanding of natural systems, human impacts on those systems, and sustainability. By being ecologically literate, people are more likely to be able to solve the complex problems that exist today. However, achieving ecological literacy requires making environmental education a central focus of K-12 education, not just an extra activity in which a few students occasionally participate (Orr 2005). Hands-on teaching that goes beyond the blank-slate model of education and teaches kids about concepts like ecology, interdisciplinary thinking, and sustainability will lead to an increase in kids' ecological literacy (Orr 2005). Through ecological literacy, we can provide students with the tools necessary to tackle the widely accepted ecological crisis (Curry 2006).

Environmental education programs are uniquely poised to help kids achieve ecological literacy. The Tbilisi goals of environmental education (EE) declare that these programs aim:

1. to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas;
2. to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;

3. to create new patterns of behavior of individuals, groups, and society as a whole towards the environment (Tbilisi Declaration 1977).

The most effective environmental education programs are interactive, multifaceted, and allow students to actively experience the environment. Several pre-existing conditions have been linked to students' ability to make environmentally sustainable decisions. They include: "(a) knowledge of ecological concepts, (b) environmental issue awareness, (c) knowledge and skill in the use of environmental action strategies, and (d) evaluation of environmental issues and responsible citizenship behavior," (Culen and Mony 1999).

Systems thinking is one approach to environmental education that theorizes that all social systems are inherently and inextricably nested within natural ecosystems. Reinforcing feedback loops are a key characteristic of systems. These processes are defined as self-perpetuating cycles that intensify over time (Meadows 2008). They can be observed in many current situations. For example, conventional agricultural systems result in feedback loops with negative effects. Farmers' use of pesticides to control insects leads to pesticide-resistant insects, so farmers need to apply more and more pesticides in order to keep insect populations low. Agricultural pesticides cause water contamination, can have negative health effects on workers, and can leave residues on produce. There are many more examples of reinforcing feedback loops with negative consequences in conventional agriculture.

Wendell Berry demonstrates a systems perspective in thinking about agriculture, stating that "Neither nature nor people alone can produce human sustenance, but only the two together," (Berry 2002). We rely on ecosystems for essential services like eliminating toxins and providing natural resources. However, our continued reliance on industrial agriculture is causing large-scale environmental problems like a 20,000 km^2 dead zone in the Gulf of Mexico, soil erosion, the use of 3 million tons of pesticides annually, stream contamination, and decreased crop diversity (Horrigan et al. 2002, Orr 2004). With so much environmental damage resulting from industrial agriculture, our social systems are also being affected. Our food systems need to reflect our interdependence with natural systems.

In contrast to the many social and environmental problems caused by industrial agriculture, sustainable agriculture creates a feedback loop of positive effects. Sustainable agriculture improves soil quality, recycles nutrients, uses much less energy than conventional farming, and produces healthier food. Growing a wide range of fruits and vegetables gives local

communities greater access to fresh, nutritious food, contributing to the overall health of the community. This type of agriculture also avoids the pollution problems caused by pesticide runoff from industrial agriculture systems, since sustainable agriculture avoids pesticide use. These benefits make sustainable agriculture a "solution…that causes a ramifying series of solutions," rather than a solution that causes new problems (Berry l981).

Civic ecology is emerging as a way of increasing the resilience of our social and ecological systems. Krasny and Tidball (2009) define civic ecology as the matching of needs and assets within communities. This matching process is based in systems thinking. It aims to create resilient social and ecological systems by building community through environmental restoration. Community-based projects such as gardens and riparian buffer restoration are examples of civic ecology (Krasny and Tidball 2009).

In civic ecology programs, participants learn through hands-on activities like harvesting tomatoes, talking to older community members with traditional knowledge of gardening, and planting trees. Involvement in these types of programs allows kids to spend more time outside and gain a deeper knowledge of their local communities. Learning how food is grown and engaging in their communities enables participants with the knowledge, skills, and values necessary for them to want to create more sustainable food systems. In contrast to conventional agriculture, sustainable food systems are based on concepts of community and interdependence. (Berry 1984). A key characteristic of civic ecology programs is their potential to empower students. Through gardening, restoration, or other community action-based programs, students become aware of their efficacy. So, they can be motivated to continue these forms of civic engagement (Krasny and Tidball 2009). As their involvement becomes larger, they can be more motivated to make change. The success of small projects can lead to students taking on larger projects, which can motivate them to take on larger projects. Since this effect shows that civic ecology programs are effective, it facilitates the creation and expansion of these types of programs.

Moving away from educational and agricultural systems that act more like factories than human and ecological systems is not an easy process. Ableman (2005) believes that shifting towards more sustainable systems and "being connected with the land…provides a deeper soulful nourishment that I think our society desperately longs for…based on relationships—local, biological interpersonal, ecological," (Ableman 2005). Fostering these

kinds of relationships will teach students about the interconnections between people and the land.

Even though the effects of creating healthy school systems are rewarding, implementing systemic change in schools is difficult and time-intensive (Evans 2005). Looking at affecting change in school systems as a social movement, it could be placed in the "ripening conditions" stage of its development. In this stage, important resources are beginning to come together and the general public is starting to gain interest in an issue. To progress to the next stage, the movement for schools designed on slow-food values needs to become widely recognized (Moyer 2001). Outside factors play a large role in making the change process such a slow one. For example, schools are often facing urgent problems like violence within the school and increasing dropout rates. These problems are just as significant as the lack of access to local foods (Evans 2005).

So, school administrators are often likely to think that implementing civic ecology programs would take time away from addressing problems they perceive as more serious. Other problems like finding reliable funding sources, a lack of leaders in the educational system, and existing feedback loops that make systems hard to change are also obstacles faced by initiatives to change schools. Challenges identified in Bill Moyer's social movement theory include discouragement and allowing creativity and independence to fall away from the movement (Moyer 2001). However, persevering in the face of challenges and employing systems thinking can help to steadily affect change in educational systems until school curricula reflect the interconnections between people and nature (Evans 2005). Finding the leverage points that can tip the scales in our favor is the first step in the right direction.

School Gardens: Environmental Education through Civic Ecology

Over the past century, school garden programs have been shown to have many positive effects on student learning, health, social skills, and awareness of environmental issues. In contrast to classroom education that often focuses on teaching students how to regurgitate answers on tests, EE garden programs can be geared toward students' different abilities and interests. They can also facilitate many different kinds of learning. For example, Krasny and Tidball (2009) found that the Garden Mosaics intergenerational community gardening program had significant impacts on student learning. This program increased students' amount of knowledge by providing them with an opportunity to engage in their environment. Particularly

in science education, experience with actual scientific projects allows students to learn interactively. Through working in groups, students learn from each other (Krasny and Tidball 2009). Although this study was based on learning outcomes from a community garden, the same learning conditions could be replicated at a school garden. A connection with community members, including teachers, and working on garden projects in groups could contribute to student learning.

Gardner's theory of multiple intelligences supports this type of education by outlining seven different types of intelligence, including spatial intelligence, bodily-kinesthetic intelligence, and linguistic intelligence (Gardner 1983). Garden programs' ability to appeal to and enhance multiple types of intelligence can raise students' level of investment in their education and give them first-hand experience of how food is grown ("Edible Schoolyard" 2010). Teacher feedback about the educational effects of school gardens is also positive. A teacher at the 2nd Street Elementary School garden in Los Angeles commented that the garden has "become the students' reason to learn," (Assadourian 2003). Understanding the processes involved in gardening and developing an appreciation for fresh, healthy food counteracts prevalent "fast-food values" like a perception that natural resources are limitless. Instead, school garden programs can contribute to students' development of more ecologically sound slow-food values like hospitality, beauty, care, and enjoyment of good food (Waters 2003).

Participation in school garden programs has significant effects on students' nutritional choices, leading to healthier lives. With childhood obesity rates reaching 13% in the U.S., nutrition education has become a high priority (United States Department of Health and Human Services 2001). To further contribute to health problems, kids are leaving their broccoli on the plate. Nationally, less than half of kids ages 4 to 18 are eating the recommended five daily servings of fruits and vegetables (Robinson-O'Brien et. al 2009). Eating a wide variety of vegetables, especially dark- green leafy vegetables, decreases the risk of cancer and heart disease (Van Duyn and Pivonka 2000), so kids' lack of a diet rich in fruits and vegetables could cause serious health problems later in life.

Garden-based nutrition programs demonstrate great potential for causing kids to make healthier food choices, including an increased preference for fruits and vegetables (Story et. al. 2002). There is still a need for more studies of these programs, as many current studies lack thorough data on all aspects of the program (Robinson-O'Brien et al. 2008). However, many

promising studies have been conducted at elementary and middle schools across the country. For example, a garden-based nutrition education program at the University of California at Davis found that first-graders who participated in school garden activities were more likely to try new vegetables than a control group that did not spend time in the garden (Morris 2001). A pre- and post-test of students' fruit and vegetable intake during a 12-week in-school garden-nutrition program targeted at 6th-grade students found that students who completed the program ate 4.5 servings of fruits and vegetables per day. Before the program, they had been eating an average of 1.9 fruits and vegetables daily (McAleese and Rankin 2007).

After-school nutrition education programs also increase the amounts of fruits and vegetables students eat. Hermann found a significant increase in the amount of vegetables eaten by 3rd-8th grade students in Oklahoma after they completed an after-school garden-based nutrition education program. During the program, students planted, cared for, and harvested vegetables. Pre- and post-test surveys showed that the amount of students who ate vegetables every day increased from 22% to 44% (2006).

After a 10-week nutrition education program at a community garden in Minneapolis, boys ranging from eight to 15 years old ate significantly more fruits and vegetables. Nutrition classes and cooking and gardening activities were key components of this program. Girls in this study were not shown to have significant increases in fruit and vegetable consumption. Both boys and girls in the study expressed an increased willingness to try new vegetables and be involved in other gardens (Lautenschlager and Smith 2007).

Garden-based programs that take place during or after school seem to be the most effective at changing students' nutritional choices. While the community garden study was also effective at increasing the amounts of fruits and vegetables boys were eating, it was not as effective at causing girls to eat more fruits and vegetables. Programs that allow students to understand where food comes from and how it is grown seem to be much more effective than programs that include only classroom education. With the current high childhood obesity rates, incorporating garden-based education shows strong potential to change kids' food choices.

School gardens provide teachers with an outdoor classroom that they can creatively integrate into their existing curriculum. Pennsylvania's State Standards for Environment and Ecology for 7th grade include a knowledge of biological diversity, how agricultural systems affect society, and an ability to compare how different agricultural techniques lead to different

environmental conditions (Pennsylvania Department of Education 2002). So, incorporating gardens into school curriculums can give teachers an asset for meeting these standards. A teacher at the 2nd Street Elementary School garden in Los Angeles said that the garden "helps me teach…and provides a creative way to discuss the intricacies of math and science, as when the kids investigate the life cycle of flies that grow in marigold seed pods," (Assadourian 2003).

Methods

To research the feasibility of a school garden geared towards students in special education classes in the Meadville Middle School, I decided to practice typical garden activities to determine if special education students would be interested in gardening, and how they handled garden activities. This information would make it easier to accurately assess the feasibility of this project and make recommendations. If the project were carried out, autistic students would represent a typical classroom, but the garden would also be open to other interested students and teachers. Also, there can be logistical difficulties involved in working with kids with autism and other mental disabilities, such as a very low teacher-to-student ratio, and routine, structured activities that actively engage students without causing frustration. Thus, I collected both quantitative and qualitative data to determine if a school garden was a feasible project to pursue. One of the key components of a successful garden program is investment by the program site. It would not be feasible to start a garden at Meadville Area Middle School (MAMS) if teachers did not have enough time, interest, and enthusiasm to commit to sustaining the program. Middle school teachers were surveyed to assess teacher interest in a school garden as compared to interest in other outdoor environmental education projects, the type of garden they would most prefer, and their level of availability/interest during the planning process. Due to some initial teacher hesitance around the idea of a school garden, where it would be located, and how it would be managed, I designed this survey to statistically assess teacher's interest levels in the project.

From meetings at Meadville Area High School (MASH) and MAMS during the fall semester, I learned that teachers were also interested in other program options that would allow them to take their classes outside. To determine if a garden was still the best option to pursue, I

designed a survey to include a section where teachers could rank their interest level in a school garden as compared to other options. The Assistant Principal at MAMS had expressed interest in creating a space where teachers could have class discussions outside. The main focus of his idea was to put a few tables and benches in the courtyard for teachers to use. Art teachers were also interested in working with students and other teachers to design art projects like murals and sculptures in the courtyard. One teacher frequently takes her classes into the courtyard and other outside areas to draw plants. Even though a garden is not dependent on these other ideas, I thought it would benefit my project to gain a sense of other teachers' visions for how the courtyard could be used as an outdoor classroom.

Quantitative Data

The survey was targeted at middle school teachers because they will be integrating the school garden into their curriculums and are thus key players in this project. I chose to sample teachers from all subject areas, not just special education, because acceptance of the program by the broader school community is an important factor in program feasibility. I focused on middle school teachers because I had already connected with three high school teachers who supported the idea of a garden. Ideas and suggestions from school garden planning guides, middle school administrators, and community service coordinators were incorporated into the survey in order to most effectively assess teacher interest (Bucklin-Sporer and Pringle 2010). Out of 45 surveys sent to teachers' mailboxes, 22 were completed and returned to the middle school secretary, a 49% response rate. In consideration of teachers' busy schedules, the survey was only one page long and designed to quickly assess teachers' interest in outdoor education projects (see Appendix A).

In order to gather information on how teachers could envision using a garden in their classes, the survey included five options that could be incorporated into an outdoor classroom (See Appendix A). These options included outdoor seating, a garden, a playspace, landscaping with native plants, and outdoor student art projects to determine if there was enough teacher interest to justify a garden project or if it would be more feasible to implement a different kind of environmental education program. Seating such as tables and benches would provide teachers with a space to hold classes outside. The garden option also asked teachers to state their preference of which type of garden they would be most interested in: flower, vegetable, herb, or

any combination of those three options. Flower gardens are great places for kids to learn how plants grow, but are not really connected to local foods. Vegetable and herb gardens could provide opportunities to learn about sustainable agriculture. A playspace had been suggested by a teacher as a way to get students outside, so I also included it on the survey. A teacher had also suggested landscaping with native plants to help teach kids about local ecosystems. Art teachers were interested in using the courtyard as a space for student and teacher art projects. Including all of these options made it possible to assess teachers' relative interest levels in each project. If teacher interest was much higher in one project than all others, it would be most feasible to implement the most popular project.

To assess teacher interest in these options and help to determine the feasibility of a school garden program, a Lickert scale was used to rank each option. Since the courtyard where the proposed garden would be located is a common space, I felt it would be helpful to learn which projects teachers were most interested in. Teachers who were more interested in other options, like environmental art projects or a space to hold classes, could incorporate their ideas into the courtyard as well. At the end of the survey, a space was included for teachers to suggest their own ideas for how the courtyard could be used. As a student, I don't have the teaching expertise of teachers at MAMS. So, this space was intended to provide a place for teachers to use their knowledge of their students, curricula, and other factors to suggest any other outdoor alternatives that could be more feasible and beneficial than the options I included on the survey.

Qualitative Data

To add classroom observations to information gained from the teacher survey, I also coordinated two flower-planting practice sessions with two high-school autism support classes. There are many logistical challenges involved in working with autistic students. For example, these students need very structured schedules with minimal changes in routine, can have difficulty with social interaction, and can be frustrated by time-intensive tasks. Depending on where a student falls on the autism spectrum, they can also have difficulty with verbal communication and motor skills (Levine and Wagner 2005). Despite the challenges involved, garden-based programs can be a highly beneficial form of therapy for people with autism or developmental disabilities. Gardening improves motor skills, decreases emotional stress, and provides sensory stimulation for these populations (Buzzell and Chalquist 2009).

To determine the feasibility of working with autistic students on this project, I collaborated with two autism support teachers at MASH to plant flowers in existing raised-bed flower gardens at MASH. Two students from one autism support class were high-functioning, and six students from the second class had more severe autism. Students in both groups had constant supervision by teachers and teacher aides. Two flower-planting sessions were conducted. Each flower-planting session was one hour long. To give each student the opportunity to work in the small flower garden, students were rotated in and out of the garden by teachers. Tasks performed by students included raking leaves around the garden, using hand trowels or shovels to dig holes for tulip bulbs, placing bulbs in the holes, and covering the planted bulbs with dirt. The teachers and I helped to guide and encourage the students, providing positive reinforcement as they worked on their tasks.

Results

Choices included outdoor seating to enable teachers to hold classes outside, a school garden, a playspace, landscaping with native plants, and student- and teacher-designed environmental art projects. Surveyed teachers ranked these options on a scale from 1 to 5, with 5 being the highest level of interest and one the least interest. Scores for each option were averaged to determine which options were most highly preferred. Scores are as follows: Seating: 3.52; Garden: 2.57; Playspace: 1.58; Native Plants: 2.25; and Art: 2.4. Teachers preferred outdoor seating over the creation of a school garden. A garden was the second-most preferred option, ranking above student- and teacher-designed environmental art projects, native plant landscaping to aid in the teaching of local ecosystems, and an outdoor playspace for students, respectively (Fig. 1).

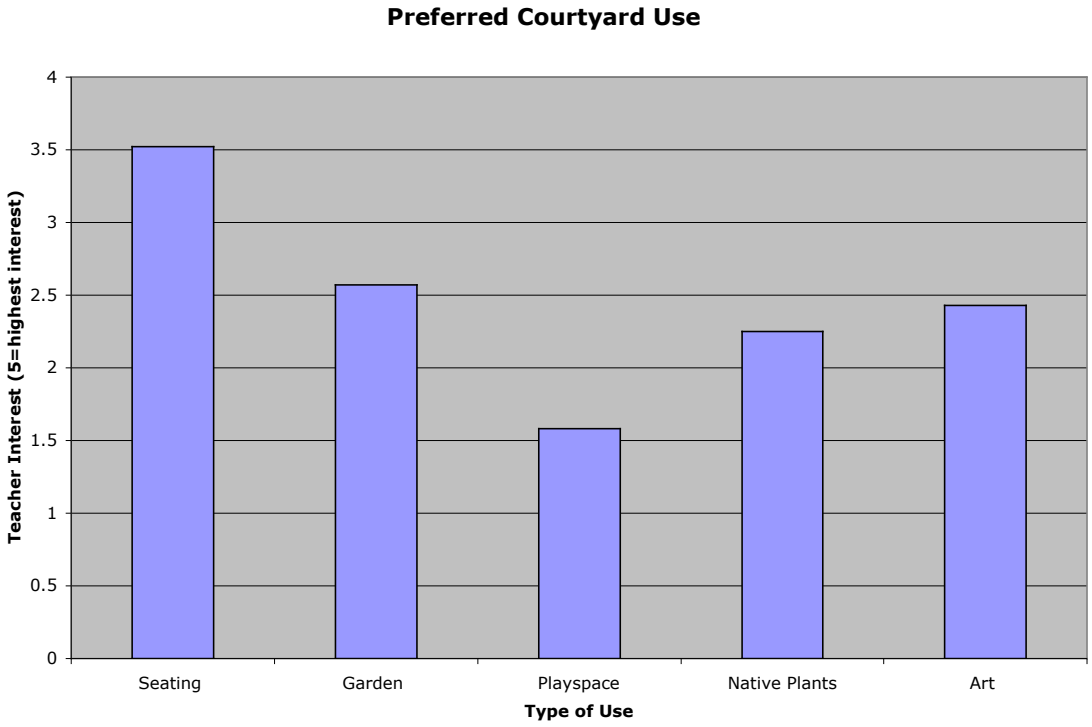


Figure 1. Teacher interest in a school garden as compared to interest in other outdoor environmental education programming.

Most teachers (9) ranked gardens as their third-most preferred option for outdoor environmental education programming. Three teachers chose a school garden as their most preferred option and four teachers chose it as their second-most preferred option. Only three teachers ranked the garden fourth or fifth as compared to the other options on the survey. Three teachers left the garden option blank on the survey form (Fig. 2).

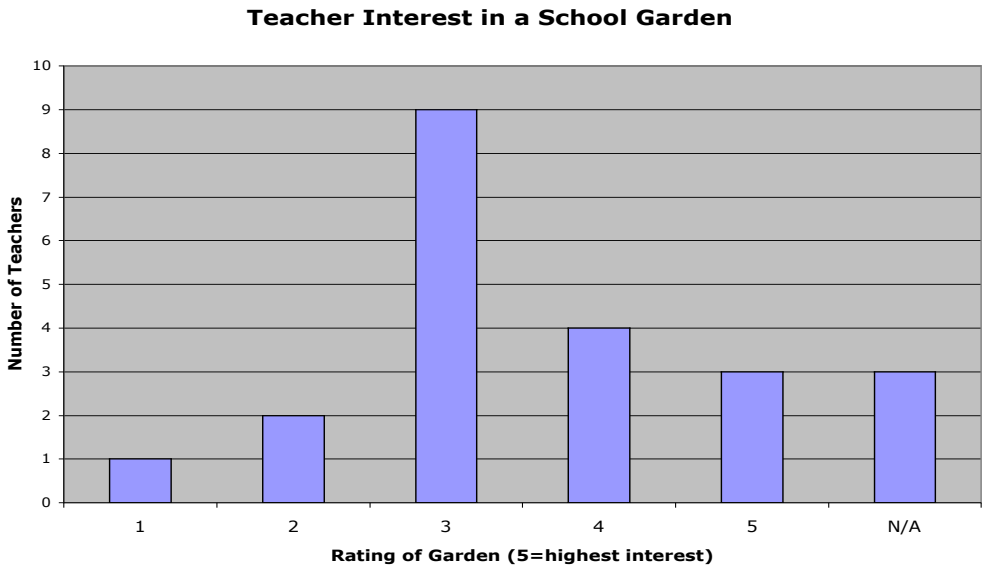


Figure 2. Teacher interest in a school garden. Columns represent the number of teachers who selected each option. n=22. N/A indicates that the garden option was left blank on the survey form.

Teachers could choose from six different combinations of garden types: vegetable only, flower only, herb only, vegetable and herb, herb and flower; and herb, vegetable, and flower. In addition to determining which type of garden teachers were most interested in, these options also helped to assess the value teachers place on local foods. For example, teachers who selected a flower-only garden may support the idea of bringing kids outside and involving them in hands-on education in gardens. However, they might not place a high importance on gardening's connection to local foods because they prefer a garden that does not include any vegetables or herbs. A flower garden was chosen as the most preferred garden type by four teachers, making it the most favored option. A combined flower, vegetable, and herb garden was selected by three teachers. A vegetable and herb garden and an herb garden were each chosen by two teachers. One teacher preferred a vegetable garden (Fig. 2).

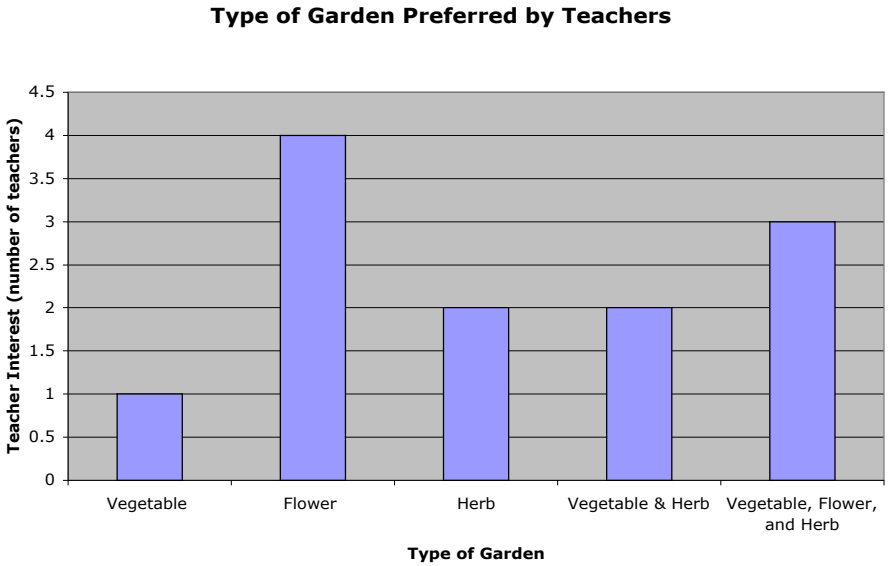


Figure 3. Teacher interest in varying types of school gardens. n=16. Out of the 22 teachers surveyed, 8 left this question blank. Surveyed teachers could choose from any of the following options for a school garden: vegetable only, flower only, herb only, vegetable and herb, or vegetable, flower, and herb. Bars represent the number of surveyed teachers who prefer each type of garden. Results are as follows: Flower garden: 4 teachers; vegetable, flower, and herb garden: 3 teachers; vegetable and herb garden: 2 teachers; herb garden: 2 teachers; vegetable garden: 1 teacher.

In addition to the three high school teachers I had previously met with about the garden project, three middle school teachers are also very interested in this project and willing/available to be a part of the planning process. Three other middle school teachers are very interested in the project, but have only a limited amount of time available for planning and program implementation. Interested middle school teachers teach learning support, reading, English, health, and art classes, representing a wide range of subjects that could be integrated into the school garden (See Appendix C). Other teachers also contributed ideas, but expressed that they do not have enough time available to be actively involved in program design.

Although this survey was very helpful at assessing teacher interest in a school garden program and other outdoor alternatives, qualitative data involving hands-on garden activities was also needed to assess the feasibility of a garden program focused on students in special education classes. Since meeting the diverse needs of this population can require a very low student-teacher ratio and autistic students are very sensitive to changes in routine, qualitative data based on autistic students in the Meadville Area High School helped to fill in the gaps in the quantitative data from the teacher survey. Although the quantitative data provided very useful

information about teachers' interest levels, to assess the feasibility of a school garden program it is also important to determine how engaged students would be in garden activities and which activities are best suited to special education students' different abilities and challenges. Practicing garden activities would also help to determine the optimum number of teachers needed to supervise garden activities. Additionally, the quantitative data included a broad sample of teachers from all subject areas. The quantitative data focused only on the special education classes since they require the most logistical support.

Students displayed widely varying levels of engagement, interest, and motor coordination. The two students from the high-functioning autism support class were very interested in the garden tasks and easily handled tasks like using a shovel to dig holes. However, students in the lower-functioning class were often distracted. During the first session, one student in particular spent a few minutes running around the garden and eventually had to be taken back to the classroom by his teacher. One student also quickly became frustrated by his task of digging holes with a hand trowel. Two students displayed adeptness at digging holes with hand trowels, seeming very engaged in the task. They were excited after they finished digging a hole and eagerly started the next one. A student who was asked to rake leaves enjoyed and completed his task. Overall, students seemed energized by the opportunity to go outside.

Teacher feedback about students' performance in the garden was also widely varying. Both teachers expressed that students from the higher-functioning class enjoyed garden work and were capable of completing it. However, teacher feedback about students in the lower-functioning group indicated that there are many considerations in designing a successful garden program for these students. One teacher commented about a distracted student in this group that "I felt like I was doing the work for him." Both teachers also expressed that having a 1:1 ratio of students to teachers (or aides) would be very helpful and contribute to increased levels of engagement in gardening.

Discussion

Prior to conducting this survey, I had only met with three high school teachers and no middle school teachers. This survey was designed to provide me with a better sense of teacher interest throughout the middle school, and to help me find more teachers who would support this project. As compared to other environmental education options, surveyed teachers ranked a

garden as their second choice (Fig. 1). Seven teachers ranked a garden as their first or second choice (Fig. 2), demonstrating that teachers at MAMS prefer a garden over most other outdoor alternatives (with the exception of seating for outdoor classes). However, this result alone does not mean that teachers are invested in a school garden. The majority of teachers preferred a flower garden above other garden types. However, six teachers also chose garden options that included vegetables (Fig. 3). So, it seems that a garden that includes vegetables, flowers, and herbs would be supported by teachers. The survey had the additional outcome of putting me in contact with three additional teachers who would like to be involved in the planning process (Table 1).

Implications of Survey Results

This survey provided valuable information about MAMS teachers' interest in environmental education. Teachers' level of interest in school gardens and other projects will help to guide the rest of this project. Gaining teacher input and actively involving teachers and administrators in all phases of the program design process follows successful school garden programs that involve a broad base of teachers and administrators in addition to parents, community volunteers, and students (Ozer 2006). Involving teachers in school gardens also helps to ensure that students' individual needs are being met (Edible Schoolyard 2010). Teacher investment is key to the sustainability of this project, so a failure by teachers to return surveys or an expression of disinterest could have signaled a lack of teacher investment.

A study of teacher perceptions of gardens at elementary schools in California had a similar teacher response rate (36%) but also sent a much larger number of surveys (1,665). Of teachers who responded, 65% had integrated gardens into science classes and 42% had integrated gardens with language arts classes. Teachers who had used a garden in their classes believed that it was moderately to very effective at improving students' science, language arts, and social skills; overall academic performance; physical activity; and healthy food choices (Graham and Zidenberg 2005). Interested teachers at MAMS and MASH mainly teach learning/autism, reading, science, English, art, and health classes. Graham and Zidenberg's study supports these findings. Students in special education classes at MAMS and MASH could especially benefit from the increased levels of physical activity and improved social skills that result from participation in garden programs.

Autistic students' participation in garden tasks during the flower-planting sessions indicates that these students would enjoy and be successful in a school garden program. Especially for students in the high-functioning classes, involvement in the garden would not be time- or resource-intensive for teachers. Students' ability to raise questions, complete tasks independently, and enjoy their work are promising indicators. However, involving students from the lower-functioning class poses logistical challenges for teachers. Teachers are hesitant about involving these students unless there is a support structure in place for them. Conducting frequent, regularly scheduled garden sessions could facilitate autistic students' involvement by making them a routine part of students' schedules. Giving students the opportunity to settle in to the gardening routine could decrease the incidence of problems like distraction and frustration (Personal Communication 2010).

Based on survey results and flower-planting sessions, teacher support for a garden at MAMS is sufficiently strong to justify this project. Support from teachers in a wide range of subjects, school administrators, and service leaders will create a sustainable foundation for this project. The development of a combined vegetable, flower, and herb garden will appeal to the majority of teachers. The formation of a Garden Committee composed of interested MAMS and MASH teachers and school administrators will facilitate planning and implementation of the garden.

Due to teachers' busy schedules, I strove to make the survey as quick as possible while still providing helpful information for this project. Thus, the survey did not include any space for teachers to explain why they were interested in certain projects more than others. It also did not include a space for teachers to give more detailed explanations of how they could envision using a garden in their classes. So, teachers may have differing ideas of how the garden program could enhance their existing curriculums. From the survey results, this limitation makes it difficult to tell which teachers already have the knowledge, resources, and enthusiasm needed to coordinate garden activities.

The 49% teacher response rate is a sufficiently high percentage for statistical purposes. However, it could be possible that some teachers did not return surveys because they are not interested in the project. This situation could have created a false perception of high teacher interest. If a garden or other outdoor alternative is implemented at MAMS, it would be helpful to gather more information about whether or not these teachers are interested in participating.

The wide diversity of students within the special education program and within MAMS was also a challenge to this study. Flower-planting sessions were conducted with a total sample size of 8 students. This sample represents only 20% of the total of 40 kids in the special education programs at MAMS and MASH. Due to the wide range of abilities of kids in the special education program, other kids could have very different experiences in the school garden.

Conclusion

A literature review and qualitative and quantitative data collected at Meadville Area Middle School throughout this project support the start of a school garden program targeted at students with mental disabilities. Benefits of school gardens include an opportunity for environmental education, development of an environmental ethic, knowledge of sustainable agriculture, appreciation of community, experiential learning, and time outdoors. They can also be an asset to teachers and the entire school, and provide students with a way to develop gifts that may not be easily seen in the classroom. Building student confidence in this way is especially beneficial to students in special education classes. With a total of six teachers interested in the project, there seems to be enough investment to support the garden and create a sustainable program. Since this survey did not focus exclusively on gardens, it would be useful to conduct a follow-up survey of the 22 surveyed teachers. A follow-up survey could focus more specifically on teacher opinions of school gardens and how they could be effectively integrated in to the school curriculum. A survey targeted at special education teachers could also provide further guidance for this project. Recent meetings with community members passionate about gardening have shown that there is also community support for a school garden and local knowledge around the process of gardening.

However, through the process of this project, many teachers' visions for a bigger project came to light. Despite the limitations faced in the quantitative data section of this study, the teacher survey had the additional outcome of determining that teachers also have high levels of interest in other projects related to environmental education. Projects such as environmental art and building tables/seating to enable teachers to hold classes outside were also exciting to teachers. Since different teachers were interested in different kinds of outdoor learning projects, at a meeting to discuss the results of the survey, it was proposed that we design an outdoor classroom that would incorporate several different projects, including a garden, tables and

benches for class discussions, and student art projects like murals and sculptures. Pulling together many different teachers' interests into one cohesive project could help to build community throughout the school and also make connections across disciplines. Although designing this outdoor classroom is beyond the scope of my project, it would be an incredible way to get students outside and increase interest in environmental education. With the time and resources available, I decided to focus on the planning and design of a school garden program.

Recommendations: Guidelines for Garden Management

School gardens are a way to address the problems caused by our current agricultural systems. These unsustainable systems have caused serious environmental damage and negatively impacted human health, so starting a school garden program will create an opportunity for students to learn about more sustainable food systems. They benefit teachers, students, administrators, and communities in a multitude of ways, from teaching students about how food is grown to increasing their appetite for vegetables. To achieve these benefits, school gardens need to be managed effectively. Selecting an appropriate location, creating a mission statement, and forming a dedicated, enthusiastic committee that will care for the garden are all key considerations that must be taken into account before a garden program is established. In addition, finding potential funding sources and creating a detailed budget can help garden programs be successful (Bucklin-Sporer and Pringle 2010). Regardless of their location in the U.S., all successful garden programs follow similar management plans.

Applying these garden management principles to Meadville middle and high schools is a process that can use community assets to meet the needs of the school. With so many community members - like the Master Gardeners, local sustainable farmers, and others – enthusiastic about gardening, there is much potential for a successful school garden at MAMS. Also, a successful school garden program was implemented by a 2nd grade teacher at Meadville's West End Elementary School for five years, until the coordinating teacher retired. This program also included an autistic student. It is possible for a garden program to be successful in this area. However, the enabling conditions of teacher and administrator investment in the project, the program's ability to meet a real educational need, sustainable funding sources, evaluation of

program goals, and time commitment are all essential to the success of this proposed garden program.

Setting Goals

A garden program can achieve its mission by developing goals that help to guide it towards more specific objectives (Kettner 1999). For example, the objectives of the Edible Schoolyard garden in San Francisco include increasing students' "connectedness to land, school, and community….and promoting nature as a context for learning," ("Edible Schoolyard" 2010). Other school garden programs have similar goals. Pittsburgh's Edible Schoolyard strives to improve students' nutritional choices and increase their investment in their own education ("Grow Pittsburgh" 2010). Other goals can include enhancing student opportunities for experiential learning, establishing a connection to place, and experiencing seasonality by taking care of the garden throughout the school year. By participating in the garden, students learn how to grow and cook their own food and gain an increased awareness of the impacts of their food choices on individual and environmental health. These program goals serve to close the gap between youth and the origins of their food. Garden program goals do not have to be measurable or quickly attainable (Kettner 1999).

When setting goals, this program should focus on the educational benefits of gardening programs. By engaging students in outdoor environments and teamwork through sustainable agriculture, this program could be an asset to existing science, art, English, and health curricula for students in regular and special education classes. It should also strive to foster healthy eating habits in participating students. Since two special education teachers are interested in the project, as well as several other teachers, the garden should also aim to create an inclusive environment where the gifts of individual students can be developed. In coordinating a school garden, local teacher Chris Gregg stated that, "Everyone has a gift…but we don't all have the same gift," and that students' gardening "jobs" could help them to recognize their own and others' strengths (Personal Communication 2011). The garden program at MAMS should also foster this development in participating students. Setting goals can lead the program to the next step: objectives.

Communicating Objectives

To clearly communicate objectives, garden programs should specify their target

population and time frames, be realistic, and focus on the process or outcomes (Kettner 1999). Since goals can often be long-term projects, it is helpful for garden programs to establish steps that lead up to the achievement of goals. These steps also make it more feasible for organizations to evaluate the success of their programs. Objectives specific to garden programs should focus on how many students and teachers will be involved and what their learning outcomes will be during each year of their participation in the program. For example, "Students from two 7th grade Biology classes will participate in weekly garden activities throughout the school year. Participating students will improve teamwork and critical thinking skills by collaborating with students and community members." Garden program objectives can include a wide variety of other desired outcomes, but must remain realistic. If a very small number of students are involved in the garden program, for example, it is not likely that huge changes will be seen throughout the school community (Ozer 2007). How will garden programs involve community members? What changes will be observed in students? How will knowledge gained in the garden be connected to classroom learning? Answering these questions can help to sustain a successful garden program.

Even though objectives are more concrete and specific than the program mission, it can still be difficult to break them down into achievable pieces. Scaling down objectives into smaller steps can make it more likely that they will be reached. For example, if one of a garden program's objectives is to involve 100 students in weekly garden activities within five years, the program should start with a small group of students and slowly expand each year until they reach their objective. The same theory can be applied to other program objectives. Gardens can be expanded over a series of growing seasons to ensure that enough teachers are invested in the project and can commit the time required to sustain the garden.

To reach this goal, the garden program at MAMS should set objectives. Community members with knowledge of gardening should definitely be involved in the planning and implementation process. Steps to meet this objective could include inviting guest speakers who have experience with different forms of sustainable agriculture and gardening, talking with local farmers and gardeners about which crops would be best for the garden's location, easy to grow, and fun for the students to harvest, cook, and eat. Farmers like Bob Ackerman and David and Rebecca Vines are experienced at growing fruits and vegetables sustainably, and could give students an enhanced perspective of the impacts of sustainable vs. industrial agriculture.

Additionally, students should be involved in all phases of gardening, from planting seeds to cooking and eating the produce. This kind of involvement makes it most likely that students will be willing to try new fruits and vegetables. Crops like radishes, lettuce, and squash, that will be ready to harvest when Meadville schools are in session, would be the best choices. They also grow well in NW PA. Involving students who are at the middle school for summer classes (June-July) could also help students be more engaged in their education by giving them an opportunity to learn in a new, interactive environment.

Implementation

To aid in achieving the goals set forth by a garden program, a garden committee should be formed. Investment in the project from staff at the school is a key component of successful gardens. Even though most school gardens start small, they are still very time- and resource-intensive, and can quickly fall by the wayside if there is not a sustainable program structure in place. Teachers who coordinate garden programs alone often need to spend many after-work and weekend hours taking care of the garden and working on other aspects of the program. While teachers who are passionate about the garden program are happy to contribute their time, having sole responsibility can lead to teacher burnout. With the formation of a committee composed of interested and enthusiastic teachers who are willing to dedicate time and energy to the project, the garden has a much better chance of becoming a permanent part of the school community. A garden committee shares the responsibility for the garden. In contrast, in cases where a school garden has only one "champion", the entire program can end if the sole coordinator leaves the school or becomes overwhelmed (Adams 2008). Additionally, a garden committee has the advantage of including a wider variety of perspectives, and should also include interested community members, local gardeners or farmers, parents, and school administrators and maintenance workers (since they will need to approve the garden location). Different roles should also be set forth within the committee. For example, one committee member could be in charge of budgeting, another could be in charge of utilizing community resources, and another could be responsible for facilitating regular committee meetings throughout the year. This type of structure can help to ensure the sustainability of the garden program.

Hiring or finding a committed volunteer to be the lead garden coordinator has been a successful aspect of many garden programs and should be seriously considered when designing a

garden program. This person should be responsible for leading the garden committee, and facilitating and sustaining the garden program. School garden programs in Pittsburgh and Oakland have had success with this model. Both schools hired full-time garden coordinators to organize the program ("Edible Schoolyard" 2010, "Grow Pittsburgh" 2010). A garden coordinator could also be the liaison between the school and the community. Especially in smaller communities, building relationships can be key to learning what resources are available to help support the garden. Having one person spearhead this effort can make it a much more organized process. Since summer management is often a concern of schools with gardens, a full-time, year-round garden coordinator would also facilitate the planning process for summer garden activities. In the case of a tight budget, it may be more feasible to find a committed volunteer to be the garden coordinator. In other programs, retired people with a passion for gardening have done excellent jobs of coordinating garden programs at schools. Garden-focused community organizations are great places to look for potential garden coordinators.

In addition to the garden coordinator and garden committee, other community members can also be assets to garden programs. For example, volunteers from nearby colleges, AmeriCorps volunteers, high school students, and community garden club members can all add experience, knowledge, enthusiasm, and help to the garden program. One way to involve college students in the garden program could be to ask education majors if they would like to help plan or supervise garden activities. This type of service would benefit both the garden program and the volunteer. The volunteer would gain experience planning lessons, working with kids, and building relationships with teachers while the teacher would gain support in the planning and facilitation of time-intensive garden activities. Every garden is located in its own unique community, so garden coordinators should strive to find and develop their own community's potential garden program assets.

Many resources need to be included in garden program design. From the people coordinating the program to the participating students to the local business that donated the compost, organizing all of the logistics into a cohesive program is essential to a successful garden program. Coordinating resources at the school is the first step. The garden committee should propose a garden location that receives adequate sunlight (at least six hours) and has access to a water source, and propose a feasible size for the garden (Bucklin-Sporer and Pringle 2010). The location should also be easily accessible. Other resources that need to be considered

include the tools and supplies required to garden. In the spirit of a community garden, local businesses and gardening associations are often willing to donate seeds, tools, and time to garden projects. Seeds for the garden can be selected so that the majority of produce will be ready to harvest while school is in session (late spring, late summer-late fall). Examples of these crops include radishes, lettuces, and winter squash. Another critical input of a school garden program is the students involved. Which students will participate in the garden? How old are they? What classes are they taking? Answering these demographic questions can guide the garden program design (Kettner 1999).

During the garden program, weekly activities can be planned to increase students' understanding of different class concepts and their environmental awareness. Teachers already have experience designing lesson plans, and may even have experience gardening, so collaboration with garden coordinators and other community gardeners can result in an effective learning experience for students. Gardens can be easily connected to classroom learning in science, art, and literature classes, and garden produce can be used in home economics classes. For example, programs across the country have had success using gardens to give kids hands-on experience with scientific concepts like predator-prey relationships, soil morphology, and soil bacteria (Blair 2009). In connection with environmental theorists like Wendell Berry, school gardens can teach kids about how to work in harmony with nature instead of trying to dominate it (Demas 1979). School gardens should include activities that involve kids in all parts of the gardening process. For kids in special education classes, especially kids with autism, garden activities should be kept within 10-15 minutes each and be structured in a way that enables students to become comfortable with a routine (Personal Communication 2011). Even though the focus of the garden activity will be different each week, students with autism can have the same responsibilities. For example, a student with autism could be responsible for weeding a section of the garden each week and another could be responsible for watering. In addition to building students' confidence, this approach will also help to decrease the frustration that sometime resulted during our trial flower-planting sections at MAMS.

Even though gardening outdoors may not be possible until late spring, winter garden programming can include planting seeds indoors, cooking with canned or preserved garden produce from the past garden season, and inviting guest speakers who are involved in other local garden programs. Increasing kids' investment in the program can also happen by assigning a

"garden role" to each student based on his or her individual abilities. This experience can be especially empowering for students with disabilities, who are often stigmatized. Garden roles can include the person responsible for communicating garden activities to the rest of the school, the person who waters the seeds, and the "journalist" who takes pictures of garden activities. These roles can also build teamwork skills.

In late spring and early summer, garden activities can focus on taking students outdoors to work in the garden. Students can learn how compost recycles nutrients, how rain barrels can be used to collect water, how integrated pest management is used to control insect problems, and can be exposed to a wide variety of fruits and vegetables they may never have seen before. Nurturing a plant from seed to produce can make kids more likely to try new fruits and vegetables, leading to better nutrition. Enabling kids to gain this experience with fruits and vegetables is a vital part of successful garden programs (Ozer 2006). As kids begin to harvest vegetables like radishes and lettuce in late spring, they can be incorporated into cooking classes and students can be given opportunities to taste them. Alice Waters' Edible Schoolyard garden program in San Francisco is a highly developed example of this aspect of garden programming. Students learn how to cook with garden produce throughout the season, trying many different recipes and combinations of fresh fruits and vegetables ("Edible Schoolyard" 2010). The main focus during this part of the program should be to give students time outdoors in the garden and opportunities to taste the produce.

Especially for students with disabilities, creating opportunities for sensory experiences and physical activity in the garden can be beneficial. Gardens can be designed around themes that make it easier for students to connect plants growing in the garden to food. For example, schools in California that target kids with disabilities have designed pizza, salsa, and five senses gardens that group plants together based on how they can be prepared and eaten. This concept makes it easier for kids to understand the garden-to-table relationship. Pizza gardens include tomatoes, basil, peppers, and other potential pizza toppings. Salsa gardens include typical salsa ingredients like peppers, garlic, onions, and tomatoes. In a five senses garden, plants such as woolly lamb's ear, strongly scented herbs, and large colorful flowers can be planted (Personal Interview 2010). A salad garden could also be a helpful addition to these types of gardens. Since salad can be easily prepared and crops like lettuce and radishes are ready to harvest relatively early in the garden season, it could be a good option. Plants like strawberries and

broccoli could be included in salad gardens.

Summer can be a challenging time for a garden program. Since students and teachers are not in school during the summer months, a system must be put in place so that the garden will continue to be cared for and will not be a burden on school maintenance employees. If possible, students should continue to be involved in this process. This season is when connections with the community can be a huge asset to both the garden and community members. Training interested families how to garden and then letting each family sign up to take care of the garden for one week during the summer has been a successful approach (Personal Interview 2011). Families or community members who already have gardening experience can also help to ensure continuity of the program through the summer. Since schools often have summer school or enrichment programs for at least a few weeks during the summer, students in these programs can also be incorporated into summer gardening. Experienced local gardeners could give presentations and teach weekly classes that are based on gardening activities (Personal Interview 2011). However, garden programs should avoid placing full responsibility on one community member without any support from the school. This approach can contribute to a lack of investment in the garden by the school, ultimately burning out the garden coordinator (Personal Interview 2011).

When the school year begins in late August or early September, the garden will be at the height of its growing season. This is an opportune time for students to be engaged in the garden. Weekly activities should include harvesting produce, cooking and eating it, and learning about the processes that allow plants to grow. This includes concepts like nutrient recycling, fertilization (with natural fertilizer), organic practices, and crop rotation. Activities should also focus on the health benefits of eating a diet rich in fruits and vegetables, and the environmental impacts of sustainably grown food versus conventional agriculture (Personal Interview 2011). Visits to local farms can also help students to see their garden in the context of a wider movement towards sustainable agriculture and build relationships with the community.

A Garden Committee should plan and facilitate this program. Since teachers are already interested in designing an outdoor classroom, the Garden Committee could be a part of the larger Outdoor Classroom Committee. If these two structures are separate but connected, it seems like they would have the best chance of success. Without some connection between these two ideas, people could end up working against each other or not collaborating effectively. Scott Lynch

and Jon Frye, the MAMS Principal and Assistant Principal, should definitely be on the Garden Committee. Support from and involvement of administrators is a key part of this process. Also, Norma Yocco is a high school teacher who is enthusiastic about this project and should be on the committee. The two interested special education teachers, Ms. Cremonese and Ms. Gordon, should also be part of the committee. Other interested middle school teachers who should be part of the committee include Carolyn Brown, Melinda Irwin, Christine Pearson, Kara Schreiber, and Barb Colwell. These teachers represent a wide range of subjects, from Learning Support to Health. However, Christine Pearson, Kara Schreiber, and Barb Colwell indicated that they are very interested in the project but may not have much time to help in the planning process, so they should probably not have key leadership roles within the committee. Since this program will take place on school grounds, it is also important to include at least one school groundskeeper on the committee so the garden does not make their job unnecessarily difficult. Allegheny students, faculty, and administrators should be a key asset in helping this program to reach its goals and objectives. Creating a reciprocal relationship between the college and the community has the potential to impact both groups. Master Gardeners such as Danuta Majchrowicz, who may be involved in coordinating the garden program, could also help it be successful.

Evaluation

Once the goals and objectives have been determined, the next step is to design a way to evaluate progress towards them. Taking the time to evaluate program successes and challenges can lead to more effective program design in order to achieve program objectives. A garden program should create concrete ways to measure its objectives so that progress can be clearly measured. Teachers' knowledge of classroom assessment is very useful in this aspect of program design. Objectives should be assessed by student and teacher surveys, teacher observations of students, and the number of students involved. Assessing program objectives at the end of the school year would be appropriate, since the garden committee and coordinator would have plenty of time during the summer to make any necessary changes to the program. In addition, measuring the success of the program at the end of the growing season would be useful for enabling the committee and coordinators to start planning ahead for the next growing season.

Evaluation tools can be used to measure the results of the garden program on the targeted population. Program design theory explains that measuring outputs can "determine (a) how much

of an available service a client actually received and (b) whether the client…received the full complement of services…quality of service provided also emerges in current discussions of output measures," (Kettner 1999). In the context of a gardening program, outcomes to assess include: Did students' learning increase as a result of participation in the garden? How much time did they spend in garden activities? How many teachers were involved, and how in-depth was their involvement in the program? An Annual Garden Report can summarize each year's garden program and communicate the outcomes of the program to everyone involved and to the wider school community. This form of outcome evaluation can also have the added benefit of raising awareness about the garden program and possibly involving more students, teachers, administrators, and community members in the garden.To evaluate progress toward program objectives, students participating in the garden should be asked what they have learned through the program, if they feel a stronger connection to nature, if they have tried new foods, and if so, how many. These questions will evaluate the program objectives of learning how to grow food, developing an environmental ethic, and increasing students' preference for fruits and vegetables. Numerical evaluations should also be used. Continued involvement of a set number of students throughout the school year can be a measure of program success. Teacher surveys (or discussions) should focus on teachers' perceptions of program effectiveness. Questions to measure their perceptions should include how teachers were able to use the garden as an asset to their in-class curriculum and challenges (logistical or others) that made it difficult to involve students in the garden.

The garden program's success could be evaluated by students' engagement in the learning process, enthusiasm for gardening, willingness to try new fruits and vegetables, and awareness of their local environment. For special education students, assessments could also include teachers' observations about students' communication and social interaction skills, and their ability to adapt to new situations. Since they regularly assess student learning outcomes, middle and high school teachers could apply their knowledge of classroom assessments to the garden program.

Creating a Budget

In order for the garden program to happen, a detailed program budget needs to be created and funding sources need to be found. Budgets should aim to efficiently provide the program

with all of the resources needed to achieve the desired program outcomes. The start-up budget for the garden program will most likely be higher than the budgets for future years, since it will be necessary to purchase everything required to start the garden. In subsequent years, tools, watering cans, seed trays, and other supplies can be reused and will defray the program's cost. However, in addition to tools, budgets should also account for other resources that may be needed. For example, if science classes want to test the soil pH or other properties, the budget will need to include soil test kits. Several different budgeting methods are available, but a budget of at least $600 will be necessary to ensure that a garden program will be able to purchase all of the necessary materials.

School garden programs should start small, and can expand in size and in the number of participating students in subsequent years. Starting with a few raised bed gardens (a good size is 4' by 8') and developing a strong, well-organized program can make it more likely that the program will continue to be supported by teachers, students, administrators, and community members. Effectively coordinating community assets, forming a garden committee, planning activities that enhance students' classroom learning, and budgeting efficiently can all contribute to the success of the program and allow it to continue growing.

Local gardeners have designed and implemented programs similar to this one with a budget of approximately $600. The majority of the budget is used to purchase garden supplies and seeds, although many of these materials could also be donated by local businesses, gardeners, or farms. For example, businesses like Al's Melons, Meadville Farm and Garden, and the Tractor Supply Co. could be willing to donate supplies such as extra pots, wood, and vegetable and flower seeds. Grants such as the College/Schools Collaborative grant could also be used to help fund this program.

Although teachers and administrators at MAMS and MASH will be the ones running this program, the research and ideas presented in this study may help to jumpstart the program. Additionally, MAMS and MASH could continue to build on the Allegheny connection and connections with community members as this garden program is developed. Overall, the garden program could be a great example of using community assets to meet community needs around environmental education.

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*Personal interviews with experienced community gardeners were conducted in January and February 2011.

Appendix A: Teacher Interest Survey Form

Environmental Education Interest Survey
Nov. 18, 2010
Meadville Area Middle and Senior High Schools

In collaboration with teachers and administrators at the Middle and High Schools, I am working on an environmental education project for special education students. I would appreciate your feedback on which features of an outdoor learning center would be most beneficial to you. Please take a minute to complete this survey.

1. Name: _____
2. Grade level and subjects you teach: _____
3. Have you ever taken your class to the Middle School courtyard?

   Yes No

4. If you answered yes to #3:

   a. How many times did you use the courtyard? _____

   b. What activities did you do there?
   _____

   c. How would you rate your experience?

   1 2 3 4 5

   Great Fair Poor

5. How interested are you in using the courtyard in future classes? (please circle one)

   a. Very interested – let's start tomorrow
   b. Nice idea, but I don't have enough time to help in the planning process
   c. I'm not able to participate right now, but keep me updated
   d. I don't know where the courtyard is and am not interested at all

6. Which of these outdoor learning options would be the most beneficial way for you and your students to use the courtyard? Rank these options from 1 to 5, with 1 being the most beneficial.

   ____ A school garden
   Circle at least one: Vegetable Flower Herb
   ____ Seating and/or tables so some classes could be held outside
   ____ Spaces for kids to play in
   ____ Native plant landscaping that could be used to teach about local ecosystems
   ____ Student-designed art projects

7. Other ideas for how the courtyard could be used?
   _____
   _____
   _____
   _____

Appendix B: Garden Budget and Materials List

Category	Material	Quantity	Cost per unit	Total Cost
Equipment	Shovels	3	$22	$66
	Leaf rake	1	$15	$15
	Garden rakes	2	$15	$30
	Hoes	5	$12	$60
	Gloves	5 pairs	$2	$10
	Trowels/hand shovels	8	$8	$64
	Garden hose	1	$30	$30
	Watering can	1	$10	$10
	Untreated lumber*	13	$12	$156
	Hammers	2	$20	$40
	Nails	1 box of 100 nails	$5	$5
Supplies and Plant Material	Vegetable and flower seeds will be donated by Seeds of Change	1 box	$15 shipping fee	$15
	Compost	5 bags	$15	$75
	Soil	5 bags	$8	$40
			Total Cost	$616

***Possible donation by Crawford Central Vo-Tech. They may also be able to donate time to build the raised beds.

Appendix C: Interested Teachers at MAMS

Table 1. Middle school teachers who will be involved in the garden planning process.

Name	Grade(s) Taught	Subject(s) Taught	Interest Level	Preferred Garden Type
Carolyn Brown	7th & 8th	Learning Support; Reading	A	Flower
Melinda Irwin	8th	Health	A	Vegetable, Flower, and Herb
Lisa McFerren	7th & 8th	Art	A	N/A
Christine Pearson	7th & 8th	Reading	A/B	Vegetable and Herb
Kara Schreiber	7th	English	A/B	Vegetable, Flower, and Herb
Barb Colwell	7th & 8th	Art	A/B	Vegetable or Flower

Table 1. A= Very interested, and have time to be involved in the planning process. A/B = Very interested, but only have a limited amount of time to be involved in the planning process. B = Interested, but don't have time to help in the planning process. Only A and B options were included on the survey form. Teachers created the A/B option by indicating their interest and time limitations on the survey.

Table 2. Preliminary teacher ideas for curriculum integration of a school garden.

Subject	Idea
Art	• Composting project • Design and build garden arches/fencing
Science	• Test soil to determine which plants will grow best

Appendix D: Local and Web-Based Resources to Support the School Garden Program

Service-Learning Theory and Practice Resources

Collaborations between colleges and communities can benefit everyone involved. The following resources can help to provide guiding principles for college-community partnerships.

Bobo, K., J. Kendall, and S. Max. 2001. *Organizing for Social Change: Midwest Academy Manual for Activists*. 3rd Ed. Seven Locks Press: California.

Johnson, A. 2006. *Privilege, Power, and Difference*. 2nd Ed. McGraw-Hill: Boston.

Morton, K. 1995. "The Irony of Service: Charity, Project, and Social Change in Service Learning." Michigan Journal of Community Service Learning 2: 19-32.

Parks Daloz, L., C. Keen, J. Keen, and S. Parks Daloz. 1996. *Common Fire: Leading Lives of Commitment in a Complex World*. Beacon Press: Boston.

Gardening Resources

These books and websites can provide information on how to farm and garden organically. They would be especially useful in supplementing the local gardening knowledge of teachers and community members.

Altieri, M. 1995. *Agroecology: The Science of Sustainable Agriculture*. 2nd Ed. Westview Press, Inc.: USA.

Bradley, F. and B. Ellis. 1997. *Rodale's All-New Encyclopedia of Organic Gardening: The Indispensable Resource for Every Gardener*. Rodale Press: Pennsylvania.

Coleman, E. 1995. *The New Organic Grower: A Master's Manual of Tools and Techniques for the Home and Market Gardener*. Molly Cook Field: USA.

Fedor, J. 2001. *Organic Gardening for the 21st Century: A Complete Guide to Growing Vegetables, Fruits, Herbs, and Flowers*. Frances Lincoln Ltd: USA.

Garden-Based Lesson Plan Resources

"Lesson Plans from the Edible Schoolyard New Orleans." Revised Oct. 6, 2010. http://esynola.org/index.php?page=esy-nola-lesson-plans

"Nourishing the Kids of Katrina: The Edible Schoolyard." 2009. http://www.nourishingthekids.com/gallery/

The Edible Schoolyard: San Francisco. 2010. "Lessons and Recipes." http://www.edibleschoolyard.org/lessons-recipes

Community Organizations

These groups have extensive knowledge of and experience in gardens and farms, and could also provide support for program design.

Meadville Master Gardeners.

Fresh from the Vines Sustainable Farm and Bakery.

Ackerman Farm Community Garden (Creating Landscapes Program).

Resources at Allegheny College

- Creating Landscapes Gifted & Talented Program
    - This program offers enrichment opportunities to local high-school students.

- Pre-Education majors, students interested in environmental education, full-time staff in Office of Community Service and Service-Learning.

- Existing volunteer mobilization programs.

    - Monthly Service Saturdays are service opportunities that accomplish short-term service projects.
    - Make A Difference Day: Every October, over 1,000 volunteers complete service projects throughout the community.
    - Global Youth Service Day: Similar to Make A Difference Day, but it occurs in mid-April and all service projects involve youth.

Summer Resources

Allegheny Service Leader Programs. (Bonner Program, Allegheny Volunteer Service Leaders, Davies Community Service Leaders).

Over 70 students are involved in these programs. Volunteers in these programs have committed to doing service for at least one year, and have an excellent understanding of the Meadville community and its needs and assets. Several current projects are based in Crawford County schools or focused on community gardens.

Meadville Master Gardeners.

Members of this organization are required to complete 50 volunteer hours per year, and are very enthusiastic about gardening. They participate in and coordinate a wide range of gardening projects, from butterfly gardens to vegetable gardens at the local Head Start.

Children and Youth AmeriCorps*VISTA Project of Northwest PA.

A team of 15 volunteers (with one- to two-year service commitments) work to reduce poverty through this initiative. The program is currently coordinated by the Office of Community Service and Service-Learning at Allegheny. A VISTA also serves the Crawford Central School District, making this position a great liaison between Allegheny and MAMS.

Potential Funding Sources

College/Schools Collaborative. Allegheny College. https://sites.google.com/a/allegheny.edu/csc-web/CSC-Web
Awards mini-grants to initiatives between Allegheny and local schools.

Local Businesses
The following businesses could be contacted to donate garden supplies, materials, or other resources.

Al's Melons.

Tractor Supply Company.

Meadville Farm and Garden.

Hog Heaven Animal Rescue Farm.

Web Resources

Seeds of Change Donation Program. http://www.seedsofchange.com/donations/default.aspx
This organization donates a mix of heirloom seeds to non-profit organizations.

Background Information

McNamee, T. 2007. *Alice Waters and Chez Panisse: The Romantic, Impractical, Often Eccentric, Ultimately Brilliant Making of a Food Revolution*. The Penguin Press: New York.
This book tells the story of Alice Waters, the pioneering local foods chef who started the Edible Schoolyard program in San Francisco, CA.

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