



SCHOOL OF NATURAL RESOURCES AND ENVIRONMENT

SNRE

A large, heart-shaped green leaf is the central focus, attached to a dark brown branch. The leaf is vibrant green with visible veins. A smaller, solid green heart is overlaid on the right side of the leaf. The background is a soft-focus green field.

Growing Our Place

Beecher Middle/High School Outdoor Classroom
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**School of Natural Resources and
Environment Master's Project Team:**

Lindsay Bienick
Priyanwada Ekanayake
Erin Mette
Erin-Amanda Schulz

Growing Our Place:

Beecher Middle/High School Outdoor Classroom Project

Produced by:

Lindsay Bienick, MS 2013

Priyanwada Ekanayake, MS 2013

Erin Mette, MS 2013

Erin-Amanda Schulz, MLA 2013

Dr. Michaela Zint, Faculty Advisor

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Executive Summary

Introduction

Discovering PLACE, University of Michigan-Flint faculty and staff, and community organizations, in collaboration with this SNRE Master's project team, worked with Beecher Middle/High School, a Flint public school, to develop an implementation plan and best practices guide for a place-based outdoor classroom. The outdoor classroom project is designed to engage the school community in an ongoing dialogue about food and environmental justice that will support students' academic and social skill development. The team assisted Beecher and Discovering PLACE in researching and planning an outdoor classroom on the school grounds, organizing and implementing a series of participatory student and teacher design charrettes, and researching and developing a place-based curriculum series for middle and high school students, as well as a best practices guide for overcoming common challenges to outdoor classrooms.

Purpose

Our Master's project team worked with Discovering PLACE and Beecher Middle/High School to develop a design and implementation plan for a place-based outdoor classroom and corresponding curriculum. The overarching goal of the project was to strengthen the presence of place-based education at Beecher, and to document the process of implementing the project so that the experience can be used as a framework for other schools interested in incorporating place-based education into their own educational practices.

Discovering PLACE and Beecher desired assistance in researching and planning an outdoor classroom on the school grounds, organizing and implementing a series of participatory student and teacher design charrettes, and researching and developing a place-based curriculum for middle and high school students.

Results and Products

To meet the goals of the project, our team produced the following primary deliverables:

Site Design

In addition to the recommendations and stated priorities resulting from the collaborative student and teacher design charrettes and surveys, we developed several goals to guide the design and implementation of the outdoor classroom space. In the design of the outdoor classroom, we strived to:

- Integrate class lesson plans and activities
- Feature aspects of local culture and environment
- Provide universal accessibility
- Require little regular maintenance
- Appeal to a variety of ages
- Incorporate and maintain existing site features

Phased Implementation and Maintenance Recommendations

Based on the priorities expressed by the Beecher school community, as well as the feasibility of implementation, the site design implementation plan is divided into four primary phases. For each phase, we have listed the features that will be implemented or further developed.

Phase 1

Build upon the work already accomplished on the site by Dr. Don Hammond and his students by expanding the existing nature trail and native plant garden.

Phase 2

- Meeting Space
- Entrance Area/Mural
- Improved Native Plant/Butterfly garden
- Renovating Trail

Phase 3

- Vegetable Garden
- Fence
- Art Installation
- Picnic Area
- Shade/cover

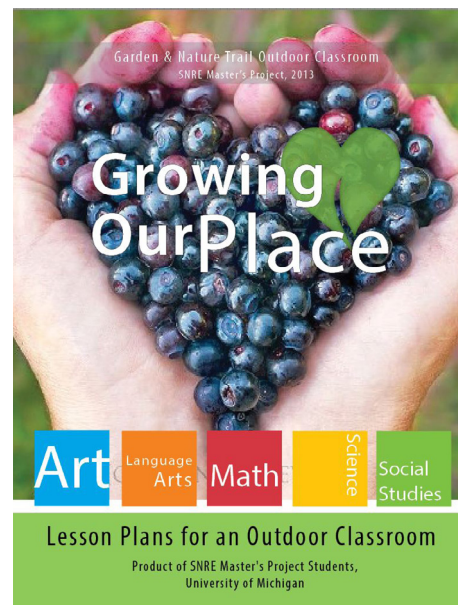
Phase 4

- Pond access (Potential seating by pond)
- Composting
- Expansion of vegetable garden

Lesson Plan Book

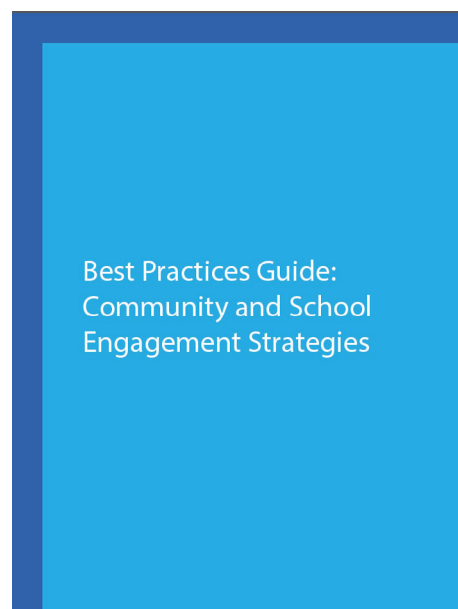
The lesson plans are compiled and composed for use in the outdoor classroom at Beecher Middle/High School. Following an overview of district goals and outcomes and an explanation of criteria critical in choosing activities, the lessons serve as an example of how a school garden or outdoor classroom can be integrated into traditional instruction.

In the book, the lessons are intended for grades 9-12, and are arranged according to subject matter, comprising Art, Math, Food (cooking and healthy eating), Social Studies, Science, and Language Arts. Each lesson includes materials and preparation, grade level expectations, learning objectives and behavioral outcomes, procedures for the activity, and assessment.



Best Practices Guide

Based on input from community partners, Beecher staff, and Discovering PLACE personnel, the Best Practices Guide is intended to provide an overview of practices to improve the effectiveness and sustainability of an outdoor classroom project. Specifically, we attempted to identify strategies for overcoming common challenges to implementing and sustaining an outdoor classroom, as well as strategies for engaging all members of the school and surrounding community in the planning, implementation, and maintenance process.



Purpose of Project

This project was conducted to fulfill a Master's degree requirement for a team of four students at the University of Michigan's School of Natural Resources and Environment. The team researched and planned an outdoor classroom on the school grounds of Beecher Middle/High School, organized and implemented a series of participatory student and teacher design charrettes, and researched and developed a best-practices guide and place-based curriculum series for middle and high school students, in cooperation with the clients, UM-Flint Office of University Outreach and Beecher Middle/High School.

Logic Model

Our team developed a logic model as guidance for the project, outlining a series of outputs and outcomes (Appendix 1, Logic Model). These were identified based on input from the Master's Project Advisor, Dr. Michaela Zint, and from Discovering PLACE and Beecher staff. Below are the outputs and short-term outcomes the project aimed to achieve.

Outputs:

- Literature Review
- Case Studies
- Site Plan for Outdoor Classroom
- Phased Implementation and Maintenance Recommendations (1 to 3 year strategic planned phases)
- Outdoor Classroom Curriculum (lesson plans)
- Best Practices Guide for Overcoming Common Challenges to Implementing and Sustaining an Outdoor Classroom
- Presentation to Beecher and SNRE

Short-term outcomes:

- Identify need(s) for outdoor classrooms and curriculum in Michigan high schools
- Identify outdoor classroom and curriculum design, implementation benefits and challenges
- Identify project mentors and partners
- Identify need(s) for outdoor classrooms and curriculum specific to Beecher MS/HS
- Identify existing project resources within Flint and state-wide in Michigan
- Identify project vision for student and community
- Identify anticipated challenges for implementation
- Identify project adaptability to other Michigan high schools

Introduction to: Discovering PLACE

Discovering PLACE (Place-based Learning and Community Experiences) is a collective of Flint-area K-12 schools, University of Michigan-Flint faculty and staff, community organizations, and parents, with the shared goals of increasing student learning, benefitting the community and local environment, connecting students with their surroundings and, ultimately, building stewardship among the students involved. The organization helps connect young adults to their local “place” by offering sustained teacher professional development, facilitating school-community partnership building, and providing resources and support to implement place-based education activities with youth. Discovering PLACE focuses primarily on addressing the urban environmental and community development needs of the Flint area, as well as making the connections between urban life and the Great Lakes relevant for urban youth.

Introduction to: Place-based Education

Place-based education is an approach to learning that “immerses students in local heritage, cultures, landscapes, opportunities and experiences; it uses these as a foundation for the study of language arts, mathematics, social studies, science and other subjects across the curriculum; and emphasizes learning through participation in service projects for the local school and/or community” (Promise of Place 2012). In short, this approach to education uses students’ local environment and community as an integrating context for learning across disciplines. Place-based education is especially relevant in environmental education, affording children the opportunity to connect with the environment around them, and to subsequently foster stewardship values based on that personal connection.

Discovering PLACE is interested in integrating a place-based focus into Flint’s curriculum because its participants and supporters understand the powerful impact that such an approach to learning can have on the lives of Flint’s students. Today young people are in almost constant contact with electronic media and technology, with those aged eight to eighteen spending an average of nine hours per day on a computer, cellphone, or in front of a TV, while time spent outdoors continues to diminish (Lewin 2010). Richard Louv (2005), in his book *Last Child in the Woods*, describes a phenomenon he identifies as “Nature Deficit Disorder,” a dissonant experience of the world that is becoming more and more common for children and young adults. Its cause is a lack of active contact with the natural world, and its symptoms comprise a range of physical, mental, and emotional issues, such as diminished attentional resources, anxiety and depression, and obesity. By providing opportunities for young people to explore the outdoors during school hours, and using their home environment as a lens through which to learn, Discovering PLACE is attempting to counteract this trend.

While we recognize that increased access to place-based education and the natural environment is far from a comprehensive solution to the social and environmental injustices faced by many of Flint’s residents, we hope that it will be one positive step towards change for the city’s future.

An outdoor classroom is

any outdoor, natural setting or space that is constructed and used by educators and students as a natural study ground to facilitate student exploration, inquiry, learning, and to achieve established learning objectives based on all subjects or curriculum. This may include, but is not limited to gardens, water areas, natural habitats, weather stations, compost sites, worm farms, and schoolyard observation sites. Outdoor classrooms are a teaching tool that incorporates hands-on active learning and allows educators move curriculum outdoors (EEAlliance 2010, Kimbro 2006).

Project Framework

The overarching goal of the project is to strengthen the presence of place-based education at Beecher Middle/High School through collaboration with the school and surrounding community to generate a design and implementation plan for an outdoor classroom on the school grounds, which could be used by the school as a multi-disciplinary, place-based learning tool. We also sought to document the process of implementing the project so that our and Beecher's experience can be used as a framework for other schools interested in incorporating place-based education strategies into their own educational practices.

The project was originally designed to engage the school community in an ongoing dialogue about food and environmental justice that supports students' academic and social skill development. Discovering PLACE and Beecher High School needed assistance in researching, developing, implementing, and evaluating a place-based education for sustainability curriculum for high school students, planning and implementing an outdoor classroom on the school grounds, and organizing a series of student and teacher charrettes about place-based learning and participatory design.

To meet the study's overarching goals, we developed a Goals of Project Diagram (Appendix 2) with tiered categories and questions that served to direct the team's work. The Goals Diagram is divided temporally into three categories: past, present and future. These categories are comprised of the study's short-term outcomes, as follows:

Past

- Identify need(s) for outdoor classrooms and curriculum in Michigan High Schools
- Identify outdoor classroom and curriculum design, implementation benefits and challenges
- Identify project mentors and partners

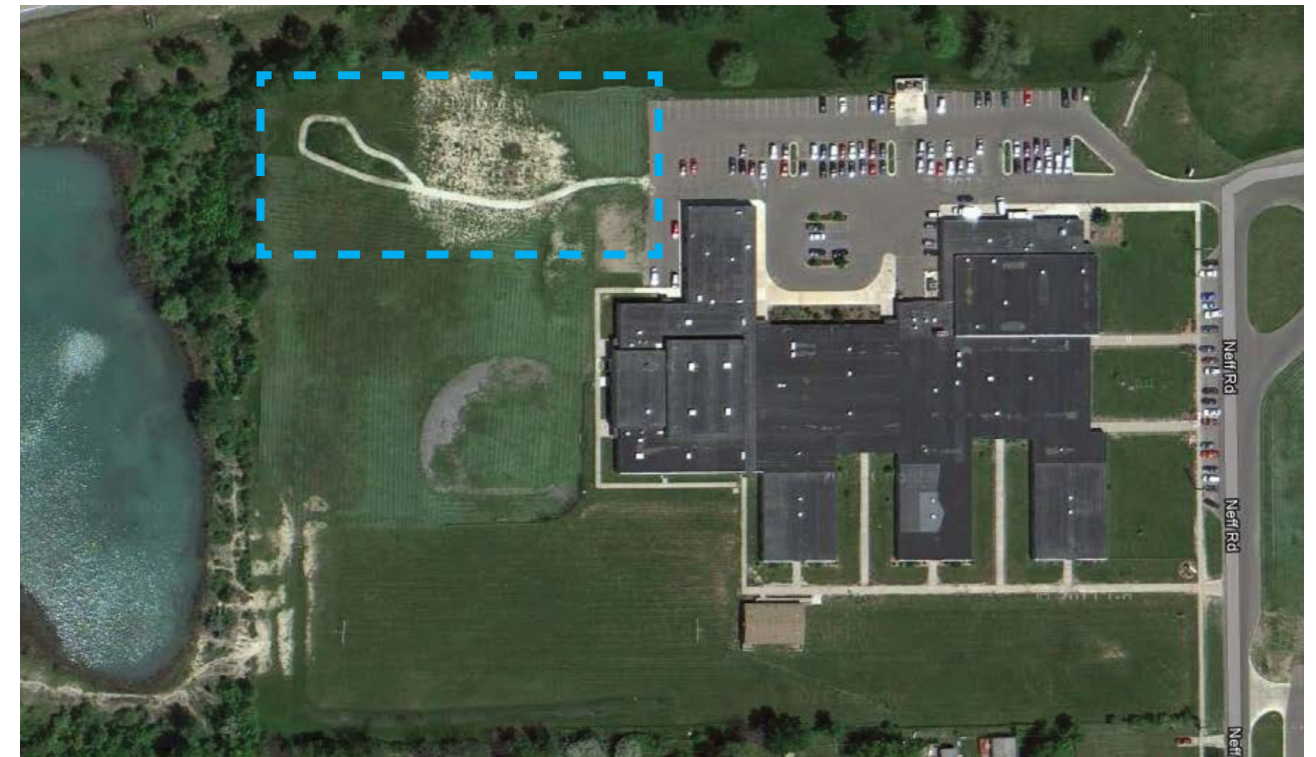
Present

- Identify need(s) for outdoor classrooms and curriculum specific to Beecher MS/HS
- Identify existing project resources within Flint, MI and state-wide

Future

- Identify project vision for student and community
- Identify anticipated challenges for implementation
- Identify project adaptability to other Michigan High Schools

Project Site: Flint, MI



Beecher Middle/High School is located in Mount Morris township, a suburb of Flint, Michigan. The school has been a recent participant in the Discovering PLACE program through the creation of a student-designed nature trail in the northwest corner of the school grounds. The nature trail includes a small garden consisting of eight raised garden beds, a gravel path loop, and a number of bird baths and bird houses meant to attract native species.

Why Flint?

The City of Flint is located in the state of Michigan approximately 60 miles northwest of the state's capital, Detroit. The city, founded in 1819 as a fur trading outpost, began to prosper in the mid-1800s as the logging industry in the area flourished. By the end of the 19th century the city's manufacturing sector dominated the economy and it became particularly well-known for carriages. This industrial infrastructure made it easy for Flint to become a manufacturing hub for automobiles when the new technology made its entrance into the market. General Motors (GM) was founded in Flint in 1908 and grew to be one of the most profitable corporations during the 20th century and brought jobs and economic stability to the city (GM 2012). The fortunes of the city changed in the 1970s as GM began to lay off workers and close plants in Flint (Beckley 2005). Flint has continued to suffer from economic depression well into the 21st century and some don't "expect the city will ever again be a thriving industrial center" (Pritchard 2006).

Economically, the city of Flint is currently facing an unemployment rate of 9.6%, which is on par with the overall United States unemployment rate (U.S. Bureau of Labor Statistics 2012). Between 2000 and 2010 the population decreased by about 18%; it is speculated that some people relocated because of the lack employment opportunities available in Flint. In addition to the issues of unemployment and population loss, Flint has a different socio-economic makeup to the rest of Michigan. The population of Flint is predominantly African America (56.6%) and the median household income is \$27,199, which is nearly \$20,000 less than the median income for Michigan (\$45,135). Finally, 36.6% of the population of Flint has been designated as below the poverty level, which is much higher than the Michigan average of 14.8% (U.S. Census Bureau 2012).

As any other city that is this economically depressed, Flint suffers from some of the hallmarks of urban blight like abandoned houses, industrial pollution, poverty, and crime; (Collier 2011) justice issues are also likely prevalent. But with a history of populist movements that have big impacts, like the 1936-7 auto plant strikes that led to the unionization of auto worker across the United States, Flint is a place where people can and have fomented change (Baulch 1997). Given this context, the city is ripe for innovation and education about sustainable systems and strategies for addressing food justice and security issues. As proposed by this project, one step in that direction could be the expansion of the city's high school curriculum to include environmental education about food justice, urban agriculture, and sustainable agro-business.



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Research Phases

Phase One – Review of Literature, Development of Case Studies, and Site Analysis

Our research was divided into four general phases. The first phase primarily consisted of literature research on the topics of place-based environmental education, urban agriculture, and native plant restoration. We reviewed literature regarding environmental and place-based education frameworks and best practices. We specifically focused our efforts on the Education for Sustainability framework of environmental education, so as to tailor our curriculum to be broadly applicable to a range of subjects, seasons, and resources. We also reviewed literature on the topic of urban place-based environmental education practices, and focused specifically on case studies of other urban school districts throughout the country that have implemented similar projects. Furthermore, we reviewed Michigan state education standards for secondary grade levels, and attempted to incorporate state standards into our lesson plans. When we completed our research of environmental education curriculum and state standards, we researched the current curriculum and educational practices of Flint public schools to identify areas that could be strengthened or expanded through a place-based environmental curriculum.

In order to gain a better understanding of similar place-based education initiatives already underway in other urban schools, we developed three case studies (Appendix 3). These case studies served to inform our process of site and program design by identifying the purpose, benefits, challenges encountered, and strategies encountered and being used by successful place-based outdoor classroom programs.

Specific research for both the native plant garden and urban farm began with an extensive analysis of the existing features on site, such as soil type, present native and invasive vegetation, location of water features and wetlands, surrounding context, etc. We achieved this through the use of GIS data obtained from the Michigan Geographic Data Library (MiGDL), the online web soil survey offered by the USDA Natural Resources Conservation Service, and physical collection and analysis of data from the site.

Research Questions

Literature Review and Case Studies

1. What are the benefits of a place-based outdoor classroom in an urban context, specifically at the high school level? What educational theories and practices support this idea?
2. What are the challenges to implementing such a project in an urban context, specifically at the high school level? What strategies can be used to overcome these challenges?
3. What are the essential features to consider when developing an outdoor classroom design? What steps are necessary to accomplish this goal?

Phase Two – Stakeholder Identification

The second phase of our research overlapped with the first phase, and focused on stakeholder identification. We identified key administrators, faculty, and staff at Beecher who were especially interested and invested in the successful design and implementation of an outdoor classroom. With the help of University of Michigan-Flint Office of University outreach staff, we developed a preliminary list of contacts within the school systems. We contacted those on our initial list and conducted informal interviews to identify the extent of their past experience with place-based education, their wants and needs in moving forward with the project, as well as any resources that they are able and willing to share that may support our project. We attempted to foster a collaborative relationship with these stakeholders, inviting ideas and feedback throughout every stage of the project.

In addition to administrators, teachers, and staff, we also hosted informal focus groups and interviews with students, as well as conducted classroom observations. We tried to establish a baseline of information about student perceptions and knowledge of and interest in outdoor, experiential environmental education.

Research Questions

Participatory Design Research

1. Why is there a need for an outdoor learning space and place-based education curriculum to be established at Beecher High School?
2. Who are the key stakeholders in this project and what are their needs?
3. What curricular and landscape design components will best meet the needs of Beecher Middle/High School and its community?
4. How will we ensure that the project will be sustained?

Best Practices

1. How do we engage multidisciplinary educational communities in the development, use, and long-term management of a place-based outdoor classroom space? What strategies have proven effective?
 - a. How can we support the initial founder of a project while still engaging the whole school?
 - b. How can schools meaningfully involve a variety of community partners?
2. How can we evaluate the effectiveness of an outdoor classroom program (evaluation protocol or instrument)?

Phase Three – Program and Outdoor Classroom Design

The third phase of our research consisted of synthesizing the information gathered in the previous two phases and conducting participatory design charrettes with teachers and students to design a functional and educational outdoor space for use by the students of Beecher Middle/High School. In addition, we conducted interviews with community partners with similar projects in the area in order to devise recommendations for a phased implementation and management plan to care for and maintain the gardens after construction. Furthermore, we researched and compiled a series of place-based lesson plans for Beecher teachers in order to facilitate use of the outdoor classroom space.

Information gathered from this phase was then utilized in conjunction with the literature review in phase one and the teacher and student design charrettes (see Participatory Design Charrettes and Surveys, below) to create a conceptual design for the gardens that reflected the needs and interests of the school.

For the curriculum design component of our project, we worked closely with Beecher teachers to establish learning goals for each lesson plan and activity. The four overarching goals that we used to guide our curriculum design, consistent with the goals of Discovering PLACE, included the following:

1. Foster environmental literacy
2. Help students understand and connect to place (Looks at Discovering PLACE's goals)
3. Develop strong communities of learners and skills for working as a team
4. Encourage behaviors that promote health and wellness

Furthermore, we tried to ensure that the lesson plans we selected are specific in subject matter; include measurable metrics of success; contain achievable goals; are realistic in scope; and are time-bound.

Measures of Success

In order to determine if the project is successful, we have broken down the measures into short term (during the project and immediately afterwards) and long term (a year or more after our participation in the project). We were able to meet all of our short term measures throughout the course of our project.

Short Term:

- Participation of 50 percent of teachers in surveys and design charrettes
- Participation of 50 percent of students in surveys and design charrettes
- Creation of outdoor classroom design, implementation plan, and best practices guide
- Synthesis of approved lesson plans

Long Term:

- Implementation of greenhouse/outdoor classroom in the next school year
- Use of outdoor classroom at least once by 75 percent of teachers during each school year
- Feedback by teachers to UM-Flint program staff
- Ability for the project to be used as a case study to inform place-based education projects in other Michigan schools

Literature Review

The following review synthesizes existing literature regarding the benefits and challenges of outdoor classrooms, and summarizes key insights from landscape architecture literature to consider in designing an effective outdoor space for school use.

Provided first are brief summaries of the key studies cited throughout our review. These summaries provide context for the variety of definitions considered and for specific points of information applicable to the goals and objectives of this project.

Community Gardens:

While this project aims to create an outdoor learning environment primarily for student use, there are important insights to be gained from studies of community gardens as well. There are two studies in particular that analyze the role of community gardening in social and educational development. The findings from these studies suggest that communal gardening can provide a number of positive mental and physical health benefits to student gardeners, and additional increase the school's and community's satisfaction with the school's surrounding environment.

1. Hale et al. (2011) "Connecting food environments and health through the relational nature of aesthetics: Gaining insight through the community gardening experience," and
2. Litt et al. (2011) "The Influence of Social Involvement, Neighborhood Aesthetics, and Community Garden Participation on Fruit and Vegetable Consumption"

Hale et al. (2011) investigated the health and social benefits of community gardens, focusing on two key areas of interest: social structures (i.e. social networks), and social and psychological processes (i.e. neighborhood attachment, collective efficacy, and perception of environmental aesthetics). Gardeners from Denver Urban Gardens were interviewed for the "Gardens for Growing Healthy Communities (GGHC)" community-based participatory research initiative. This initiative examined the relationship between community design and neighborhood health. Findings suggest that community gardeners showed a variety of positive health benefits, both physical and emotional, by participating in community gardening activities (engaging in a social network). Specifically, the surrounding aesthetics experienced (i.e. greening of the neighborhood, gardening with and among other gardeners) by participating in community gardening fostered a sense of personal meaning (a psychological process) in participants, improving their emotional state. Overall, community gardens were found to provide a context for social engagement, support ecological learning, affirmation and expression, and to provide a holistic sense of health and well-being through forming emotional connections to people and place (Hale et al. 2011).

Similar to Hale et al.'s study, public health researchers, Litt et al. (2011) used urban community gardens to examine the social and ecological connections gardeners form within their local communities. They found that community gardens have a positive influence on overall community health – both physical and psychological – through social engagement, neighborhood beautification, and community garden participation. The study found that urban beautification and garden projects

lead to an overall increased level of satisfaction with the surrounding landscape for residents. In addition, residents also reported an increased willingness to take walks, interact with neighbors, and spend more time outside (Litt et al., 2011).

Benefits of Outdoor Classroom Programs

Mirroring the approach adopted by researchers and colleagues, we have chosen to organize the relevant literature into four key types of benefits: academic, school community, environmental and health. Due to the lack of literature that specifically speaks to outdoor classroom programs, we chose to draw from the literature of the benefits of place-based education and school and community gardens—both essential components of outdoor classrooms. We feel that the findings from these fields are relevant given our definition of an outdoor classroom, and our specific vision of an outdoor classroom at Beecher (composed of an outdoor space, including a garden, nature trail, and meeting space, and based on principles of place-based education).

It is also important to note that while much peer reviewed literature has been published on the benefits of community gardening and general outdoor education, little exists specific to place-based education or outdoor classrooms at the high school level; current literature instead focuses primarily on elementary and middle school garden-based curricula. While this information is relevant, its implications for an outdoor classroom at the high school level needs to be explored further.

Academic Benefits

Multiple studies have demonstrated that students involved in place-based learning score higher on standardized tests in a variety of subjects – including reading, writing, math, science, and social studies – than students not involved in place-based education:

- A qualitative study of 40 schools in 12 states with place-based curriculum, involving interviews with teachers, students, administrators, and surveys of site characteristics, found higher scores on standardized measures of academic achievement, including reading, writing, math, science, social studies, and GPA (Lieberman & Hoody 1998).
- A study that compared student test scores of eight place-based classes in California with eight equivalent classes without EIC programs found that EIC students outscored their peers in all academic areas (SEER 2000).
- A national study found that after adopting place-based approaches, seven schools saw improvements in standardized test scores (NEETF 2000).

Beyond improved test scores in particular academic subjects, place-based education can also improve critical thinking. Ernst and Monroe (2004) presented data from 400 ninth and twelfth grade students from 11 Florida schools that demonstrated that students from place-based classrooms achieved significantly higher scores on the Cornell Critical Thinking Test than students from traditional classrooms. Additionally, students completed an Achievement Motivation Inventory; students in the place-based classrooms scored significantly higher in achievement motivation

compared with students in the non-place-based classrooms (Athman & Monroe 2004). Achievement motivation is one indicator of students' engagement in schoolwork, which subsequently affects academic performance.

School gardens are one way that place-based education approaches can be integrated into the school, and can produce definite academic benefits. School gardening programs offer an opportunity to develop teamwork, long-term project planning strategies, and marketable employment skills. In student-managed school gardens, students are more likely to meet and engage with others from differing social groups to manage a variety of tasks, such as growing techniques, implementing land use and management strategies, and produce marketing and sales (Armstrong 2011).

Student behavior and social skills

In addition to standardized test scores, other measures of learning and achievement, such as student behavior and social skill development, also point to the benefits of place-based education. Students exposed to place-based education programs have fewer instances of disciplinary issues in school (Falco 2004, Lieberman & Hoody 1998, NEETF 2000, SEER 2000) and generally exhibit more responsible behavior, both in the classroom and in the community (Bartosh 2003). Additionally, students' attendance rates have been shown to improve (SEER 2000). In two studies – a survey of 55 schools nationwide (Duffin et al. 2004) and an evaluation of ten middle schools in South Carolina that adopted EIC approaches (Falco 2004) – teachers perceived students involved in place-based programs to exhibit greater engagement in and enthusiasm for learning.

School Benefits

Beyond academic benefits, the hands-on experience and participatory learning involved in outdoor classrooms can provide other benefits to the broader school community. Conde and Sánchez (2010) found that the use of school gardens or greenhouses provided numerous benefits for both individual students and the school at large. The benefits reported by school faculty included:

- Schoolyard much cleaner
- Use of bins
- Respect for the plants
- Keenness to participate and collaborate in improving the immediate environment
- Willingness for unselfish participation and keenness for group work

Environmental Benefits

Conde and Sánchez (2010) also suggest that the most evident and important advantage found in using "green" curriculums that involve school garden or greenhouse projects was the strengthening in environmental concern and interest school-wide. Student and teacher engagement with outdoor educational activities influenced their "direct relationship with and interest in environmental topics," which "makes the pupils far more receptive and eager to engage these issues in the classroom" (Conde & Sánchez, 2010).

The goal of place-based education is to prepare individuals to work on sustaining the cultural and ecological integrity of the places they inhabit; to do so, individuals must have knowledge of ecological patterns, and the long-term effects of human actions on those patterns (Orr, 1994). The types of growing processes and community engagement experienced through school and community gardens align directly with the goals of place-based education. Learning what plants to grow and when, incorporating native species, creating a watering system, along with interacting with peers, families, and other community members provide students with the opportunity to investigate the local ecological, social, and economic systems within their own community (Litt et al., 2011).

Additionally, place-based outdoor classrooms foster a greater connection to the environment. As Duffin et al. (2004) found, reporting of attachment to place, time spent outdoors, civic engagement, and environmental stewardship all increase in proportion to involvement in place-based programs. Furthermore, studies looking at personal relationships to nature have indicated that adults who had significant and positive exposure to nature as children were more likely to report being sensitive to and concerned with environmental issues and active in environmental causes (Blair 2009).

Hale et al. (2011) found that gardening in particular can help foster a sense of ownership of and responsibility to place. They found that learning occurs through both direct "hands-on" engagement with the processes of maintaining a garden and through social interaction—gardeners learn by watching each other, asking other gardeners questions, experimenting and sharing results (Hale et al. 2011). Community gardeners described a number of experiences that impacted their own understanding of natural processes, and ecological and personal health (Hale et al 2011); school gardens and outdoor classrooms could potentially provide the same benefits to students, and their local community. Furthermore, installation of a place-based outdoor classroom could provide an opportunity for students, teachers, and community members to form a stronger connection with the local environment and with their peers. As found in the Litt et al (2011) and the Hale et al. (2011) studies, community gardens increased residents and gardeners satisfaction and interest in their surrounding environment, such as increased willingness to spend time outside, take walks, etc.

Health Benefits: Emotional & Physical

Increased interest in the local environment and participation in such activities can also lead to a number of emotional and psychical health benefits (Litt et al, 2011, Hale et al., 2011). Public health researchers have examined the social and ecological connections gardeners form within their local urban communities (Litt et al. 2011). They found that community gardens have a positive influence on overall community health, entailing both community members' physical health (activity and consumption) and members' emotional health (mental and psychological). Specific variables of influence were social engagement, neighborhood beautification and community garden participation (Litt et al., 2011).

Emotional

Gardens and the act of gardening, can improve individuals emotional and mental well-being. In particular, gardening can help alleviate the stresses of urban youth and young adults such as feelings of loneliness, confusion, and depression (Hale et al., 2011). Communal gardening is also known for bringing people together, sharing ideas, stories, and concerns (Hale et al., 2011, Litt et al., 2011). Students are able to learn from each other, share knowledge and experiences with each other, not only in terms of outdoor education, but also in terms of dealing with real life situations. Gardens provide a therapeutic environment where individuals can openly communicate with others or reflect.

Physical

At an age when healthy eating is extremely important for young adults, gardening can help them make improved choices. Community gardens appear to influence fruit and vegetable consumption and thus, physical health, through social processes. Litt et al.'s (2011) study found that community gardeners report higher fruits and vegetables intake than home gardeners and non-gardeners (Litt et al., 2011). In Flint, Michigan, for example, "individuals in community gardening households consumed fruits and vegetables 1.4 more times per day than did those in non-community gardening households and were 3.5 times more likely to consume fruits and vegetables 5 or more times per day" (p. 1467). These findings suggests that such increase in fruit and vegetable consumption is encouraged through social interactions in community gardening; a strong variable of influence which is missing from the home garden contexts. Through gardening, students gain awareness of foods, of what they are eating compared to what they should be eating, learn about the process of growing their own food, and the importance of a locally grown food system that ties into their own community (Litt et al., 2011).

Creating and maintaining gardens keeps students physically active and the "hands-on" experience of doing so is an excellent learning tool, connecting all five senses to the activity (Hale et al., 2011). Respondents in the Flint study also reported an average of 17 hours of physical activity a week (Litt et al., 2011). Such activity includes pulling weeds, moving soil, building beds and hoops houses, planting shrubs or trees, along with a number of other garden-related tasks that keeps gardeners on their feet and moving around.

Challenges of Outdoor Classroom Programs

Although outdoor classrooms have a number of immediate and long-term benefits, there are multiple challenges faced by schools in the implementation and maintenance of programs. Due to a lack of literature that focuses on barriers faced by high school teachers, studies of elementary and middle school teachers and programs provide insight into potential barriers when working outdoor classroom programs into schools. The main barriers reoccurring in the literature are interlinked but can be separated into four categories: funding, staffing, time, and climate.

Funding

Due to a lack of funding from state and school districts for outdoor classroom implementation and maintenance, many programs rely on donations of funding and labor from the community or grant organizations (Ozer 2007). For example, in a case study conducted by Azuma and colleagues (2001) in the Los Angeles school district, they found that most school gardens had difficulty finding secure funding and 14% of district schools included in the study had a program that could not be sustained and a survey conducted showed that one of the main reasons was funding (in addition to lack of time, lack of parent/volunteer support, lack of gardening experience).

Staffing and Personnel

Since the funding for school garden and outdoor classroom programs is difficult to obtain and cannot cover the full costs of the program, it is essential that there be support from staff and other personnel to ensure the space is maintained and used. Because teachers' interests and desire determine whether a garden curriculum will be taught, their support is crucial (DeMarco 1997). However, Harris' (1999) and Michie's (1998) surveys of secondary school teachers show that main obstacles to outdoor education were not only a lack of funding, but also a lack of time for tasks such as: preparing materials, organizing students, organizing additional funding for projects, and having to spend additional time after school.

An outdoor classroom also needs maintenance support from all school staff throughout the year. Enabling timely access to students and community members is key, as is maintaining the garden during the summer months when there are no classes (Nocito 2012). Ozer (2007) stressed that multiple practitioners emphasized the need for a paid staff person or active participant that is dedicated to the program. To ensure longevity, there must be a team or club that is invested in the regular care of the school garden. Assigning responsibility for roles that facilitate long term care of school gardens is also helpful. To name a few, there should be garden coordinators, parent-teacher liaisons (member of PTA/PTO), planners, and fundraisers/public relations leaders (School Garden Wizard 2012).

Time

As mentioned above, surveys of secondary school teachers showed that time was an obstacle in school programs because of the need to prepare additional material and organizing students. Even when there is an established outdoor classroom in the school, teachers may feel that a single lesson period is insufficient time for significant work outside and that it is harder to ensure the

safety of all students without additional staff (Titman 1999 and Rickinson et al 2004). In addition, teachers may feel that they do not have the background and training for outdoor educational programs, as suggested by interviews with 59 elementary teachers in Chicago (Simmons 1998).

One must also consider the organization of both primary and high school systems, where the main focus of teachers' and administrators' time is on students' ability to perform on academic tests (Fang 1995). The increased focus on standardized testing also leads to a reduction in both resources and time for non-tested subject areas and activities (Pederson 2007). Because of a pressure to 'teach for the test' if already overburdened teachers wish to incorporate new lesson plans in their classroom, they must justify their actions by ensuring that state standards are met. In addition, high school curricula are more structured than that of elementary and middle schools, and therefore there is less flexibility in the lesson plans (Wakeford, 1995). Therefore, for an outdoor classroom to be utilized, its use must be incorporated into existing curricula.

Climate

Another crucial factor in areas like Michigan is the climate, where the peak growing season is concentrated in the summer months when school is not in session (Oxenham and King 2010). Despite the successful implementation of hoop houses to address this particular challenge, such structures are expensive to implement and require maintenance throughout the year (AgBio 2012). Due to a lack of funding, personnel, and time it might prove difficult for schools to devote the energy to ensure that a variety of plants can be grown in the school space with climactic restrictions.

Outdoor Classrooms: A Landscape Architecture Perspective

With an understanding of the overall benefits and challenges of an outdoor classroom, it is crucial to next investigate how to properly design the outdoor classroom space. In the following sections, the available landscape architecture literature pertinent to outdoor classrooms is organized and reviewed. The information is presented in two main portions; the first answers the question of what key characteristics and design qualities are important to consider when planning a place-based outdoor classroom. The second section explores the elements that are essential in the classroom design process.

Essential Characteristics and Design Qualities

Participant/Visitor Stimulation

The ability to capture, hold, and inspire the interest of a landscape's main users, is perhaps the most complicated and intangible characteristic to consider within an outdoor classroom design. It is also one of the most important, and unfortunately, one that is often misunderstood. This misconception is often due to many designers' failure to recognize that a child's desires and interests do not entirely align with those of an adult (Stine 1997). Even on the brink of adulthood, adolescents' interest in the landscape does not mirror their elders', and would best be described as a midpoint between the two (Stine 1997). Since the outdoor classroom being designed at Beecher Middle/High School would most likely be utilized by both the middle and high school classes within the building, designing for a wide range of ages and audiences would be best.

Although literature revealing the preferences of teenagers in landscapes is scarce, there is a wealth of information on the needs and desires of both children and adults. In combining and comparing the overlap between the two, the following list of features/experiences was determined as significant when designing an outdoor classroom for multiple ages.

1. Varied Scales

Incorporating design elements such as pathways, buildings, topography, and gathering spaces at a multitude of scales not only creates visual interest, but allows for various types of activities to occur within the space, from formal class gatherings to sitting or exploring in solitude (Johnson 2000). In addition, the inclusion of small "perching places" (Stine 1997) where one can sit and see without being seen, appeal to the human desire for prospect and refuge (Appleton 1996), while allowing for solitude and imaginative play. Design elements that might accomplish this include elevated topography, boulders, vegetative screening, or building structures. teachers may feel that they do not have the background and training for outdoor educational programs, as suggested by interviews with 59 elementary teachers in Chicago (Simmons 1998).

2. Legible and Complex Images

Kaplan and Kaplan (1998) describe the ideal landscapes as those that embody both legible and complex elements. Legible refers to easily understood design elements like a pathway or picnic bench that help one orient to a space. Complex elements are either detailed components in and of themselves, or provide another layer of complexity to the landscape by obscuring other features such as a hedge. Together these elements create views in the landscape that speak to the human need to both understand and explore the environment. Possible design elements include pathways or archways with partial vegetative screen.

3. Connections

Visual, physical, and cultural connections between the outdoor classroom and the surrounding community and school itself are important because they make the landscape mentally more accessible and useable to everyone (Johnson 2000). In addition, they help to reinforce the sense of place. Design elements might include repeated flowerbed formations, plant types, or construction materials.

4. Flexibility

Creating areas and elements within the outdoor classroom that are flexible allow people to interact closely with the landscape, often engaging their interest much more keenly and creating a personalized sense of place. This refers to unfinished or open-ended areas that can be utilized in more than one way such as a common green or amphitheater, or elements within the landscape that can be moved or changed physically (Johnson 2000). This could be in the form of a physical object within the landscape that changes consistently such as the interactive turning "Cube" on the University of Michigan's Ann Arbor campus, or the seasonal planting of new plot designs created by students.

5. Technology

In addition to the above well-established design features of an outdoor classroom, it is also important to address the role of technology as it relates to stimulating participant interest within the garden. Although not yet well documented, the literature available implies that the landscape design of place-based outdoor classrooms should facilitate the use of technological activities in order to acquire and maintain adolescent interest and participation. Studies have indicated that the incorporation of technology and technology-dependent activities can be far more effective in stimulating youth interest than more traditional garden activities. When compared to paper etching and nature scavenger hunts, technology-dependent activities like geocaching and digital photography are often rated higher by 10% or more (Chavez 2009).

Outdoor Inclusive Environments

Educational and public landscapes increasingly seek opportunities for creating inclusive design experiences in order to provide a richer and more varied experience for all students. Popularized by the design professions, the term outdoor inclusive environments incorporates both physical accessibility (the removal of physical barriers) and social inclusivity (the removal of social and cultural barriers) in the design considerations. In addition, it plans for not only those with mental or physical disabilities, but for all children and adults whatever their ability level may be (Christensen 2006). In fact when designing outdoor inclusive environments, it is probably best to think of creating environments based upon ability, rather than disability. After all, "appropriate design recognizes that a child with a disability is a child with abilities, and that activity, rather than appliance, oriented design creates a setting where all children may be included in the fun" (Christensen 2006).

Although certainly not an exhaustive list of the possible design elements and characteristics for an inclusive outdoor classroom, perusing the Americans with Disabilities Act Guidelines (ADAAG) is certainly a good starting point for discovering tips to barrier free design. These guidelines include practical recommendations for path widths, turning radii, paving materials, and seat transfer heights for wheel chairs and students with limited mobility (U.S. EEOC 1991). Additional elements to consider are raised planting beds and worktables, which not only improve physical access to the site, but may also increase the growing season by warming the soil and providing added drainage (Yeoman 1993).

However, improving physical access to a site does not necessarily improve social inclusivity. In fact, developing separate but equally usable design elements, as is often done to accommodate persons with disabilities, may well encourage social isolation by highlighting students' differences. This is often witnessed in conjunction with designs that emphasize transfer systems as a way of meeting ADA guidelines. Studies indicate that fewer than 10% of children with limited mobility can utilize a transfer system (Owens 2000), and those who can often find themselves crawling or seeking aid in order to accomplish this task (Christensen 2006). Only in designing elements and solutions that all students can utilize, will the outdoor classroom be truly inclusive (Cosco 2009).

In addition, best practices for social inclusion also include the use of fragrant and touchable elements within the landscape for those with sensory impairments, multilingual interpretive signage for areas with more than one predominant language, and connections to cultural practices prevalent within the community (Morris 2002).

Garden Type

Another important consideration is the type of garden the outdoor classroom will be: Will there be individual plots or communal gardening areas? Will it be themed or not themed?

The type of garden chosen will be mainly dependent upon personal choice, the goals of what the garden is supposed to teach, and the age group of those involved. For instance, individual plots might be good for younger children because they foster ownership, responsibility, and are space efficient. On the other hand, adolescents might do well in communal gardens, which convey cooperation and allow for less structured, creative designs (Eberbach 1988). A good mix of both plot types might even be best, so either the teacher or the students themselves can choose.

A further consideration is theme, or multiple themes, for the outdoor classroom in cases where the site is very large. In general, themes serve as connections between garden, student interest, curricula, and often sense of place (Johnson 2000). It is here, that the tenets of place-based education can prosper. Finding a garden theme that is either closely connected to the site itself or the community at large will help to engage students on a more personal level. Themes like this might include designing a rain garden to catch and filter the excess runoff from a large asphalt parking lot before it reaches the pond nearby, creating a butterfly garden habitat for a rare local butterfly species, or incorporating the local art heritage into the design by planning a sculpture garden. Often, many of these themes fall into one of five general categories: habitat, food garden, sustainability, cultural and artistic expression, and interpretive features (i.e. highlight historic natural and cultural artifacts like a solar plaza) (Johnson 2000). However, theme need not fit into any of these categories as long as it is meaningful to that specific community.

Long-Term Sustainability

When creating an outdoor classroom design, it is best to think long-term about the sustainability of the project at the outset of the design process. Although much of the success depends heavily upon the school and community who will be performing regular maintenance of the landscape throughout its lifetime, there are a few measures a designer can integrate into the site in order to help ensure its continued use.

1. Incorporate multiple layers of engagement/use across a variety of disciplines and users

It is important to remember that the uses and users of a school landscape will change over time as people come and go at what could be a rather rapid speed. Incorporating multiple layers of engagement with the landscape and the multitude of curricula will not only make it more interesting and complex for the users, but also help the outdoor classroom to weather the fluctuations of changing hands, trends, and interests. In addition, multiple layers will generally garner more support from a larger group of people (Johnson 2000).

2. Include sustainable techniques to conserve and recycle resources

The inclusion of sustainable techniques such as rain gardens, rain barrels, recycled materials, or composting can help defray the long-term maintenance costs of the landscape, while providing a point of pride in the school and community (Johnson 2000).

3. Provide a simple and comprehensive long-term care plan for one garden cycle to the next

Sustainable design does not stop at the level of the site plan. Designing for easy maintenance along with a comprehensive care plan can help the succession of new caretakers become easily acquainted with the site's character and needs (California School Garden Network 2010).

Essential Elements of Outdoor Classroom Design Process

Site Inventory and Analysis

One of the first and foremost characteristics to consider before beginning a design is the composition and location of the existing features and physical attributes of the site. In other words, it is best to begin the design process with a site inventory and analysis. Soil composition, sunlight, average temperature and precipitation, topography, drainage, and infrastructure services like access to water, all will have a profound effect on the type and placement of both the vegetation and hardscape portions of the design. After all, the plants that are chosen "all must accept the common denominators of the soils in our gardens and the local vagaries of climate" (Damrosch 2001), to do otherwise could prove undesirable, if not entirely disastrous. For instance, leaf burn of a shade plant placed in full sun could be seen as unwelcome, while the eventual failure of a retaining wall placed in a wet, undrained soil could represent a serious health hazard. Although some of these physical attributes can be altered, like conditioning an overly sandy soil with mulch and compost (Dunne 2009) or re-grading a steep slope into a gentler incline, many of these attributes are inalterable (i.e. climate), costly, or change slowly over time (Damrosch 2001). Thus, it is generally best to plan in response to the existing conditions found within the site, which in the end, often results in a much more unique and creative design.

Additionally, investigations into site features and analysis can be utilized as a catalyst for student and faculty involvement and education. "As active users of school grounds, students' involvement can not only identify relevant, meaningful elements and relationships, but also foster a sense of ownership in the site" (Johnson 2000). Incorporating the school and community in all aspects of the process, especially site analysis, can prove useful in more than one way. Faculty and students, the regular users of the site, commonly have greater insight into the day-to-day challenges and benefits already present (Hart 1997). Some of this knowledge might be as simple as understanding patterns of ingress and egress. In other words, where do people walk? Do they utilize the pre-planned paved pathways given to them, or create some of their own? Which pathways are used most and which ones see little wear? Students often understand these patterns best.

The Design Charrette

Once preliminary analysis of the site has been completed, the actual planning can begin in a process that is often referred to as the design charrette. Derived from the French word 'la chariot,' or cart, a charrette refers to a short period of intense brainstorming towards a design goal that culminates in the creation of a rough site plan, or design solution. A charrette generally involves the design team, clients, and all interested stakeholders, and includes activities such as discussions of design objectives and programming, drawing, modeling, and critiquing (Smith 2012). Although not a necessary step, hosting a design charrette with students and faculty is the most common form of gaining the most feedback from a large number of stakeholders in a short period of time. It is also the most inclusive method of accomplishing this task because it allows immediate engagement, collaboration, and innovation across ages and disciplines (Smith 2012).

Utilized within the context of a school environment, the design charrette itself can become an important educational tool. These investigations and insights into site analysis and design can be incorporated into the regular curriculum, offering educational opportunities in many subjects such as chemistry, ecology, social studies, and mathematics, while expanding students' skills in flexible thinking, communication, and self-directed learning (Davis 1997). It is important to remember, however, that levels and strategies of participation may differ by age and grade level. For instance, developing design ideas in plan view with high school students can be an ideal strategy for laying out major features on a site plan, while younger children may find this type of abstract thinking much more difficult. Hands-on methods, such as modeling and walking tours might be best, because they are more concrete and engage a wider range of senses (Hart 1997).

Iterative Design and Analysis

Lastly it is important to remember, as countless literature and design professionals often remind, that the initial analysis and design products are not the last step. Designing for any landscape is an iterative process that goes back and forth between site inventory and analysis, client goals, and the design itself until all challenges and goals have been met. In fact, following the "design process in a completely sequential and unyielding fashion may stifle the designer's imagination" (Booth 2012) and result in an inadequate or subpar design. In the case of a place-based outdoor classroom design, this might involve the use of multiple workshops and charrettes in order to accommodate the diverse facets of the school community, and the forthcoming challenges and differences of opinion that will almost certainly arise.

Site Analysis

To begin the development of the Beecher outdoor classroom design, multiple site visits were made to record the physical, structural, and environmental factors present. During these visits, all notable information regarding the site and surrounding community were recorded. These observations were then taken into consideration when determining the best location and design of the outdoor space.

Site Description and Existing Features

The site is located at the crossroads of Neff Road and Flamingo Drive in Mount Morris Township, Michigan. It is the current location of Beecher Community Middle/High School, and has been a recent participant in the Discovering PLACE program through the creation of a student designed nature trail in the northwest corner of the school grounds. The nature trail includes a small garden consisting of eight raised garden beds, a gravel path loop, and a number of bird baths and bird houses meant to attract native species. In addition to the nature trail and school building itself, the site includes a rather large pond, baseball and football fields, and plenty of open lawn space. To the north lies a major freeway I-475/United Auto Workers Freeway and to the south a residential community. East of the site is open land attached to the nearby Dailey Elementary School (MiGDL, 2002; Bing Maps, 2012).



Location and Access/Circulation

Access to the nature trail itself can be obtained from the west side of the parking lot, which lies directly behind the school structure. Sandwiched between bollards separating the boundaries between garden space and parking, the gravel trail travels westward, splits off into a loop halfway across the site, and returns to the original entrance destination. According to faculty and student accounts there is also an informal pathway that begins at the apex of the loop and continues west into the wooded area all the way to the pond where water quality testing is often performed as a part of class curriculum.

Based on these observations, design efforts might best be served by extending the nature trail to the edge of the pond for greater accessibility, and by encouraging measures that ensure greater visibility and presence for the garden. Due to its hidden location, visibility and therefore continued use, are very real issues for this space. Measures to improve visibility might include the addition of educational signage, an entrance garden, and greater presence not only behind, but also in front of the school.



Topography

The topography on site is mostly level gently sloping downward 10 ft across the entirety of the school property from south to north. Slopes consist of no more than 2-3 percent (USDA, 2012). Steeper slopes of about 8-10% just beyond the northern edge of the property connect the school property to the highway.

Noise

Although often overlooked, the presence of noise in the surrounding environment has a profound effect on the perception and desirability of a space. Located just south of a major freeway (I-475/ United Auto Workers Freeway), the possible effects of noisy automobile traffic on the site are considerable. Although on site visits levels have not appeared to impede regular conversation, its use as an outdoor classroom, where regular lessons take place, might prove more difficult. Extraneous traffic noises might be a possible source of distraction or make listening to lectures more difficult. Additional vegetation and fence screening may help to limit noise levels while disrupting the line of sight between garden and freeway.

Infrastructure Facilities

One of the major concerns dealing with infrastructure on site is the accessibility of water. The only current access to water is located via a water spigot on the west side of the school building (near the gymnasium entrance) about 60 yards from the beginning of the nature trail. This may have serious implications for the location of any future vegetable and fruit gardens placed on site, as these typically require large amounts of watering. Creating a pathway between the water source and the existing nature trail and garden beds or locating future vegetable garden beds closer to the water source are simple remedies. The addition of rain barrels in the garden areas may also help to alleviate this problem.

Lighting is another possibly important source of infrastructure on site. Located directly to the north of the trail entrance, two large street lamps brighten the west side of the parking area. The rest of the nature trail, on the other hand, remains unlit. However, since probable use of the nature trail (and the rest of the school grounds) after dark is low, and indeed may even be discouraged, extra lighting sources are not a main concern. If future lighting is needed along the pathway, small solar lamps might be an easy and reasonable solution.

Soil Type and Hydrology

According to the Genesee County Soil survey, the predominant soil types existing on site are Brookston Loam (BW), Crosler Loam (CsraaA), and Metamora Sandy Loam (MIA). All three are rated as ideal agricultural soils with little risk of erosion when well-drained. However, both the Crosler and Metamora soil types are identified as somewhat poorly drained meaning drainage issues if not already addressed by existing infrastructure will have to be tackled (USDA, 2012). Evidence of puddling and extreme muddiness in the spring corroborates these findings. Raised garden beds, organic amendments, aeration, grading, rain gardens, and careful plant selection are simple remedies to help improve this situation.

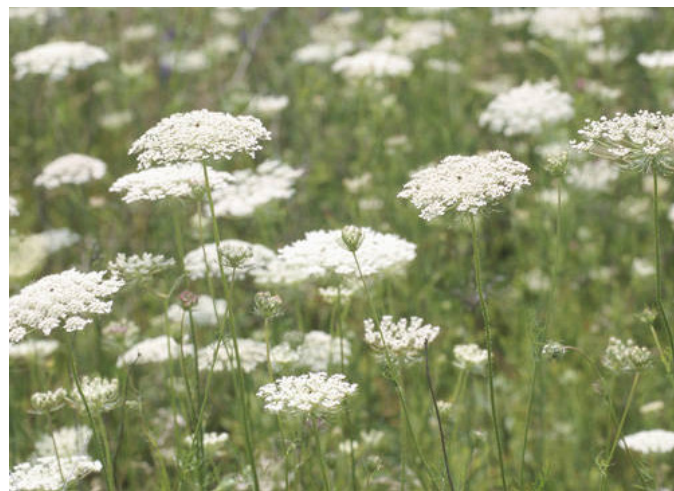


Sun/Shade Patterns

Since sun and shade patterns have a significant impact on the unique microclimate of each site, it is important to understand the general trend of sun and shade and how they change annually. Overall, the site is sunny throughout the developed portion (nature trail and planters) with shadier patches to the north and west where large groupings of trees have created a shadier, more forested atmosphere. Luckily, sunny areas are good for growing vegetable gardens and promoting native Michigan prairie vegetation.

Vegetation

The current vegetation on site is a mix of mown turf grass, Michigan native prairie grasses and wild flowers, hardwood forest, and invasive species. Most notable of these invasive species is *Phragmites australis*. Also known as the common reed, it is a large, tropical perennial grass found in many wetlands across the U.S. today. Identified as very aggressive, it is believed to be a major threat to many native wetland species. Located in force along the banks of the school's nearby pond, the students have already begun the process of removal.



Plant species names from bottom left image, to top right and down:
Queen Anne's Lace; New England Aster; Phragmites; Fleabane; Canadian-goldenrod

Participatory Design Charrettes and Surveys

School and community input in the Beecher garden design was an important research component of this project. By obtaining user feedback on design concepts and ideas, the master's team helped to provide the school with a garden design that better addresses the needs and concerns of students and teachers alike. For this reason, a charrette was chosen for the design of the Beecher outdoor classroom as the best possible method of data collection and participation for the design of the Beecher garden space. It allowed the project team to involve and garner ideas from a large number of potential garden users (students, faculty, and staff) in just a few short visits to the school.

A design charrette is a workshop style technique that allows both designers and stakeholders to collaborate closely in the design process by allowing considerable cross-pollination of ideas within a short period of time. Although the specifics of each charrette may vary slightly, the overall objective of the process is to gather the largest amount of project stakeholders and designers into one place, or session, in order to allow for the free flow of ideas concerning the site. In the end, the goal is to create a design that is the best possible solution for user and maintenance needs, while hopefully inspiring community pride and participation in the project (Hanington 2012).

Participants

There were 106 participants involved in the overall design process: 94 of those were students, 12 were teachers. However, more specific numbers vary based on the step of the charrette process, and can be viewed in greater detail within the data section of the report. All students involved were current Beecher Middle/High School or Beecher Ninth Grade Academy students between the ages of 14-18 years (9th-12th grade), and all teachers were current Beecher staff members.

Materials and Procedure

For this site, the charrette process was separated into three distinct steps, where students and teachers were either asked to participate in a short individual survey or group drawing activity. Each charrette visit was prefaced with a short PowerPoint overview of the site background, design, and goals in order to familiarize participants with the project.

During the first step, which occurred in May of 2012, students were asked to complete one or all of the following three activities. In the first activity, students were asked to fill out surveys measuring their level of interest in planning, maintaining, or constructing an outdoor space for Beecher (Appendix 4) in order to better predict future participation. The second activity asked students to describe the positive and negatives of the current outdoor space. The third was a group drawing activity in which students utilized markers and printed aerials of the site to describe the types of elements they would like to see within the garden space. In the second portion of the charrette in

January 2012, both students and teachers were given an individual survey asking the participants to rank a number of possible Beecher garden features in order of personal priority from 1-6 (Appendix 5). The features included were based upon the responses received within the first charrette.

For the last charrette, in February 2013, students were again separated into small groups and given large aerials of the site, trace paper, and markers, and were asked to think about the following three questions.

1. What do you dream about being here [on the site]?
2. What would work? What would not work?
3. How can your class get involved in the garden? What's a potential project?

At the conclusion of this session, each group was asked to share their findings with the rest of the class.

Scoring

General collation and scoring of charrette responses was done on a straight scale (i.e. one group equals one vote). These were later turned into percentages of the entire representative group for each portion of the charrette process. However, surveys specifically measuring garden feature priorities were reverse scored with points 1-6, giving the most desired features the highest score available.

Data

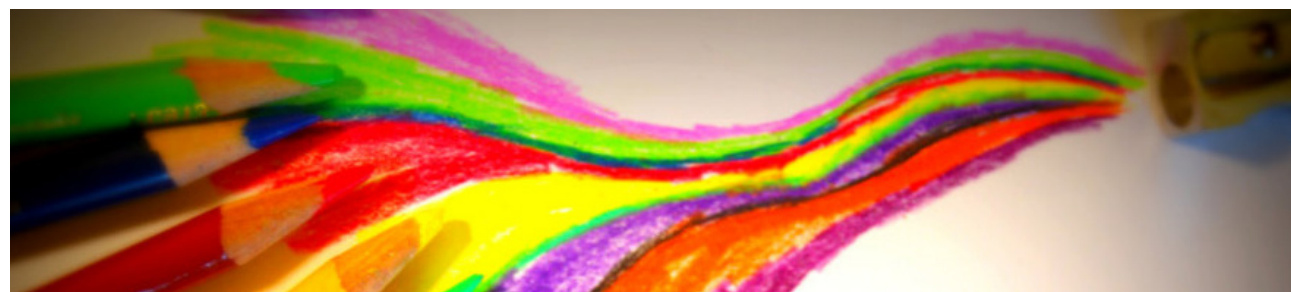
The following data, gathered during the charrette process, is separated into the three phases previously described.

Charrette Phase 1: May 2012

Activity 1: Survey of Participant Interest

(May 2012 – individual activity, 27 student respondents)

Planning	Construction	Maintenance
85 %	70 %	70%



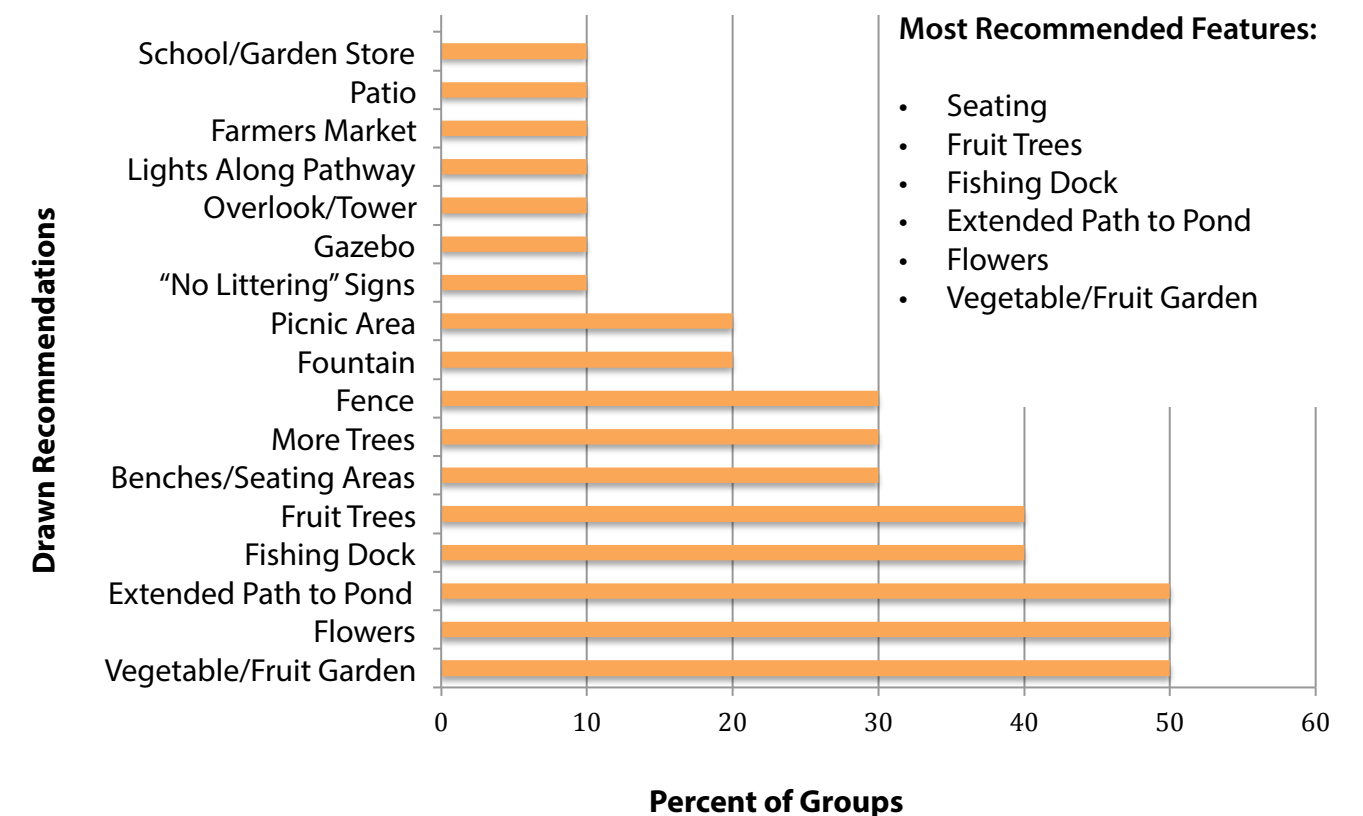
Activity 2: Survey of Garden Strengths & Issues

(May 2012 – individual activity, 16 student respondents)

Issues	% of Respondents	Strengths	% of Respondents
Trash	63	Increased Biodiversity	56
Invasive Species	56	Trail	50
Plant Disease	32	Birds/Bird Feeders	44
Vandalism	19	Having a Garden	32
Cold Weather	13	Learning About Plants/Natural Communities	19
Dirty Water	13	Native Plant Species	13
Weeds	7	Flower Boxes	7
No Bird Food	7	Insects	7
Little Space	7	Rich Soil	7

Activity 3: Group Drawing Activity (Site Aerial and Markers)

(May 2012 – groups of 2-4, 10 groups, 30 student respondents)



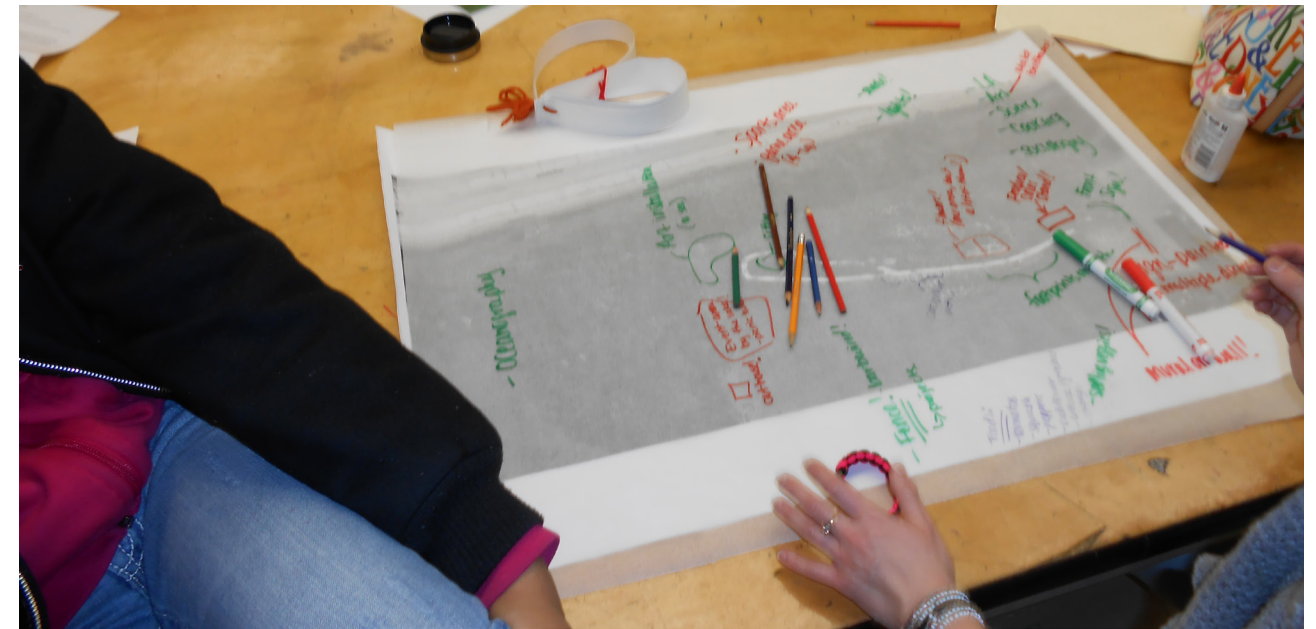
Charrette Phase 2: January 2013

Garden Feature Priorities – Teachers
(January 2013 – 12 faculty respondents)

Garden Feature	Ranking
Meeting Space	1
Native Plant Garden	2
Entrance Area	3
Vegetable Garden	4
Butterfly Garden	5
Pond Access	6

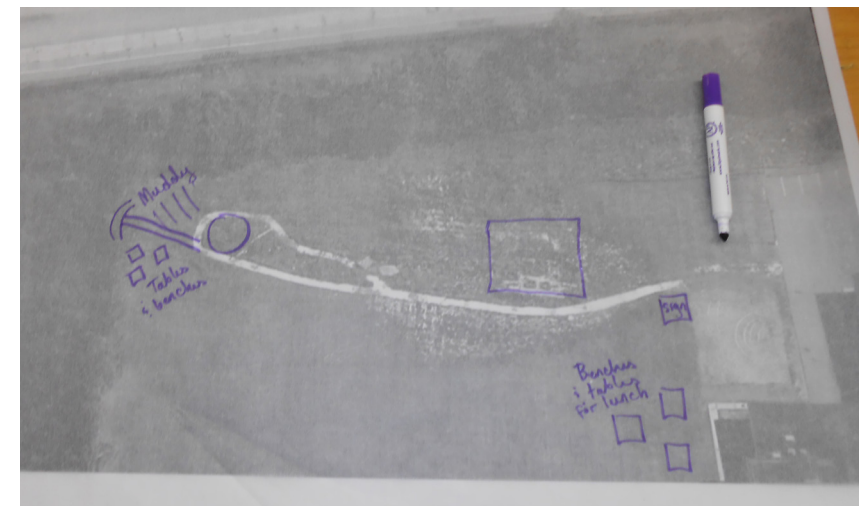
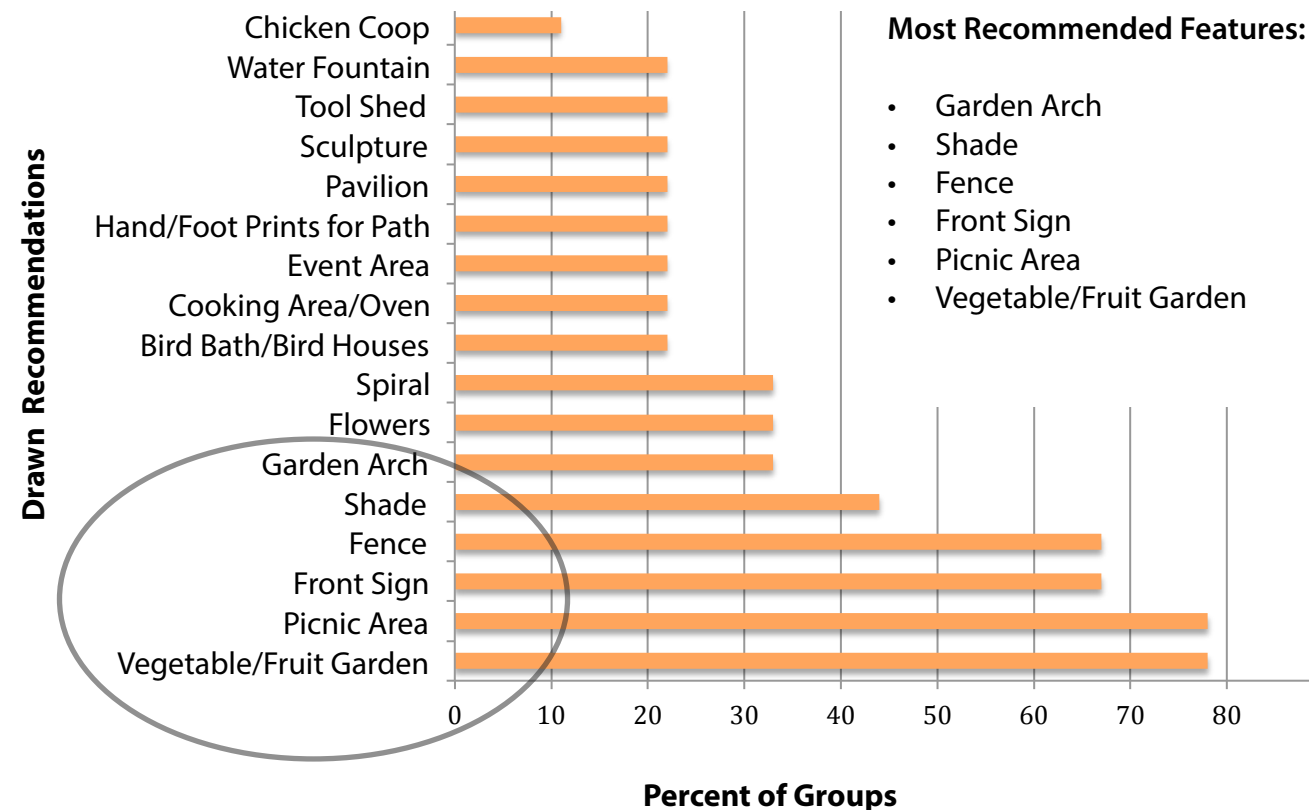
Garden Feature Priorities – Students
(January 2013 – 19 student respondents)

Garden Feature	Ranking
Entrance Area	1
Meeting Space	2
Butterfly Garden	3
Native Plant Garden	4
Pond Access	5
Vegetable Garden	6



Charrette Phase 3: February 2013

Group Drawing Activity (Site Aerial and Markers)
(February 2013 – groups of 6-8, 9 groups, 64 student respondents)



Photos:
The three images were taken during the third charrette (Phase 3) in Ms. Miriram's Art class. Students illustrated and discussed elements they thought important to include in the Outdoor Classroom.

Results

Although not entirely conclusive, results from this charrette seem to indicate a high preference for the following site elements: an outdoor meeting space where regular class activities and lessons can take place, a garden area for both native and food plants, an improved entrance area and educational signage for the garden, an archway, additional shaded areas, and a place for outdoor picnicking.



Outdoor Classroom Conceptual Design

The final design for an outdoor classroom at Beecher Middle/High School was developed with the following framework, a measure derived from the information found in the literature review, case studies, and interviews performed for this project. In addition to the various suggestions made by students and faculty during the charrette visits and the site analysis performed by the project team, each component of the framework was addressed in the design process as a means of creating a more inclusive and functional design for the school.

Integrate Curriculum

Curriculum development accompanied the design process in order to integrate the final design of the outdoor classroom into daily lessons. A lesson plan book describing these activities can be found in Appendix 10.

Maximize Maintenance, Safety, and Accessibility

Maximizing ease of garden maintenance, safety, and universal accessibility are all very important concerns in any landscape design. This is especially true for those built and maintained by student and volunteer groups where regular maintenance may only be seasonal. Considerations for these are evident in the plant choice, path widths and turning radii, ADA accessible paving materials, and programmatic location of elements throughout the Beecher outdoor classroom.

Feature Local Culture and Environment

The design features some aspects of local culture and environment through the use of native plants and local materials.

Incorporate Existing Site Features

The existing work done by Don Hammond and the ecology club students was integrated into the final design plan. These elements included the nature trail loop, birdhouses, and raised beds.

Minimize Site and Habitat Disruption

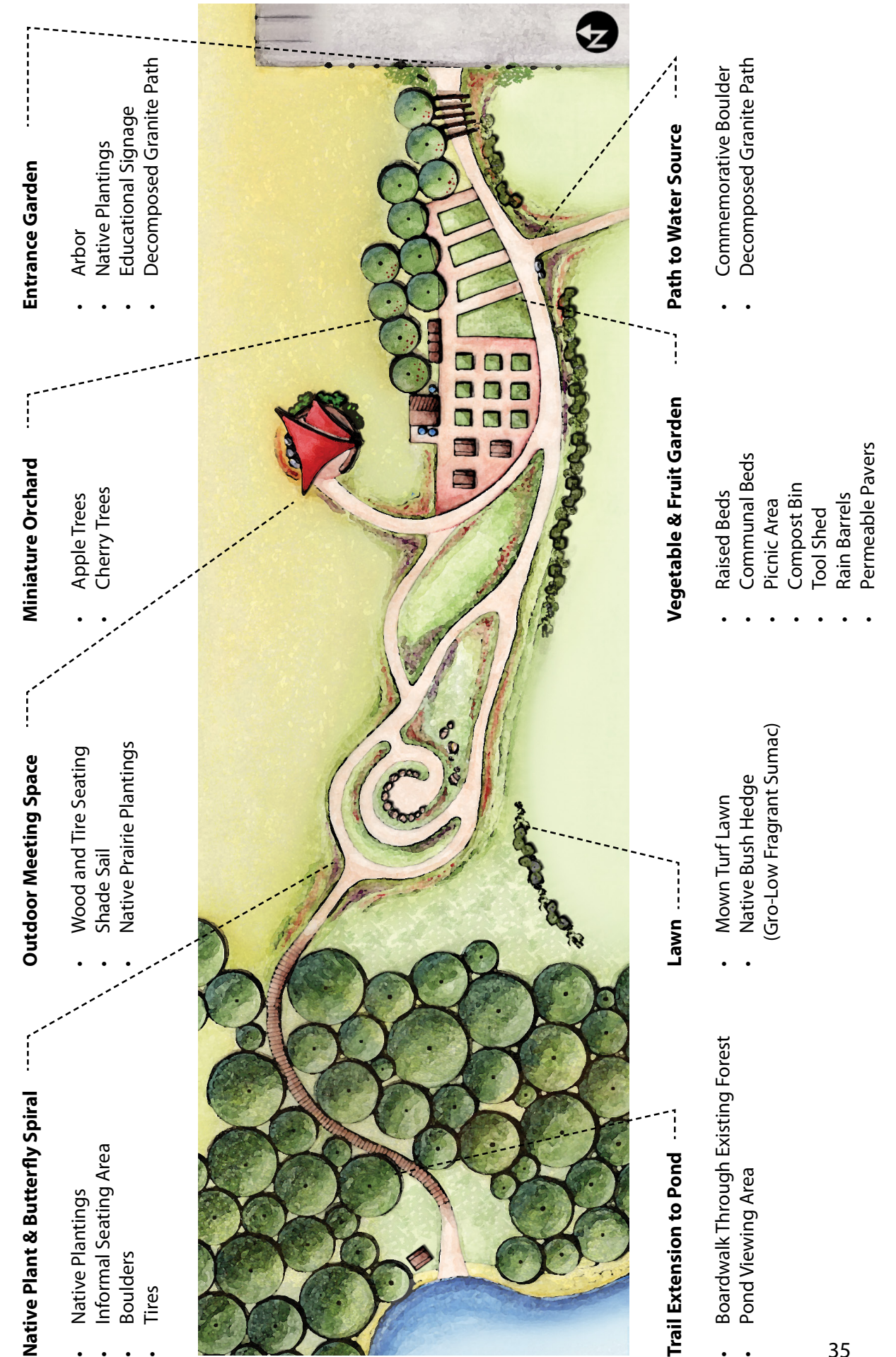
By focusing the majority of the outdoor classroom plan around the existing raised beds and nature trail areas, the design minimizes habitat disruption, pollution, and soil erosion to the rest of the site.

Appeal to a Variety of Ages

Due to the range of age groups currently residing in the Beecher Middle/High School building (anywhere from age 12-18 years) and the elementary school across the road, garden elements in the design need to appeal to a variety of age groups in order to capture the interest of all possible users for the site. Finding the most appealing elements was accomplished through extensive survey and charrette interaction with a cross section of the possible users. The five main garden areas described in the site plan are a result of this interaction.

Further discussion, plans, elevations, and perspectives for the Beecher outdoor classroom can be found in the following pages.

Conceptual Site Plan



Materials & Character

Material choices for the outdoor classroom evoke an easygoing, casual, and imaginative atmosphere for learning. Additionally, the use of tires in various forms (seating, planters, etc.) provides continuity throughout while extending a nod to Flint's long history in the state automobile industry.



Wooden Boardwalk



Rain Barrels, Hoop Houses & Permeable Concrete Pavers



Decomposed Granite Paving



Tire Planters, Arbor & Mosaic Bollards



Shade Sail & Tire Seating Bench



Outdoor Classroom Conceptual Design 36

Native Plant Palette

Relying heavily upon native Michigan prairie and butterfly attracting species, the following page contains a selection of plants specifically chosen to suit the planting needs of the Beecher outdoor classroom. Chosen not only for their vibrancy and beauty, native prairie plants provide sanctuary for numerous insect, bird, and small mammal species, reduce soil erosion, and increase water infiltration.

Additionally, native plants generally require less water than non-natives and need little regular maintenance making them easier for school students, staff, and volunteers to care for. The plants shown here are just a few examples of native Michigan plants, all of which are recommended for use throughout the outdoor classroom.



Bee Balm

Joe-Pye Weed

Gro-Low Fragrant Sumac

Butterfly Weed

Orange Coneflower

Indian Grass

Common Milkweed

Apple Tree

Wild Strawberry

Little Blue Stem

Purple Love Grass

New England Aster

Blazing Star

Outdoor Classroom Conceptual Design 37

Entrance Elevation



Located to the farthest east edge of the outdoor classroom, the entrance garden welcomes visitors with an enchanting arbor. Nestled next to the pathway and to the south, a small native plant and butterfly garden attracts local bird, mammal, and insect species with the vibrant colors of Bee Balm, Joe Pye Weed, and New England Aster, a sight that is especially vibrant late summer to early fall when students are returning to school.

Educational signage created by Beecher's students teaches local visitors about the history, habitat restoration, and learning opportunities of the outdoor classroom. Directly north of the pathway, a large expanse of native prairie vegetation covers the upper half of the site before meeting the northern tree line. In the distance, a small orchard and the bright red shade sail for the outdoor meeting space can be seen.

Vegetable Garden Elevation



The vegetable and fruit garden, located just west of the entrance arbor and butterfly garden, provides an exquisite learning opportunity to grow and understand local methods of produce production on a very small scale. In addition to the sense of pride, ownership, and stewardship such experiences can provide, the lessons and skills learned here can then be transferred to the students' own lives and future gardens.

Consisting mainly of 5' x 5' raised beds previously constructed by Beecher's students and staff, the garden area will also include larger communal beds, a miniature orchard, a tool shed for storage supplies, rain barrels, a composting bin, and seasonal hoop houses for the raised beds that can help extend the growing season into the fall semester. Similarly, hoop houses can be employed in early spring.



Outdoor Meeting Space



Located north of the vegetable and fruit garden, an outdoor meeting space meant to hold small class lessons and activities provides an escape into nature during the warmer months of the year. Separated a little ways from the main outdoor classroom area, the taller prairie grasses ensure a semblance of seclusion and quiet from the higher activity areas.

Constructed mainly of recycled tires and reclaimed wood, the circular seating bench holds small classes of twenty to thirty students at a time. Overhead two triangular shade sails provide respite from the hot Michigan sun. Tinted to match Beecher's predominant school color, red, the shade sails can be easily setup yearly and removed for winter.

Outdoor Classroom Conceptual Design 40

Outdoor Meeting Space



A fun and straight forward activity everyone can participate in, tire bench construction for the outdoor meeting space will help teach students basic construction methods and an appreciation of recycled materials. The basic support structure is built like a rammed earth wall. Soil is shoveled into the tire and then

compacted. Once packed with dirt, the tire walls bulge interlocking with the tire row below. Each row of tires is then stacked on top of each other in a running bond type pattern. In other words, each row of tires is half off from the row above and the row below creating a stonger wall.

Outdoor Classroom Conceptual Design 41

Phased Implementation and Maintenance Recommendations

An important part of implementing any outdoor classroom design is dividing the work to be done into easily manageable phases based upon priority, funds, and the resources available to the school at any given time. Additionally, it helps to prevent serious soil erosion and habitat loss that can occur during major construction projects. For Beecher, the outdoor classroom design has been divided into four phases for implementation. They are as follows:

PHASE 1

Already completed. This was the initial phase. Don Hammond and his students installed a nature trail loop, raised beds, and bird houses/baths.



PHASE 2

The second phase will focus on the areas students and teachers gave the most priority in their survey responses. Here an entrance garden and outdoor classroom meeting space will begin to be put in. Furthermore, the nature trail itself will be improved (resurfacing of the gravel), additional native plants will be added, and educational signage will be installed.

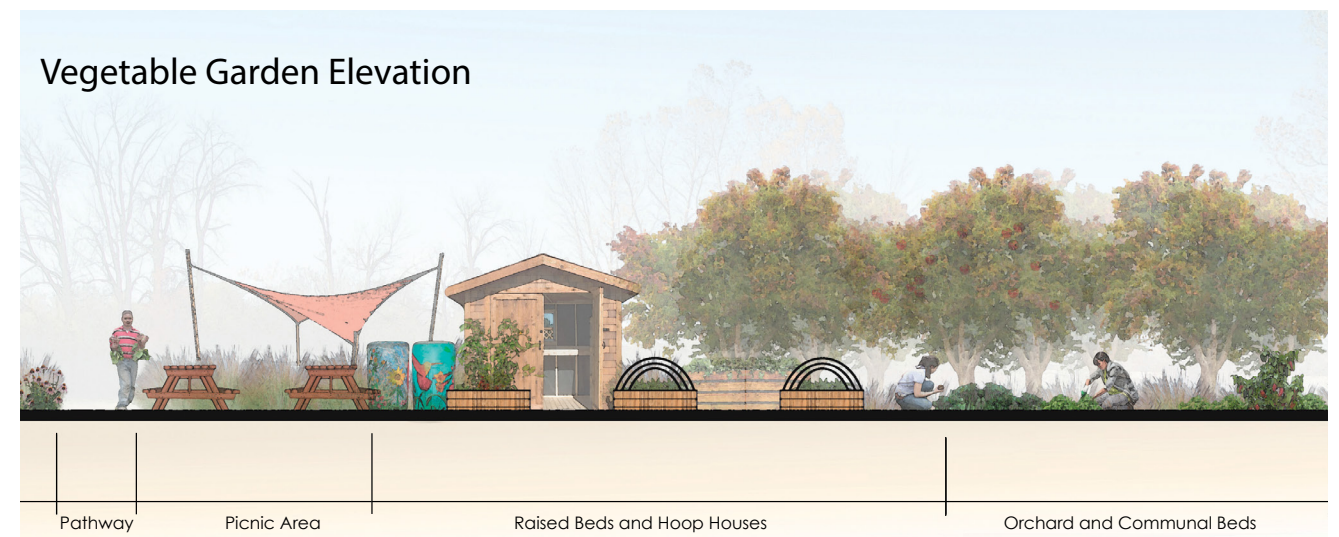
Entrance Elevation



PHASE 3

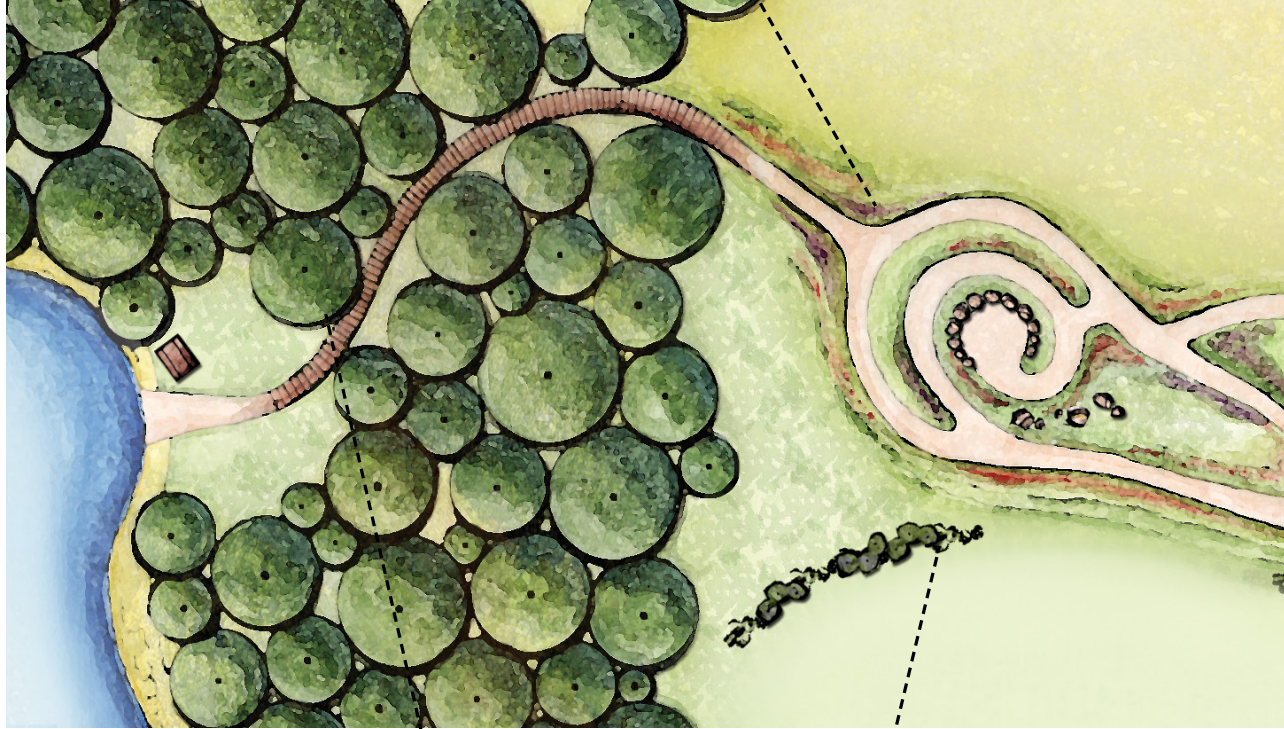
In the third phase, the idea of a vegetable garden utilizing and expanding upon the existing raised beds will be addressed. This will include a composting area, rain barrels, benches, and demonstration tables. Additionally, a small picnic area for outdoor eating, a more permanent garden fence, and shade for the meeting space will be addressed.

Vegetable Garden Elevation



PHASE 4

In the fourth and final phase, the main focus will be the extension of the nature trail to the pond and the creation of a small viewing area. In addition, the vegetable garden will be expanded to include larger non-raised communal beds and hoop houses.



Trail Extension to Pond

- Boardwalk Through Existing Forest
- Pond Viewing Area

Maintenance Recommendations

To facilitate maintenance of the outdoor classroom space in all phases, a list of recommendation and tips were compiled into: general recommendations, weekly chores, seasonal chores, general tips for each season, and reference websites that provide additional information. (See Appendices 6 & 7). The needs of the space were taken into consideration and where possible community partners that could provide assistance or supplies were identified.

An additional source of infrastructure on site that is not included in the above phases is lighting. Located directly to the north of the trail entrance, two large street lamps brighten the west side of the parking area. The rest of the nature trail, on the other hand, remains unlit. However, since probable use of the nature trail (and the rest of the school grounds) after dark is low, and indeed may even be discouraged, extra lighting sources are not of main concern. If future lighting is needed along the pathway, small solar lamps might be an easy and reasonable solution.

Best Practices Guide: Community and School Engagement Strategies

Introduction

Based on input from community partners, Beecher staff, and Discovering PLACE personnel, this guide is intended to provide an overview of practices to improve the effectiveness and sustainability of an outdoor classroom project. Specifically, we attempted to identify strategies for overcoming common challenges to implementing and sustaining an outdoor classroom, as well as strategies for engaging all members of the school and surrounding community in the planning, implementation, and maintenance process. More specific strategies for physically constructing and implementing an outdoor classroom space can be found in our phased implementation plan. While this guide is intended for the outdoor classroom at Beecher Middle/High School in particular, it is also more broadly applicable to other urban high schools throughout Michigan (See Appendix 9 for interview questions).

The most significant challenge facing most outdoor classroom projects is a lack of initial buy-in from the school community, and subsequently a lack of participants willing to help maintain the project long-term. The initial interest for an outdoor classroom project can come from any member of the school community – teachers, students, parents, administrators – but it does need to arise from within, rather than outside of, the school community. While the idea may stem from one teacher or student, a broader network of support will be necessary to get the project off the ground. If the interest and support of the school community does not exist from the outset, it will be very difficult to initiate and sustain an effective outdoor classroom. Outdoor classroom projects that have a diverse platform of stakeholders have the best chance of sustained success.

Getting Started

Common challenges: lack of interested participants, overburdened educators, uncertainty regarding possibilities for outdoor classroom

- Assess the needs and interests of all potential stakeholders and participants
 - o Speak with administrators about school needs and resources
 - The support of the school principal and vice principal are crucial to the initiation of an outdoor classroom project. What are their concerns for such a project? What standards, for the curriculum, the physical space, or its use by students, need to be met?
 - Inform other district-wide administrators, such as the superintendent, of the idea for an outdoor classroom
 - o Survey all teachers and staff regarding interest and needs in an outdoor classroom
 - Written or in-person surveys or interviews should assess teachers' comfort level with teaching outdoors, knowledge of outdoor and place-based education practices, special needs and concerns, and ideas for features, use, and curricular integration. What sort of project would be most useful for them and their students? How can the project be designed to support instruction?
 - Additionally, attending staff and advisory board meetings to informally assess teacher interest level and availability, and show support for their work, is important in fostering ownership of the project.
 - o Survey all students about what they would like to see in an outdoor classroom
 - Surveys can be conducted in-person as a classroom activity
 - Students often have in-depth knowledge of how outdoor spaces are already being used by their classmates; this information can be very useful in informing the location selection and initial designs of the outdoor classroom. Where do students gather before and after school? What features would help students interact with the environment surrounding their school? What would students like to learn about outdoors or in their community?
 - o Explore potential parent and community support
 - Survey parents and guardians, local environmental and community non-profits, and local businesses about interest in the project and skills and/or resources they might be willing to share or donate
 - Also ask parents and guardians about particular academic or safety concerns they may have regarding their children's use of an outdoor classroom, and if they would be willing to act as chaperones during outdoor activities
 - o Assess existing possibilities for an outdoor classroom on the school grounds
 - Speak with maintenance staff about existing infrastructure and natural resource considerations on the school grounds. Where is access to a water source for a garden? What considerations must be made for sports fields? How can we lessen additional maintenance needs for the site?
 - Research specific neighborhood and community requirements, such as zoning and construction regulationschaperones during outdoor activities

Planning and Design

Common challenges: unbalanced leadership structure for project (only one teacher or community partner committed, etc.), lack of common vision, lack of resources and funding.

- Host a gathering for all interested stakeholders and participants. The primary purpose of this initial meeting will be to develop a mission statement, comprising a set of agreed upon goals and an overarching vision for the project.
- Conduct a more in-depth site analysis and inventory (example see Site Analysis, pg #?).
- Encouraging buy-in from:
 - o Teachers
 - Conduct participatory visioning and design charrettes with teachers who have expressed an interest in participating in the project during the initial survey phase (see Research Methods).
 - Host a training session for teachers regarding place-based, environmental, and outdoor education.
 - In Flint, the organization Growing Hope offers a Garden Leadership Training program for teachers and school staff that covers issues related to school gardens and community organizing. In an attempt to encourage broad support for a project and ensure long-term success, Growing Hope strongly recommends that at least four people from an interested school attend the training.
 - Discuss specific plans for connecting the project to indoor classroom curriculum and state educational standards.
 - Collaborate with teachers to develop a safety protocol for outdoor activities with students
 - Encourage teachers to give ownership of the project to students as much as possible. This will not only lessen the workload for already overburdened teachers, but also encourage leadership activity for students. An adult ally or advisory workshop can help clarify how teachers and other adults can best delegate responsibilities and facilitate student empowerment.
 - o Students
 - Conduct multiple participatory visioning and design charrettes with students (see Research Methods). These can be conducted, with agreement from teachers, during class time. The goal is to reach out to as many students as possible.
 - Research graduation requirements for students; many high schools now require students to complete a certain number of volunteer hours in order to graduate. Assisting in the construction or maintenance of the outdoor classroom could provide an opportunity for students to earn credit for their volunteer time.
 - Encourage participation from elementary schools in the district, with high school students acting as mentors to the younger visiting students.

- o Parents and Families
 - Host potlucks, parent volunteer time, or other interactive family events and invite parents and other family members. Building positive relationships with families can encourage active student participation during school time and parent/family participation as volunteers.
 - Attend all parent events, including PTA meetings, school fairs, etc.
- o Community Partners
 - Connect with partners in a similar manner to the suggestions for parents and families. Partners are valuable not only for resources they may be willing to share, but also in strategy and credibility.
 - Attend community meetings and events
- Funding:
 - o Design the classroom to be as inexpensive and easy to maintain as possible. Refer back to initial needs and resources assessment to determine what is already available to you and what will still need to be acquired or developed.
 - o Fundraising and Donations
 - Reach out to community partners and local small businesses for assistance in construction and for the donation of materials.
 - Create a form letter or email that can be easily adapted by teachers and staff to solicit donations for the project

Implementation

Common challenges: uncertainty regarding connecting outdoor activities and learning back to conventional curriculum and state standards, difficulty expanding awareness of the project and rallying community support.

■ Curricular integration

- o Invite educators/instructors from local environmental education organizations to lead an activity or series of activities with students outside. This can provide a first-hand example for teachers of what is possible in terms of outdoor instruction. Many such organizations also have extensive collections of lesson plans and curriculum that they are willing to share with teachers.
- o Similarly, national organizations such as Project WET, Project WILD, and Project Learning Tree are specifically focused on environmental education curriculum development and integration into the classroom, and offer curriculum guides and lesson plan books to schools that are willing to host one of their training sessions with teachers.

■ Publicity and Communication

- o Encourage students to create media coverage of the activities they are doing in the outdoor classroom. This not only provides publicity for the project, but also provides young people with the opportunity to synthesize the complex issues they are exploring and develop a sense of pride in their work. A blog, Facebook page, or website dedicated to the project are potential platforms for such media.
- o If using an online platform such as these, provide information on volunteer opportunities and a donation wish-list, as well as a space for volunteers to register and visitors to fill out feedback surveys
- o Print brochures and flyers with an overview of the project and make them available in public buildings such as libraries.
- o Reach out to local newspapers and television stations to encourage coverage of activities and events happening in the outdoor classroom.

Long-term Maintenance and Incorporation

Common challenges: lack of caretakers when school is not in session, vandalism, lack of long-term leadership.

- Signage that provides information about why the outdoor classroom exists and who benefits from garden produce (if a garden is part of the project), such as children at the school or a local food bank, can help deter vandalism or other destructive activity at the site.

■ Caretakers

- o Develop student teams that will be responsible for different maintenance activities for the outdoor classroom, such as watering, composting, etc. This is especially important if a garden is a central part of the outdoor classroom, as is the case with Beecher. These roles and responsibilities should be determined primarily by the students, not just handed down from teachers or other adult advisors.
- o Look to community gardens as models: provide space for garden plots that can be rented out or freely available to community members.
- o If funding allows, consider offering a paid internship for a student caretaker during the summer months, and/or a teacher liaison for after school programs
- o Have students co-facilitate volunteer work days

■ Assessment/Evaluation

- o Develop and use a standard survey for the following groups: students, teachers, community partners, and volunteers. Distribute this survey to users following their participation in the outdoor classroom.
- o Keep a detailed record of the number of students, staff, parents, community partners and other volunteers who work on or use the outdoor classroom, as well as the number of hours worked, materials donated, produce produced from the garden, etc.

Conclusions

This project sought to strengthen the presence of place-based education at Beecher Middle/High School by collaborating with the school and surrounding community to generate a design and implementation plan for an outdoor classroom on the school grounds, which could be used by the school as a multi-disciplinary, place-based learning tool. We also sought to document the process of implementing the project so that our and Beecher's experience can be used as a framework for other schools interested in incorporating place-based education strategies into their own educational practices.

To accomplish these goals, the team conducted a review of literature regarding place-based, outdoor, and environmental education practices, benefits, and challenges, as well as reviewed literature on the topics of community and school garden design and implementation. We also researched and developed several case studies of organizations already pursuing outdoor classroom and school garden projects in order to learn from their experiences. Similarly, we conducted interviews with schools and non-profit organizations in southeast Michigan to identify common challenges outdoor classroom programs and strategies being used to overcome these identified challenges; and from this information synthesized a Best Practices Guide.

In order to develop a design for the outdoor classroom space, as well as implementation and maintenance recommendations, the team first conducted a comprehensive site analysis. We assessed the accessibility of the location, existing infrastructure, soil quality, topography, vegetation, noise levels, and shade patterns. Our primary source of information for the site plan and design, however, were the teachers and students themselves. In order to assess the needs and interests of the school community and develop an outdoor classroom that would be most useful, feasible, and enjoyable for them, we planned and conducted a series of participatory design charrettes and distributed and analyzed written surveys regarding preferences and priorities for outdoor classroom features. The final design incorporated the school feedback and feasibility analysis that represented the needs of Beecher in a manageable, phased approach.

Moving Forward

As we complete our work with Beecher and Discovering PLACE, we are pleased to share the steps they have taken to continue the development and implementation of the outdoor classroom. Beecher has secured a \$3,000 grant from the Greater Flint Educational Consortium (GFEC) and Genesee Intermediate School District (GISD) to implement the proposed plan for the outdoor classroom. In combination with the initial Discovering PLACE grant, Beecher now has \$5,000 to invest in the space.

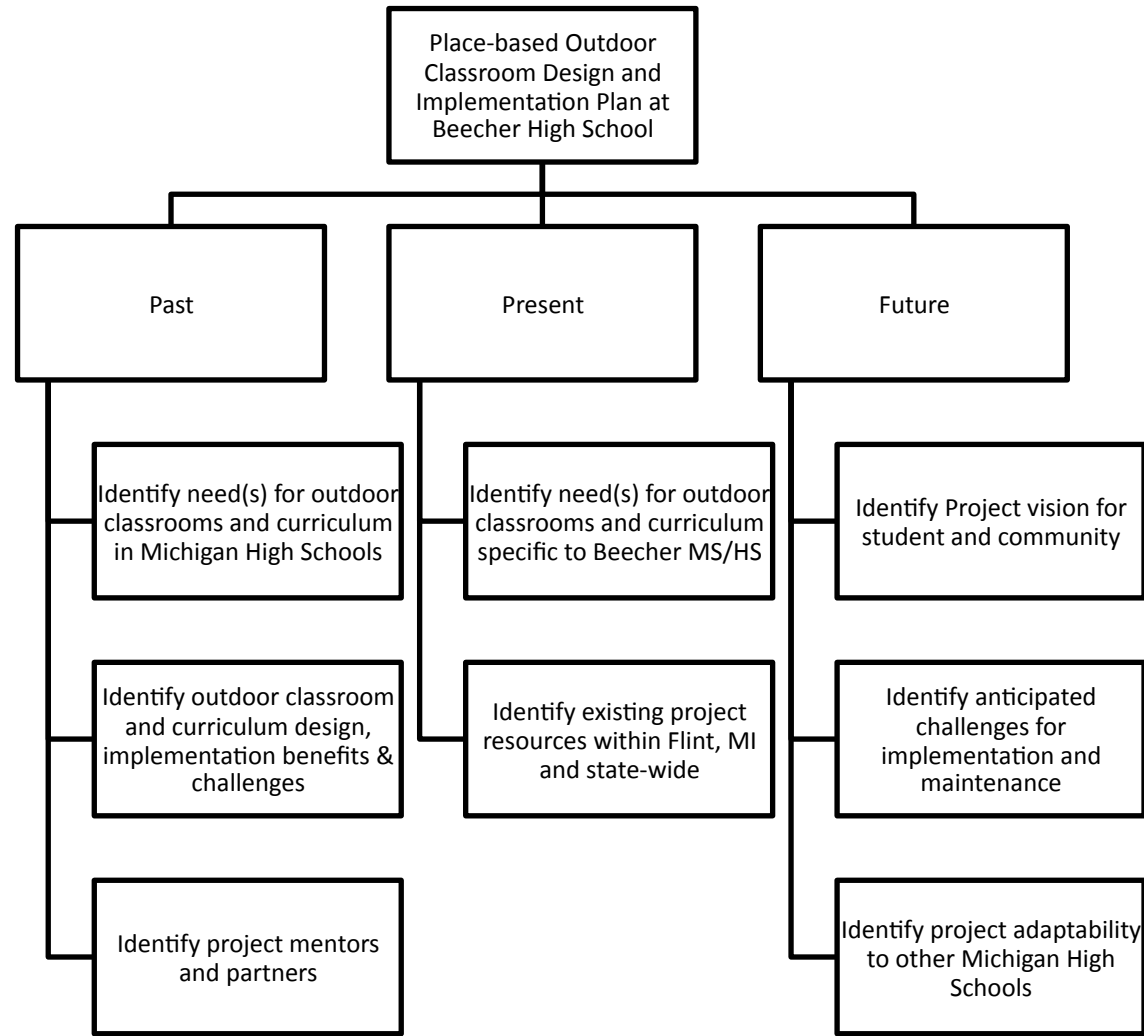
Additionally, Discovering PLACE has facilitated a partnership between University of Michigan-Flint students and Beecher students to begin implementation and construction of the outdoor classroom. The college and high school students will be leading workdays at the site throughout the spring of 2013, with the first workday occurring Friday, April 12, 2013. An additional partnership between the Genesee Regional Youth Quest Program and the Neff Center (a satellite office of UM-Flint's Office of University Outreach located at Beecher) will facilitate weekly workdays at the site with Beecher students throughout the summer, providing much needed maintenance when school is not in session.

Appendices

Appendix 1: Logic Model

Appendix 2: Goals of Project Diagram

Goals of Project Diagram



Logic Model			Outcomes & Impacts	
Inputs	Activities & Duration	Outputs	Short-term	Long-term
Client Discovering PLACE, UM Flint, Department of Outreach Beecher MS/HS faculty Researchers University of Michigan, School of Natural Resources & Environment Master's Project Team Advisory Board Discovering PLACE Beecher Faculty UM Faculty Advisor M'lis Bartlett, Project Mentor RESEARCH INPUTS: Case Studies Project Grow, Ann Arbor Catherine Ferguson Academy Simple Living Institute Interview/Focus Group Participants Beecher MS/HS teachers & faculty Beecher MS/HS students Discovering PLACE, UM Flint Department of Outreach Flint-based community partners (See Appendix 7) Literature Outdoor Classroom Research School Garden, Community Garden, & Place-based Education Research	Meetings Client Meetings Weekly Master's Project Team Meetings Bi-weekly meetings with Project Faculty Advisor Research Activities Literature Review Case Studies Site Analysis Outdoor Classroom Curriculum Design Interviews/focus groups with Beecher faculty & students Interviews with Community Partners Obtaining resources from Community Partners Interviews with potential project mentors/partners Final Steps Creation of Site plan & Curriculum Identify resources & stakeholders in Flint, MI for planning and implementation Finalize Literature Review and Case Studies Identify Best Practices for Overcoming Challenges to Implementing and Sustaining an Outdoor Classroom (specific to Michigan) Present to SNRE and Beecher Project Duration Jan 2012 - May 2013	To Client & Beecher Site Plan Outdoor Classroom Curriculum (with Lesson Plans) Guide for Best Practices for Overcoming Challenges to Implementing and Sustaining an Outdoor Classroom -1 to 3 year strategic planned phases TO SNRE Literature Review Case Studies - summarizing methods, results, & recommendations Copy of Site Plan, Outdoor Classroom Curriculum (with Lesson Plans, and Guide for Best Practices) Presentation to SNRE	Past Identify need(s) for outdoor classrooms and curriculum in Michigan High Schools Identify outdoor classroom and curriculum design, implementation benefits & challenges Identify project mentors and partners Present Identify need(s) for outdoor classrooms and curriculum specific to Beecher MS/HS existing project resources within Flint, MI and state-wide Future Project vision for student and community Identify anticipated challenges for implementation and maintenance Identify	For Master's Group Building capacity for outdoor classroom based projects Identify project adaptability to other Michigan High Schools Provide comprehensive guide to educators focused on place-based education that: 1) Achieves the goals of PLACE-based education 2) Promotes environmental stewardship within students and community 3) Provides knowledge for overcoming challenge and utilizing the benefits of an outdoor classroom For Students Promote long term environmental stewardship within the school and community Provide access to outdoor classroom learning Promote cross-curricular learning For the Flint Community

Appendix 3: Case Studies

Case Study 1: Catherine Ferguson Academy

About the School and Community

Catherine Ferguson Academy (CFA) is located in Detroit, Michigan. The school opened in 1986 as an alternative high school in the Detroit Public School system, with the intention of serving the educational needs of pregnant girls and teen mothers in the city. In addition to providing education and parenting resources for young

women, the school also offers daycare and early childhood education for the students' children. CFA remained a public school until 2011, when the Detroit Emergency Financial Manager proposed to close the school, one of several schools facing closure as part of a deficit reduction plan. After much public outcry and national media attention regarding the impending closure, the school was purchased by a local charter school operator, Evans Solution. The school reopened for the 2011-2012 school year as a for-profit charter school, part of the Blanche Kelso School District.

Approximately 78 percent of CFA students qualify for free or reduced meal programs, and 97 percent are of African American descent. During the 2010 school year, CFA had a 97 percent attendance rate and a 90 percent high school graduation rate, with the vast majority of students going on to either a two or a four year college; admission to at least one college is a graduation requirement. In 2004, CFA won the National Association of Secondary School Principals' Breakthrough High School award for outstanding achievement among schools with high poverty rates.



Appendices 56

Featured Place-Based Education Effort

Since its inception, CFA has had an educational farm on the school grounds. The farm was developed by a CFA science teacher named Paul Wertz, who continued to manage the farm until his recent retirement. The farm was founded with the intention of providing an opportunity for students to learn project management skills and have access to healthy food. It is largely dedicated to vegetable production, but also has goats, chickens, rabbits, and bee hives. Students assist in the daily operations of the farm, learning to grow vegetables, care for animals, and other self-sufficiency skills. The current farm manager, Dana Applebaum, encourages students to maintain as much control over the vision for and use of the farm as possible.

Teaching and Learning

Instructional strategies: Although the farm is not formally integrated into specific subject instruction at the school, students have the freedom to design and implement projects related to the farm that interest them as part of independent study. This project-based approach is meant to encourage student leadership and collaboration. Applebaum provides guidance and access to resources while students develop and implement projects. A major avenue for instruction is the student-led Farm Council. The council is made up of students who choose to participate in a weekly farm class led by Applebaum. Council members then take the knowledge and skills gained in the class back to fellow students in other classes, where they lead the farm-based lesson as an instructor. Applebaum is also hoping to develop a farm internship program, in which 2-3 students are hired as assistant farm managers during the summer months and are paid for their work.

Assessment methods: There has been no formal evaluation of the impacts of the farm, either on students' academic achievement or health, or on the local environment. This gap in knowledge is actively being remedied by Applebaum, who is currently attempting to develop an evaluation strategy.

Participants

School Administration

- Dana Applebaum is the farm manager at CFA, and the first person to be hired by the school for this role exclusively. Prior to the 2012-2013 school year, this responsibility was shared by teachers, students, and community volunteers.

Community Partners

- The Greening of Detroit AmeriCorps interns assist with the management of the farm and provide farming tools and resources when needed. They have been an active community partner in the farm since 2005.
- Local volunteers assist with daily farm maintenance and animal care, especially during the summer.

Contact Information

Catherine Ferguson Academy
2750 Selden Street
Detroit, Michigan 48208
(313) 596-4766
www.catherinefergusonacademy.org/

Dana Applebaum, Farm Manager
applebaumdana@gmail.com
ferguson-farm@sustainabledetroit.org

Case Study 2: Simple Living Institute and Homegrown Delights

About the Organization

Simple Living Institute (SLI) is a 501c3 tax-exempt non-profit corporation, founded in 2002 to teach people how to produce their own food, develop community gardens and school gardens and help create a network for gardening related activities in Central Florida. The entire organization is volunteer-based, with two full time volunteers: Shirley Silvasy and Tia Meer. Their mission is to scientifically research and develop working organic farms with effective soil, water, and wildlife conservation; to publish findings for the scientific and general community; and to provide cooperative education experiences empowering individuals and organizations as responsible stewards of their well-being and the environment. The main education programs take place in on a five acre Permaculture farm in Orlando that straddles the environmentally-sensitive Econlockhatchee River.

Homegrown Delights, LLC. is essentially a consulting gardening business that specializes in garden placement, installation, and management. Tia also provides coaching, educational classes, and a variety of garden products (i.e. rain barrels, organic fertilizer, worm bins, starter plants)—in short all resources needed to start and maintain a healthy organic garden of any size.



About Summer Garden Visits

During this summer I had the opportunity to work with Tia as an intern at Simple Living Institute as well as tour a few of the gardens that she helped set up and organize through her company. Two areas we visited a number of times are:

- *Killarney Elementary School Garden:* This garden is located in the central courtyard of the school and consists of six large raised beds which hold a variety of vegetables (i.e. tomatoes, cabbage, beans, eggplant) and flowers. The garden is mainly maintained by volunteers (PTO, PTA), but any member of the school can come to the beds, pick the produce, and take it home.
- *St. Mary Magdalene Church:* This community garden was requested by the Church Health Committee and is managed by church volunteers. The garden is located in a courtyard of the Church school and consists of five raised beds with a walking path in the middle. As with the Elementary School garden, there is a variety of seasonal vegetables and companion flower plants in the beds.

Teaching and Learning

Instructional strategies: At Killarney Elementary School there is no clear connection between classroom work and the garden, and many teachers do not utilize it. Students are encouraged to walk through the garden, look, and learn, but it is not formally incorporated into their daily routine. Few of the staff seemed to even be able to identify what was growing in each garden bed. In contrast, at St. Mary Magdalene Church the garden is incorporated into regular lesson plans. Each class has a garden work day and on the weekends parishioners and other Church volunteers sign up. There are events organized around the garden—Harvest Fest, Tomato Tasting/ Salsa Days—and all Church community members are allowed to take produce home.

Assessment methods: There have not been any internal or external evaluation conducted at either garden to determine how the garden impacts the students or the community members, and there does not appear to be any movement toward a formal evaluation.

Participants

LLC & Co-founder

- Tia Meer is the founder of Homegrown Delights, LLC. and co-founder of Simple Living Institute, both organizations that work to promote and enable community and school gardening in the Orlando area.

Contact Information

Tia Meer

16206 Hamilton Dr.
Orlando, FL 32833
(321) 217-8492
info@homegrowndelightsllc.com
www.homegrowndelightsllc.com



Case Study 3: Project Grow



About the Organization

Project Grow is a private, non-profit, community gardening organization that has been serving Ann Arbor residents since 1972. The focus of Project Grow is to facilitate organic community garden sites throughout Ann Arbor, and to inspire and educate people of all ages and gardening abilities to engage in community gardening on a variety of plot types, tended by volunteers.

Project Grow (PG) provides its services in identifying garden sites, arranging and preparing them for use, along with guidance and assistance in maintaining the network of gardens over time. Currently PG manages 18 garden sites of various sizes; from 3 plots at the Brook St. location to over 80 plots at the Country Farm site. Gardeners can be neighborhood residents, community members, local organizations, non- and for- profits, local schools, etc.). People of all ages are invited to grow food in the gardens, but certain plots are designated for specific age groups. Furthermore, PG classes are offered to anyone interested at little to no cost, covering various gardening topics, and providing assistance and training to each groups' specific needs.

Featured Place-Based Education Effort

Project Grow hosts a variety of classes and events, covering such topics as:

- Preserving harvest
- Practical advice
- Organic composting
- Gardening techniques

Gardeners can also enroll in the "Organic Certification Program" that is co-sponsored by Washtenaw Community College. The program teaches the knowledge and skills needed to establish and maintain organic lawns and gardens. Participants attend eight classes and contribute 20 hours of volunteer work, along with receiving a course pack and final exam.



Project Grow strives to provide the instructional and maintenance knowledge needed from the very start with the goal that gardeners' will become more self-sufficient throughout the season. Gardener-to-gardener interaction information sharing is highly encouraged- "It will happen anyway!" explains Kirk Jones, Project Grow Managing Director & Ex-Officio Board Member. Such experience and knowledge exchange promotes a stronger sense of self-efficacy, community building and ownership among community gardeners. Additionally, PG instructors always support gardeners by reminding them if they need help, "Just ask!" PG feels that making education and information easy to access is extremely important.

Teaching and Learning

Project Grow currently hosts adult, elderly, and youth programs with corresponding workshops. While PG educates participants on gardening, and its benefits, along with training for the planning and implementation process, PG does not follow any specific curriculum. However, successful, long-time gardeners and organizational leaders are often the hosts for these workshops, sharing their expertise with local residents. Most take place at The Leslie House of Leslie Science and Nature Center, a local community learning facility, but others can take place around the city, specifically at plot sites for easy access to participants.

Instructional strategies: Currently, Project Grow offers a large variety of "how-to" classes along with just-for-fun classes. All gardeners receive a member handbook, which gives an overview of PG, its goals, objectives, and programs, and also includes detailed information such as site-specific information on soil conditions, watering locations, and so on. PG's programs are designed to accommodate all ages and physical needs.

Participants

West Park Schools

- Clague Elementary
- Dicken Elementary
- Lakewood Elementary
- Mitchell Elementary
- Northside Elementary
- Wines Elementary

Community Sites

- Burh Park
- Catholic Social Services
- Chapel Hill
- County Farm Park A and Park B
- County Farm Park- Discovery Garden
- Discovery Garden
- Greenview
- Hillside Terrace
- Hunt Park
- Leslie Science and Nature Center- Discovery Garden
- Matthaei Botanical Gardens
- Platt

Project Grow Staff

- Kirk has been a part of Project Grow since 1985, starting as just a gardener, then became PG's newsletter editor. More recently, Kirk has served as part of PG's Board of Directors, working with residents all over the Ann Arbor Area.

Programs offered by Project Grow:

"Wise Roots"

- Raised bed garden plots, available in different heights
- Provide space for older adults in an inter-generational setting
- Easy access for participants
- Participants encouraged to garden together, along with the Wonder Sprouts and the Easy Access

"Wonder Sprouts"

- Organic Gardening
- Children 3 - 12 years
- Weekly meetings, share tips/tricks, trade seeds and produce, and are helped by the program coordinators
- Craft-based classes
- Monthly potluck with families (in the community)

"Easy Access"

- Especially for wheel-chair bound participants

Contact Information

Project Grow Community Gardens
P.O. Box 130293, Ann Arbor, MI 48113
Phone: 734-996-3169
<http://projectgrowgardens.org/>

Kirk Jones
Managing Director & Ex-Officio Board Member
kirk@projectgrowgardens.org

Take Away Points

Strategies and Considerations

As a result of conversations with the featured schools and organizations, we identified a number of common strategies and considerations that have proven important in the planning, implementation, and maintenance of these successful place-based outdoor classroom programs, particularly regarding the use of educational gardens.

Planning and Maintenance

- Long-term vision and planning
 - Establish a shared vision of the outdoor classroom and garden, outlining the goals of all participants and identifying the ones that they have in common
- Plan ahead for all scenarios
 - Those who are going to manage and care for the garden over time need to be considered and involved in the planning stages
 - A plan for management in the case that the program loses support in some area should also be drawn up
- Adapt to changing needs of participants
 - If the project appears to be too much work for an already overstressed teacher or volunteer, then it is best to not force the continuation of the project
- Don't be afraid to ask for help
 - Seek out supportive community partners when possible
- Consider the weather/climate when planning a planting schedule for a garden. Use plants that are adapted to the local environment.

Funding

- Grants
 - It is much easier to acquire grant funding for activities that are new and exciting, big, and attractive to the public, but more challenging to find funding for smaller, ongoing needs, such as to provide salaries, cover supplies and maintenance costs, etc.

Leadership, Workforce, and Volunteers

- Develop an organized group of volunteers that is invested in forming and maintaining the garden.
 - Example from Leslie Science and Nature Center's (LSNC): At St. Mary Magdalene Church community garden, a member garden of LSNC, the garden is situated near the church elementary school. There is a church health committee that helps organize parishioners, parents, and teachers in order to ensure that the garden is watered and maintained.
 - At schools, students and student groups should be engaged and encouraged to take on leadership roles.

- If possible, consider providing some form of compensation (money, school credit, etc.) to those involved in maintaining the garden space, or hiring a person to take on a leadership role.
 - Example from Leslie Nature and Science Center's Project Grow: Initially, a particularly motivated volunteer spearheaded the program on her own. However, once she left, LNSC struggled find someone to fill her shoes as a volunteer. The center decided to start compensating for the position, which is currently filled by a graduate student working part time.
- Tension can sometimes develop between volunteers and paid staff.
 - Example from Catherine Ferguson Academy: Volunteers are crucial in the maintenance of the school farm. In the past, however, there has been tension between volunteers and the school staff regarding leadership, control, and vision for the farm. Explicitly outlining the specific roles and responsibilities of staff and volunteers, as well as open and regular communication regarding this subject, can help mitigate this tension.

Awareness and Public Engagement

- Develop creative events that highlight the benefits and celebrate the successes of the project with the public.
 - Example from Leslie Science and Nature Center: Project Grow hosts an annual plant sale offering heirloom tomatoes, peppers and basil plants organically grown by local gardeners on local plots. This sale takes place for one weekend each May in front of Ann Arbor's People's Food Co-op. Project Grow also holds two other annual events: Seed Swap (February) and Tomato Tastings (August and September). These events focus on promoting the value of seed saving, heirloom tomatoes, along with general benefits of local and organic gardening practices.

Appendix 4: Teacher Surveys

Growing Our Place

Garden & Nature Trail Outdoor Classroom
Master's Project, 2013

We appreciate your feedback!

Please rank the proposed outdoor classroom elements in order of importance/preference (1 – top priority, 6 – lowest priority)

- | | |
|---|---|
| <input type="checkbox"/> Meeting space/Council Ring | <input type="checkbox"/> Vegetable garden |
| <input type="checkbox"/> Native plant garden | <input type="checkbox"/> Pond access (from trail) |
| <input type="checkbox"/> Butterfly garden | <input type="checkbox"/> Entrance Area |

Are there any other elements you would like to see implemented in the outdoor classroom?

What resources would you need to make use of the outdoor classroom? (Check all that apply)

- Lesson plan and activity examples
- Educational workshops (composting, gardening, etc.)
- Guest speakers/instructors from local organizations
- Visitor Guide for the outdoor classroom (map, descriptions of elements, etc.)

Other ideas:

Appendix 5: Student Surveys and Questionnaire

Name: _____

Grade: _____

Email address: _____

1. Do you have any interest in participating in the planning and design of the space?

Yes / No

2. Do you have any interest in participating in the construction/implementation of the space?

Yes / No

3. Do you have any interest in participating in the maintenance/management of the space once it is in place?

Yes / No

4. What would make you more interested in participating in any of the above activities? Would you be more willing to participate if there was some type of reward for doing so? If so, what would these things be? (i.e. school credit, payment, coupons, community service credit, etc.)

Appendix 6: Maintenance Recommendations

General Recommendations

Ensure that the site is well used:

- Make the outdoor classroom a regular part of school activity—please refer to the Lesson Plan Book on how to conduct a lesson or part of a lesson while utilizing the space.
- Conduct staff or student organizations meetings in the meeting space so that it becomes engrained in part of school life
- Have a rotation of volunteers take on weekly garden chores:
 - Weeding
 - Watering
 - Raking
- Ensure that other tasks are done to ensure a healthy and productive space:
 - Mulching
 - Fertilizing
 - Cover crops
 - Frost protection
- Contact members of PTA or community that can act as a skill bank for garden workdays
 - Community resources:
 - Deb Hamilton of Edible Flint Garden Starters; hamiltod@anr.msu.edu
 - Dennis Lackey of Food Corps; dennis.lackey@foodcorps.gov
 - Dora and Jack King of Karate-Ka; kingkarate@sbcglobal.net (810.785.5505)
- Encourage parents to walk the space with their students during school visits
- Recognize volunteers on the Beecher High School website
- A garden coordinator would be a great resource to ensure all maintenance and care. They can take part in the Garden Starters Training by Edible Flint.
 - <http://www.edibleflint.org/pages-and-content/what-we-do/what-we-do.html>
 - ~\$65.00 for full training and there are scholarship available as well
 - Annual training session and applications typically due mid January

Weekly Garden Chores

Weeding:

- Weed after watering.
 - To make removal of the roots much easier. If the soil around the root of the weed is dry, chances are the root is dry also and therefore more likely to break.
- Weed early in spring.
 - Again, this is when the soil is wet and the weeds are small.
 - Early weeding will cut down on what you have to do later in the season.
- Remove as much of the root as possible.
 - You can use a trowel to dig out the weeds. If the root remains in the ground, maintenance may be more difficult in the future.

- Make weeding into a game to inspire greater interest.
 - Be certain that students know what the weed looks like, and what a desired native plant is. This is especially important when young plants are sprouting, as they are difficult to identify.
 - Refer to Common Michigan Weeds (appendix)
 - One fun activity: Pick an example of a popular weed in the garden and place it in a bucket. Give each student/pair a bucket with a different weed. Weed for a certain period of time (10 minutes is a pretty good span) and then compare the relative abundance of each weed. Have a conversation about why some weeds grow larger or more prolifically than others.
- Allow some natives and weeds to thrive.
 - Weeding is best concentrated in the grow boxes, around the boxes and along the path to ensure that plants grow well and walkways are clear. In the areas where there are more native plantings, allow plants to grow...there might be butterfly larvae or chrysalis on the underside of leaves.
- Selective composting of weeds -- The school compost pile may not heat up sufficiently to fully break down weed material, so it is a good idea to keep problematic weeds and their seeds out of the compost pile.
- Pests – Be very observant, check the underside of leaves. Aphids, cabbage worms, white flies, etc can be removed by hand or with a gentle spray of water.
 - Slugs and snails are deterred by surrounding seedlings with a ring of eggshells.
 - Any diseased plants should be thrown away and not put into the compost bin.

Watering:

- Having well composted and mulched beds will mean less watering since the soil can retain moisture better.
- Watering schedules depend on the age of the plants and the season
 - If seedling/starts: water frequently (every day) until they are settled and growing
 - If it's summer, then more frequent watering is necessary
- Generally, it is better to deep water fewer times a week, than to water shallowly and more often.
 - This way, your plants build tolerance and can deal with fewer waterings
 - Water about one foot deep, so that plants have plenty to draw from for a few days
- Water in the morning or evenings to avoid the heat of the day
- Always water the soil, and not the plant. Water left on leaves can cause mold growth or disease.
- In the future, see if it's possible to install drip irrigation, which allows about 85% of the water to go directly to the root zone as opposed to overhead watering (70%).

Ranking:

- Always rake with the wind and downhill when possible
- Use tarps and rake leaves onto them in order to minimize the distance you rake the leaves
 - Can also use old sheets, cardboard boxes, or wheelbarrows
- Walk over your tarp of leaves to crush them down and make them less prone to fly away
- Use the leaves as mulch for you beds that you won't work until Spring
- Try to have a mix of leaf types to encourage microorganisms that will break down the leaves

Seasonal Chores

Mulching:

- To suppress weeds, to keep the soil warm in the winter, and to preserve moisture in the spring.
 - Lay down some sheets of newspaper between rows and cover with compost, hay, or mulch from the city
 - Lasagna layering: Lay down alternating layers of cardboard and newspaper to suppress weeds around the raised boxes
- Mulch can be turned into the soil the following season.

Cover Crops:

Helps cover your soil over late fall and winter and replenishes the soil for spring planting.

- Red Clover, most popular in Michigan.
 - Legume that will help fix nitrogen in the soil
- Crimson Clover
 - Faster growth in cooler months than red clover
- Grain Rye
- Winter Wheat
- Hairy Vetch
- Winer Peas
- Can also mix cover crops:
 - Common mix is cereal rye and hairy vetch
 - Ideally a cereal grain with a legume

Fertilizing:

- We recommend compost as a fertilizer for the garden.
 - Chuck McKay of McKay's seems really interested in local projects. If you give him a call and explain your project, you might be able to get some cheap/free compost for your beds. His number is 810-287-6893.
 - Mushroom compost is also a great addition to the soil
- Worm tea
- Fish Emulsion

Frost Protection:

When it appears that the temperature is dropping low or down to freezing, and you still have plants that are out and growing, you can protect them with row covers. Some common ones are:

- Floating row covers
 - Very lightweight, letting in air, water, and 85% ambient light
 - Can also be used as a way to deter pests
- General tips
 - Row covers can be weighed down with soil or plastic bottles filled with soil/sand
 - Wire hoops can be placed over the plants to support row covers
 - Waxed dental floss can be used to sew up torn areas
 - Clothespins can also be used to attach row covers to hoops, cages, or supports

For more detailed information please see:

<http://www.organicgardening.com/learn-and-grow/row-covers>

Preparing Extra Containers or Beds

Resources in Flint

- Habitat for Humanity Re-Store. These have lots of cheap lumber/ paint supplies/ outdoor furniture/ whatever. It might be worth it to wander through and see what you can repurpose for an outdoor classroom sometime.
- American Roots, Ortonville, MI
 - 248-627-8525
 - americanrootsnt@aol.com
 - wildflowers and native plants, many of the Oakland County genotype
- Wetlands Nursery, Jewel Richardson, Saginaw, MI
 - 989-752-3492
 - jewel-richardson@peoplec.com
 - Michigan native aquatic and wetland seeds, consulting, and installation
- Container plantings
 - Old containers can be cleaned with a combination of 1 part bleach to 9 parts wateramericanrootsnt@aol.com
- Raised beds
 - Always clear the weeds out first
 - Add any fertilizer or compost
 - Turn the soil thoroughly so that it's well aerated and make sure it does not compact down before planting
- If preparing garden soil from bagged products, a good recipe:
 - 1 part compost (bagged)
 - 1 part topsoil mix
 - 1 part shredded pine bark
- Thinning plants after planting is essential to their healthy growth
 - See the back of seed packet or seed catalog website for detailed instructions
- Carol Groat is the grow-lab coordinator for MSU extension. She seems very busy and is a little hard to get a hold of sometimes, but she and her husband David might be able to give construction advice.
 - They also have a contact at Flint's Kettering University who sets her up with volunteer help, so that might be a good resource if you're going to do a build day. You can try her at groatcarol@aol.com
 - Information from Dennis Lackey (see Community Partners list)

General Seasonal Tips

Fall

- Rake leaves
- Clean and weed garden beds
- Lay plant matter over the grow boxes to compost
- Mulch and plant cover crops
- Have row covers ready for cold snaps

Spring

- Get garden starts ready
- Remember to weed when they are small
- Prepare beds and soil by adding amendments and tilling to aerate
- Plan summer maintenance
- Mulch the boxes well so that water is conserved
 - Can use compost, composted leaf mulch, straw, or bark mulch and spread to two inches deep around plants.

Winter

- Clean and store garden tools
- Check on cover crops
- Plan next year's garden

Summer

- Weed and water
 - Remember not to water in the middle of the day
- Schedule both maintenance and harvesting
 - Might be fun to have garden parties

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http://www.ext.colostate.edu/4_h/school-garden.pdf

Common Michigan Weeds



Common Lambsquarters
(*Chenopodium album* L.)



Fall panicum (*Panicum dichotomiflorum* Michx.)



Common ragweed
(*Ambrosia artemisiifolia* L.)



Common Lambsquarters
(*Chenopodium album* L.)



Eastern Black Nightshade (*Solanum ptycanthum* Dun.)



Common ragweed
(*Ambrosia artemisiifolia* L.)



Jimsonweed (*Datura stramonium* L.)



Velvetleaf (*Abutilon theophrasti* Medicus)



Redroot and smooth pigweeds (*Amaranthus retroflexus* L. and *A. hybridus* L.)



Wild mustard (*Brassica kaber* D.C.)



Pennsylvania Smartweed and Ladythumb (*Polygonum pensylvanicum* L. and *P. persicaria* L.)

Appendix 7: Community Partners and Resources

COMMUNITY PARTNERS

ORGANIZATION	CONTACT	PHONE
Edible Flint	Deb Hamilton	
Crim Fitness Foundation	Dennis Lackey	
Crim Fitness Foundation	Robyn Wardell	
Crim Fitness Foundation	Sandy Selby, RD	(810) 235-7461
Michigan State University Center for Regional Food Systems	Kaitlin Koch	(517) 432 4525
MSU Center for Regional Food Systems	Colleen Matts	(517) 432-0310
North West Initiative	Joy Bladwin	517-999-2894
Growing Hope	Danielle Gartner	(734) 786-8401
Harvesting Earth Educational Farm	Dora and Jack King	(810) 785-5505
Sanilac FFA	Robert Sollman	(810) 648-4700x238
Earthworks Urban Farm	Patrick Crouch	313-579-2100 Ext. 176
Earthworks Urban Farm	Shane Bernardo	313-579-2100 Ext. 204
PE-Nut (Physical Education-Nutrition) Program	Virginia Sparkman or Mary Grill:	
MSU Extension	Carol Groat	

PHYSICAL RESOURCES

ORGANIZATION	CONTACT	PHONE
Habitat for Humanity ReStore		
McKay's Compost	Chuck McKay	(810) 287-6893
American Roots	Trish A. Hacker Henning	248-627-8525
Mary Ann's Michigan Trees & Shrubs	Mary Ann Menck	269-628-2474
Native Connections	Jerry Stewart	269-580-4765
The Native Plant Nursery LLC	Greg Vaclavek	734-677-3260
Wetlands Nursery, Inc.	Jewel Richardson	989-752-3492
Shiawassee National Wildlife Refuge		(989) 777-5930

EMAIL	WEBSITE	NOTES
hamiltod@anr.msu.edu	www.edibleflint.org	Great resource! Garden training.
dennis.lackey@foodcorps.gov		Food Corps 2012
robyn.wardell@foodcorps.org	http://www.crim.org/	Previous Food Corps Flint
sselby@crim.org	http://www.crim.org/	great resource! Slow on email, good on phone
kochkait@msu.edu	www.foodcorps.gov	In office wed. and thurs.
matts@anr.msu.edu	www.foodsystems.msu.edu	Oversees Food Corps for MI
londs@msu.edu foodsystemsproject@northwestinitiative	http://www.nwlansing.org/foodsyste ms.html	Variety of youth programs, community gardens, Farmer's Market
getintouch@growinghope.net	www.growinghope.net	Trains teachers to grow food in Flint
kingkarate@sbcglobal.net	http://kingkarate.org/index.php/harve sting-earth-farm	Potential field trip or volunteer opportunity
rsollman@sanilac.k12.mi.us	http://www.sanilacffa.org/contact.ht ml	
mcrouch@cskdetroit.org	http://www.cskdetroit.org/EWG/	Detroit, MI urban farm
sbernardo@cskdetroit.org		
mgrill@michiganfitness.org	http://www.michigannutritionnetwor k.org/content/pe-nuthealthy- classrooms-healthy-schools	May be good for students to mentor these younger children
groatcarol@aol.com		Construction advice; has contact at Kettering University= volunteering

EMAIL	WEBSITE	NOTES
		Building or garden supplies
		compost--possibly free or reduced
		wildflowers and native plants, many of the Oakland County genotype
americanrootsnat@aol.com		
mamenck@mei.net	www.maryannstrees.com	Michigan trees and shrubs
		Michigan grass seed, design, consultation, installation, and management
jerry@nativeconnections.net	www.nativeconnections.net	
plants@nativeplant.com	www.nativeplant.com	native plants and seeds, consulting, design and installation
		Michigan native aquatic and wetland seeds, consulting, and installation
jewel-richardson@peoplec.com		
Shiawassee@fws.gov	http://www.fws.gov/refuge/shiawassee/	

Appendix 8: Notice of IRB Exemption

To: Erin-Amanda Schulz

:From

There are no items to display

:Cc

Erin-Amanda	Schulz
Priyanwada	Ekanayake
Lindsay	Bienick
Michaela	Zint
Erin	Mette


Subject: Notice of Determination of "Not Regulated" Status for [HUM00062583]

:SUBMISSION INFORMATION

Title: Discovering PLACE Environmental Food Justice Landscape Project
 :(Full Study Title (if applicable)
 Study eResearch ID: [HUM00062583](#)
 Date of this Notification from IRB: 6/14/2012
 2012/6/14 : Date of IRB Not Regulated Determination

:IRB NOT REGULATED STATUS

Category	Outcome Letter Text
Quality Assurance and Quality Improvement Activities - Other	Based on the information provided, the proposed study does not fit the definition of human subjects research re- and UM policy). 26 CFR 21, 27 CFR 20 quiring IRB approval (per Although the results of your project may be published, program evaluations, self-assessment of programs or business practices, and other quality improvement projects do not require IRB review because in these cases, it is the activities rather than humans .subjects that are the objects of the study



Richard Redman
Chair, IRB HSBS

Appendix 9: Interview Questions for Community Partners

1. Why did your organization choose to pursue an outdoor classroom project? What are the overarching goals of the project?
2. What benefits are you hoping to produce? What benefits have you already witnessed?
3. What are the most significant challenges your organization has faced with the outdoor classroom so far?
4. What specific strategies would you recommend for overcoming those challenges?
5. How has your organization engaged students, teachers, and community members throughout the process (planning, implementation, evaluation) (specific strategies)?
6. How is your organization working to ensure that the program is sustained over a long period of time?
7. How has your organization spread awareness of the project? What communication/ advertisement tools have they used?
8. How have educators made use of the outdoor classroom and related the project back to indoor classroom learning (instructional strategies)?
9. How is your organization evaluating the effectiveness of their outdoor classroom program?

Appendix 10: Study Team Biographies

Lindsay Bienick

Lindsay is a born and raised Michigander. She grew up in Rochester Hills and then moved to Ann Arbor to pursue her undergraduate degree at the University of Michigan, where she received a B.F.A from the School of Art & Design and minored in Program in the Environment. It was through the process of art making that sparked her interest in environmental studies and strengthened her relationship with the environment. Her repetitive use of nature and interest in mimicking the natural world propelled her to share such experiences with others, leading to her current interest in psychology of the environment and behavior change. Other current interests are environmental education, urban agriculture, and communication, which she hopes to one day synthesize and draw connections throughout these areas into a means of educating societies, specifically urban, with how to deal with our changing world.

Priyanwada Ekanayake

Priyanwada is originally from Kandy, Sri Lanka, but has lived in Orlando, Florida since immigrating to the United States. She received her B. A. in Biology and Anthropology from Rollins College, where she was a pre-medical student. It was also during this time at Rollins that her passion for environmental education slowly formed, resulting in an environmental educator position at Heifer Ranch, the educational center for Heifer International. Her interests encompass environmental education, urban agriculture, and sustainable farming practices. In her free time, Pri enjoys cooking, eating, reading and crafting.

Erin Mette

Erin is from Belmont, Michigan. She graduated from Kalamazoo College in 2009 with a B.A. in Political Science, Environmental Studies, and Public Policy and Urban Affairs. Before beginning graduate school, she worked as an environmental educator at the McCall Outdoor Science School in McCall, Idaho, a children's ski instructor at Deer Valley Resort in Park City, Utah, and an outdoor educator at the Manice Education Center in Florida, Massachusetts. Her primary academic and professional interests include experiential environmental education, sustainable agriculture, and land-use planning. In her free time, Erin enjoys biking, swimming, reading, cooking, and traveling, and is an avid Detroit Tigers fan.



Erin-Amanda Schulz

Erin-Amanda Schulz received a B.S. degree in Linguistics and Biopsychology from the University of Michigan in 2009 and is currently working toward an M.L.A. (Masters of Landscape Architecture) at the University of Michigan's School of Natural Resources and Environment. Current research and design interests emphasize ecologically-based landscape design, inclusive design, food justice issues, and community engagement. Her interests stem from a fascination with the way these elements impact design processes and the physical places we help to create. With a strong focus on research and community involvement, she has worked as an educator for the Detroit Zoological Society, research assistant in a psychological study at the University of Michigan addressing issues of sexuality and social perception, and volunteered at a variety of non-profit organizations such as the Humane Society of Huron Valley and Matthaei Botanical Gardens & Nichols Arboretum.

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Appendix 12: Lesson Plan Book

Garden & Nature Trail Outdoor Classroom
SNRE Master's Project, 2013

Growing Our Place



Art

Language
Arts

Math

Science

Social
Studies

Lesson Plans for an Outdoor Classroom

Product of SNRE Master's Project Students,
University of Michigan



Growing Our Place

Garden & Nature Trail Outdoor Classroom
SNRE Master's Project, 2013

Lesson Plans for an
Outdoor Classroom

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II. Language Arts

IV. Math

V. Science

VI. Social Studies

The following Lesson Plans are compiled and composed for use in the Outdoor Classroom at Beecher Middle/High School. Following an overview of district goals and outcomes and an explanation of criteria critical in choosing activities, the following lessons will serve as an example of how a school garden or outdoor classroom can be integrated into traditional instruction.

Art

Language
Arts

Math

Science

Social
Studies

Art Introduction

Language Arts

Math

Science

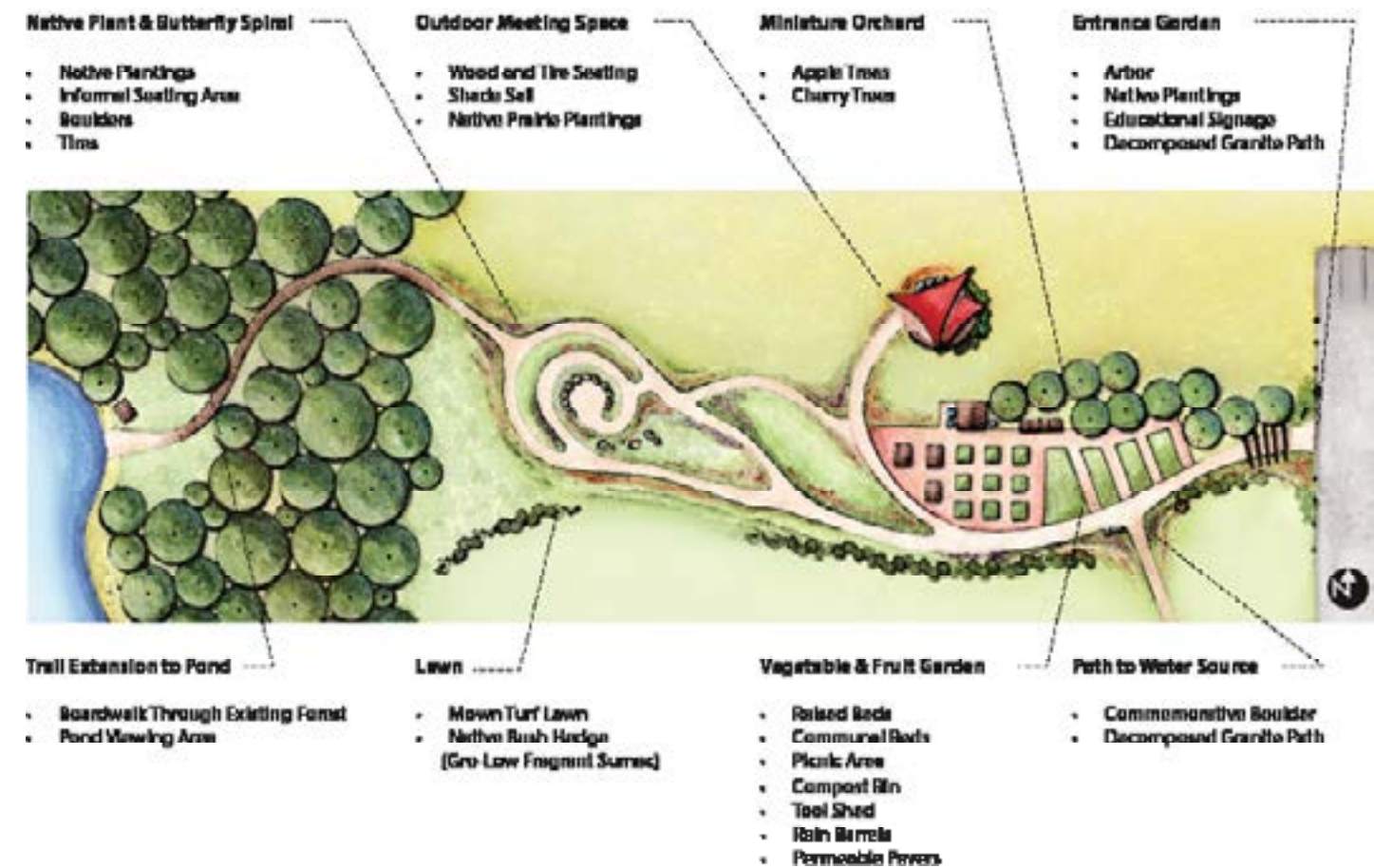
Social Studies

In the *2012-16 Strategic Plan* the Beecher Community School District emphasizes its desire to be a leader in K-12 education by providing high quality learning opportunities that are valued by all students and to create a culture where students reach beyond their potential through excellence in achievement. Integration of an Outdoor Classroom at Beecher Middle/High School will be one more step in fulfilling the district vision and can result in a number of outcomes at the end of schooling:

1. Build on the BCSD mission to empower students to be successful academically and socially in a global society.
2. Create a willingness to take risks and problem solve
3. Have clear communication skills—both written and speaking—that can also be used to teach others
4. Desire and passion to be a lifelong learner
5. The ability to think critically and independently

Below is the final conceptual site plan presented to Beecher Middle/High School at the culmination of the design process. This final plan was organized into a phased approach according to the recommendations and feasibility. However, the following lesson plans are meant to be used in the space during all and any phase in the

Conceptual Site Plan



What is an Outdoor Classroom?



Classroom?

Outdoor Classroom Elements

An Outdoor Classroom is, any outdoor, natural setting or space that is constructed and used by educators and students as a natural study ground to facilitate student exploration, inquiry, learning, and to achieve established learning objectives based on all subjects or curriculum. This may include, but is not limited to gardens, water areas, natural habitats, weather stations, compost sites, worm farms, and schoolyard observation sites. Outdoor classrooms are a teaching tool that incorporates hands-on active learning and allows educators move curriculum outdoors (EEAlliance 2010, Kimbro 2006).

Low Tunnels,
Season
Extension

Produce Stand



Meeting Space



Entrance Area



Vegetable & Native Plant Garden



Improved Trail



Activity Format

Guidelines for Choosing Learning Activities:

Tyler (1949) defines the term “learning experiences” as any interaction between the learner and the environmental conditions with which he/she reacts. This means that it is not the behavior of the instructor that drives learning—although the instructor is responsible for creating an environment where learning can happen, delivering material in a way that meets outcomes, and structuring the activities so that the desired behavior is exhibited by the learner. In addition, Dewey (1938) believes that genuine education comes about through experience and that students already have learning experiences, but we have to consciously examine them to see if they actually dissuade further learning or don’t connect to further experience. The learning experience is then based on active student behavior, but there are also five general principles that Tyler recommends instructors use in the creative process to establish proper educational experiences:

1. Practice: students must practice behavior required by objective to understand the topic
2. Rewards: students must obtain satisfaction from the required behavior, otherwise chances of the student engaging in the subject matter and retaining information is low
3. Perform: students must be able to perform the required behavior, therefore the instructor must understand the students’ prior knowledge and not make the process too difficult or easy.
4. Variety: the same objective can be accomplished with different experiences so different teachers can use different methods based on what they prefer.
5. Multiple outcomes: different outcomes culminate from the same experience, and both positive and negative learning can take place

In addition, Dewey recommends the following criteria:

1. Experiential continuum: make sure that the learning experiences are linked, are cumulative; this goes back to the negative possible effect of learning experiences—try to minimize those. So, the educator must consider the future at every stage of the teaching process.
2. Interaction: Dewey is specifically talking about the interaction of two sets of conditions—objective and internal—that create a situation. We need to not only consider the external conditions of a learning experience, but also the internal conditions that decide what experience the learner has.

Therefore, there are some characteristics for what learning experiences can be used for: developing thinking skills, acquiring information, helping develop social attitudes (through assimilation, emotional effects of certain kinds of experiences, traumatic experiences, and direct intellectual process), and developing interests. Thus, with an understanding that there are different learning experiences, the guidelines stressed for choosing learning activities in this report are:

- Active learning & reading
- Collaborative learning
- Connections
- Cooperative learning
- Linked to prior knowledge
- Empathy-building
- Linked to other disciplines
- Age & ability appropriate
- Authentic learning experience (link to the real world) that is context-based
- Provide opportunities for leadership
- Ownership of learning
- Engaging and incentivizes continued learning
- Learner choice (in process or product)

Art

Language
Arts

Math

Science

Social
Studies

Lesson Plans & Activities

Art

Visual
Conceptual
Environmental

Audubon Adventure: Record the Natural World

Subjects:

Art, Life Science

Setting: Classroom, Outdoor
Classroom, Garden, or Field space

Instructional Time:

2 class periods

Learning Objectives:

The students will pick a specimen from their local environment to study and translate into a painting.

Lesson Summary:

Enjoy being outdoors? Interested in art? Combine both! John James Audubon was a scientist and self-taught artist who did just that by studying the natural world and creating exquisitely detailed paintings of birds and nature. You can follow in his footsteps with this art project that has you create a naturalist painting. Use this guide to spend some time outdoors, appreciate nature, and learn to record the world exactly as you see it.

Advanced Preparation:

Make copies of Audubon Adventure Worksheet

Source

Education.com - Marik Berghs, Jessica McBrayer

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<http://www.education.com/activity/article/audubon-adventure-record-nature/>

Grade Level

Expectations:

ART.VA.I.HS Apply skills and knowledge to perform in the arts.

ART.VA.II.HS Apply skills and knowledge to create in the arts.

ART.VA.IV.HS Understand, analyze, and describe the arts in their historical, social, and cultural contexts.

ART.VA.V.HS Recognize, analyze, and describe connections among the arts; between the arts and other disciplines; between the arts and everyday life.

Supplies:

- Brushes
- Erasers
- Watercolors
- HB or softer pencils, found at any art and hobby store
- Pencil sharpener
- Natural specimen to draw (flowers, bushes, leaves, and other plants)
- Watercolor paper
- Containers for water

Art

9-
12

Audubon Adventure: Record the Natural World Worksheet

Step 1

Pick a Specimen. Go outside! Take a nature walk in your backyard or other area with plants, trees, and wildlife. As you walk, observe the natural world around you and note plants that catch your interest. For your painting, you'll want a natural specimen to draw such as a plant with stems, leaves, flower, bulbs, and roots intact, if possible. Once you find a specimen, sit down to draw outside or, if you're allowed, carefully take the plant home with you.

Step 2

Reference. Take out your drawing paper. You can fill in this part later, but for reference's sake, print the following words:

Plant Name: _____ Where observed: _____ Classification: _____

Step 3

Placement: Lightly, block out the general shape of the flower and stems, branch and leaves, and seeds and decide the most pleasing way to place them on your paper.

- You may want to divide the drawing, showing the stem and everything above ground and maybe the root or bulb inside a circle or outline to the side.
- Take a while to study how the plant is put together before you go any further with your drawing.
- As you start drawing, remember that observation and detail are the most important aspects. Be prepared to slow down and take in all minute details. A botanical artist can take as long as 15 hours to complete one painting of a flower!

Step 4

Details: Note and record details.

- Pay close attention to various lines, veins, and spots on flowers; thorns and hairs on stems and branches; bundle scars on twigs; or the number of needles in a pine cluster. These are not accidental events, and to give your drawing accuracy, you will need to record in words and images. Leaves, for instance, are rarely perfect in nature; they will have tears and insect marks and bites
- Record what is rather than what you expect to see.
- Make notes about your "specimens" around the edges of your drawing.

Step 5

Color: Watercolor or colored pencils work well for botanical or other nature studies.

- Watercolor is "built" by laying in color from lightest to darkest. Don't use black if you want to show natural color. Shadows are usually colors and very rarely include black.
- Start with washes. This means using lots of water in your color and not much pigment. This gives a "washed out" transparent result and works well for backgrounds of leaves and petals. When the wash is done, let it dry completely.
- You can now use a color with less water and lots more pigment to "draw" with your paintbrush. For instance, use green to draw the veins and mid-veins of a leaf or petal over the dry washes.
- You do not need to color the entire drawing, just parts of it to see how colors blend or fade, to note colors of shadows, and to remember which parts of the plant are what color.
- Let your painting dry.

Use this same general template for insects and other specimens that students collect. Remind students that careful observation of details and practice will give them excellent results.

For more information on naturalist paintings, check out Audubon's work. Another artist to study is Beatrix Potter, who created wonderful journals of the animals and plants she observed and lived. Her studies helped make her art accurate as well as charming.

Extention Ideas:

Lesson: *Document plant growth in sketchbooks*

Many artists have also been scientists - John James Audubon, Leonardo da Vinci and more. These artists studied nature and wildlife, documenting what they saw in collections of drawings.

Students begin by planting seeds in planters and as seedlings sprout, students draw the progress of their plants in sketchbooks, documenting the growth at specified intervals (weekly or every few days). This continues until the plant blossoms, bears fruit, or even until it withers. ; students write scientific notes by each drawing as well. This activity demonstrates a plant's life cycle, teaches students what it needs to grow, and also allows them to develop their drawing and observation skills.

Source (Extension)

Lesson Plans Integrating Art, Gardening and Science, 2010 Becca Swanson.
<http://voices.yahoo.com/lesson-plans-integrating-art-gardening-science-5598158.html?cat=25>

Native Plant Identification and Collection

Subjects:

Art, Science

Setting: Classroom, Outdoor Classroom, Garden, or Field space

Instructional Time:
2 class periods

Learning Objectives:

The students will be able to:

- Collect and press native plants. (sketch plants in field journal)
- Identify distinguishing characters
- Use field guides and/or dichotomous keys to identify plants (depending on level of students and course.)
- Identify native plants by common and scientific name.
- Categorize plants by family, genus, and species.
- Create booklet, journal, file, file box, or notebook of native plant specimens.

Procedures:

Day 1:

1. Set guidelines for being outside as a class.
2. Assign partners for plant collection.
3. As a class walk quietly to field location (could instruct students to walk single file and observe surroundings silently.)
4. Instruct students to collect plant specimens carefully, taking enough of a sample to see necessary characters, but without damaging entire plant or general population.

Grade Level Expectations:

ART.VA.I.HS Apply skills and knowledge to perform in the arts.

ART.VA.II.HS Apply skills and knowledge to create in the arts.

ART.VA.IV.HS Understand, analyze, and describe the arts in their historical, social, and cultural contexts.

ART.VA.V.HS Recognize, analyze, and describe connections among the arts; between the arts and other disciplines; between the arts and everyday life.

Supplies:

- Field journals or paper booklet
- Native plant field guides and/or dichotomous keys
- Plant presses or cardboard and books for pressing
- Contact paper or packaging tape
- Plant storage method: file folders, 3 ring binders, or 5 x 8 inch note cards and ring or storage box.

5. Determine number and/or species of plants expected to be collected.
6. Students should keep samples in journal or paper booklet. For each plant take note of plant's location and date collected. Using field guides, students may begin to identify plants in the field and make notes in journal.
7. Take plant samples back to lab and carefully arrange and press in plant presses. (Stacks of cardboard and text books may also be used.) Keep track of which plant is which by numbering them in field book and on paper in plant presses. Leave until plants have been effectively pressed and dried (may take multiple days.)

Day 2:

1. When plants are dry and pressed students will create a booklet, notebook, file box, file folder, or journal of native plants. Determine whether students will put specimens in a notebook, journal, file folder, booklet, or on note cards in a file box or on a ring.
2. Instruct students to carefully lay plant specimens on paper (depending on what they are making) and cover plant with contact paper or packaging tape to preserve them. Leave room next to specimen or on back of paper to write name and characters of plant.
3. Instruct students to use field guides and dichotomous keys to identify plants and classify them by family, genus and species. Students should write distinguishing characters and common and scientific names of each plant. (Note: Preteaching on use of field guides and dichotomous keys may be necessary. Also, depending on level of course and students, instructor may choose to aid in plant identification. Some keys are very difficult to find at the appropriate level.)
4. Students should put plants in order by family.

Assessment:

1. Completion of artistic personal field guide to local plants.
2. Test students on local plant specimens with or without the use of their specimens and notes.

Alternate Plan

Instead of collecting plants, instruct students to sketch plants, noting distinguishing characters in field. Drawings must be detailed. Then have students work in lab to identify plants using keys and field guides based on their drawings. Preteaching of plant sketching and making accurate observations is necessary to do this.

Source

Rima Givot, Sisters High School (Oregon, USA), 2009

<http://www.nutnet.umn.edu/files/nutnet/NutNet-Lesson-plan-plant-field-collex-ID-GivotRET.pdf>

Native Plant Artistic Lesson Series

Subjects:

Art, Science

Setting: Classroom, Outdoor Classroom, Garden, or Field space

Instructional Time:
2 class periods per lesson

Learning Objectives:

Students learn best when they build knowledge across the curriculum and make connections between subjects. By using Art lessons that integrate with Gardening and Science one can:

- Teach students an appreciation and respect for nature and Art
- Build upon student interests, developing life-long learning, teaching students about history
- Encourage artistic expression
- Help students use both sides of their brain - the analytical/scientific and the creative - at the same time.



Grade Level Expectations:

ART.VA.I.HS Apply skills and knowledge to perform in the arts.

ART.VA.II.HS Apply skills and knowledge to create in the arts.

ART.VA.IV.HS Understand, analyze, and describe the arts in their historical, social, and cultural contexts.

ART.VA.V.HS Recognize, analyze, and describe connections among the arts; between the arts and other disciplines; between the arts and everyday life.

View still-life collage Art here: <http://collagemuseum.com/Bakers/Bakers7/exhibit/exb27.html> and here: <http://collagemuseum.com/Bakers/Bakers7/exhibit/exb88.html>.

Source (Extension)

Lesson Plans Integrating Art, Gardening and Science, 2010
Becca Swanson.
<http://voices.yahoo.com/lesson-plans-integrating-art-gardening-science-5598158.html?cat=25>

Lesson: Create a cut-paper still-life collage

Pablo Picasso, Eric Carle, Romare Bearden, and Henri Matisse are four modern artists that have experimented with Collage - creating an image with glued paper. Still-life is art made by observing unmoving objects. Students gather plants and flowers from their garden, along with other objects, and arrange an interesting still-life composition. Using patterned, solid, textured and painted paper, students cut or tear paper and arrange it to create a still-life collage.

Lesson: Create a relief-print in the style of Andy Warhol

Besides soup cans and celebrities, Andy Warhol also created a series of flower prints, seen here: http://www.artbrokerage.com/images/warhol/warhol_flowers1970_1.jpg.

Students create drawings based off the plants they have grown or witnessed outdoors in a garden. Students transfer their drawings to a printing plate and carve their images into linoleum (look for safe kid-friendly kinds in catalogs), balsa blocks or flat Styrofoam panels. The printing plates are rolled with ink or paint, then printed onto paper. Besides fine Art, these prints may be made into greeting cards or invitations to 'garden parties.



Lesson: Digital artwork - gardening style

Students take digital cameras to their gardens, and create a photo-documentary of their plants, seeds, blossoms, even their gardening equipment - shovels, stakes, etc. After uploading, students use Photoshop or other photo software to manipulate the images - using filters, effects, hue/saturation changes and more. The resulting digital art can be printed, framed, turned into calendars, or more.

Lesson: Sculpt miniature garden jewelry/sculpture

Students honor their blossoming gardens in sculptural Art. Observe their plants in real life, sketch drawings, or take photographs for reference. Learning about working in three-dimensions, students use Sculpey polymer clay (or other brands), to experiment with color-mixing colors, create textures, use molds, and sculpt forms and details in miniature. After baking, sculptures can be decoration, gift accents, ornaments, hanging art sculptures, or made into jewelry pieces - charms, pendants, earrings, etc. Read [10 Quick Tips for Sculpting in Polymer Clay](#) or [Sculpt a Rose and Other Flowers out of Polymer Clay](#) for help.



Botany and Art and their roles in conservation

Subjects:

Art, Science

Setting: Classroom, Outdoor Classroom and/or Garden

Instructional Time:
2 class periods

Learning Objectives:

The students will be able to:

- Collect and press native plants. (sketch plants in field journal)
- Identify distinguishing characters of plants.
- Use field guides and/or dichotomous keys to identify plants (depending on level of students and course).
- Ability to illustrate observation skills and attention to detail

Background: Fragile Beauty

More than 20 percent of the world's 350,000 known plant species are in danger of extinction, according to the estimates of conservationists. Thousands of these plants have never been described by science. If any are lost, they will be lost even to human memory.

Botanists around the world are racing to make records of threatened species, the first step in any conservation effort. Working along with them are botanical artists, who provide "visual descriptions" of plants. Some of the artists use the latest illustration software. Others, like Alice Tangerini of the Smithsonian National Museum of Natural History, continue working with pen or brush.

But what can an illustration tell us that a written description cannot? And why draw or paint a specimen when you can just take a picture?

Source

Smithsonian in Your Classroom, 2011
Smithsonian Institution, SmithsonianEducation.org

Grade Level Expectations:

ART.VA.I.HS Apply skills and knowledge to perform in the arts.

ART.VA.II.HS Apply skills and knowledge to create in the arts.

ART.VA.IV.HS Understand, analyze, and describe the arts in their historical, social, and cultural contexts.

ART.VA.V.HS Recognize, analyze, and describe connections among the arts; between the arts and other disciplines; between the arts and everyday life.

Students consider these questions in the first lesson of this issue. They compare representations of endangered plants in three forms: illustration, photograph, and dried specimen. In the second lesson, they try their own hands at botanical art, using some of Tangerini's methods.

Along the way, as they look closely at plants, they consider questions that conservationists themselves must ask. Are some plants more valuable than others? Is plant life as valuable as animal life? Are all species of life equally worth saving?

All of the illustrations in the issue appear in the traveling exhibition *Losing Paradise? Endangered Plants Here and Around the World*, organized by the American Society of Botanical Artists in collaboration with the Smithsonian. To see an online version of the exhibition, including video interviews with Smithsonian staff featured in the issue, visit smithsonianeducation.org/botany.

How a Plant Becomes Endangered

"All habitats on the Earth are constantly subjected to alteration and change," says Gary Krupnick, head of the Plant Conservation Unit at the Smithsonian's National Museum of Natural History. Habitat alteration leads to species extinction. "Severe alterations by human activities," as Krupnick puts it, have led to a rapid rise in the extinction rate—as much as a thousand times the natural rate.

Among those human activities, Krupnick lists forest clearing, agricultural expansion, suburban sprawl, dam construction, the introduction of invasive species, and, in the case of aquatic plants, commercial fishing. Along with these is the burning of fossil fuels and the overarching threats of climate change.

The details of habitat alteration and the endangerment of plants vary from habitat to habitat and from plant to plant. To take just two examples out of thousands:

Remya kauaiensis, a member of the aster family with no common name, is native only to steep cliffs on the Hawaiian island of Kauai. One of the main threats to its survival has been the degradation of the cliffs caused by feral goats and pigs, which were introduced to Hawaii in the nineteenth century. A more recent threat has been wildfires ignited by weapons practice at a nearby army base.

Another member of the aster family, Schweinitz's sunflower (*Helianthus schweinitzii*), is native only to the Piedmont region of North and South Carolina. As its name suggests, it requires full sunlight. As late as colonial times, its natural range in an otherwise wooded region was a miniature prairie, complete with bison. Prairie fires and the grazing of the bison provided necessary "disturbances" for its survival. Today, with its prairie gone, it thrives only where human activity has paradoxically provided similar disturbances—along the clear-cut paths of power lines or in the margins of roads.

So, in the case of one: goats and pigs and too much fire. In the case of the other: no bison and not enough fire.

This, however, is an oversimplification that leaves out many links in the chain reactions of species loss—the interconnectedness of death as well as life. In the case of the Hawaiian plant, for instance, the degradation of the cliffs has paved the way for invasive plant species, which bring new competition. One of these alien species, molasses grass, provides a fuel for the spread of wildfires.

Where Botany Comes In

“To save endangered species we must know about their basic biology,” says Krupnick. “On a greater scale, to save biodiversity, we must first know what it is and where it lives. This task of discovering, identifying, and describing plants is the central work of botanists at museums and botanical gardens.”

Krupnick and his colleagues use data from the Smithsonian’s herbarium, a collection of nearly 5 million dried plant specimens, to determine which plant species may be endangered and to identify habitats of greatest biodiversity. It is all a matter of priorities: if a species or a habitat is about to disappear, it should get the most urgent attention.

As a means of prioritizing, the Smithsonian uses a flowchart that places a species into one of three categories—“likely extinct,” “not threatened,” or “likely threatened”—on the basis of answers to a series of questions. (See below.)



Scientific organizations around the world are similarly involved in determining the health of species, though each has its own method. The Smithsonian has tested its method by asking the questions about species already deemed endangered or extinct by the International Union for the Conservation of Nature (IUCN), the largest environmental network in the world.

The IUCN has no power to grant legal protected status to a threatened species. In the United States, this status is assigned at the federal level by the U.S. Fish and Wildlife Service, which administers the Endangered Species Act of 1973. Other countries grant protection under similar laws. But it is the work of scientists that gives a basis for all conservation action.

“Governments generate policies to save threatened and endangered species,”

says Krupnick. “Historically, plants have been ignored in favor of the ‘charismatic megafauna,’ such as pandas, bald eagles, or orangutans. When high school and college students are asked to name an endangered species, less than 5 percent will name a plant species. It is up to museums and botanical gardens to raise awareness and draw attention to endangered plants.”

Where Art Comes In

A good scientific record of a plant species requires pictures as well as written descriptions. That is where artists like Alice Tangerini come in. Tangerini is the staff botanical illustrator at the Smithsonian. Her task is to depict plants with more accuracy and detail than even the latest digital photography can offer.

“What a digital camera always produces is a digital image made of pixels,” she says, referring to the smallest elements of an image. “The larger these images are projected, the more visible the pixels become. An illustrator viewing a subject through a microscope may keep enlarging the subject to see detail without the interference of pixelation.”

An illustrator can also emphasize specific details—the details a scientist is studying—and eliminate the details that are irrelevant and perhaps distracting. And while a photograph of a plant shows one member of a species, with all of its individual traits, an illustration can better represent a *typical* member of a species.

While many scientific illustrators do all of their work on a computer, Tangerini continues to work with traditional tools. The drawing stylus of computer illustration is less sensitive to her touch than the fine pens and brushes she uses. Then, too, the software is less time-saving for her than it is for other kinds of illustrators. Someone using software to draw an insect, for example, can complete one side of the specimen’s body and then copy and paste to fill in the other side. Insects have a bilateral, or two-sided, symmetry; plants do not. Drawing a plant this way, says Tangerini, “will introduce a false interpretation.”

Bringing an artist’s eye to science is one of the satisfactions of Tangerini’s work. The flip side is that she can’t help bringing a scientist’s eye to art. In an art museum, she finds herself homing in on the depiction of plant life in paintings—a bit like a geologist seeing Leonardo’s *Virgin of the Rocks* and going straight for the rocks. She can’t help looking for simplifications and inaccuracies.

“I’m reminded of seeing the movie *The Last of the Mohicans* with botany friends,” she says. “Although the setting was supposed to be upstate New York, all of us noticed the presence of magnolia trees, which do not occur naturally north of Virginia. The movie then became only interesting for its botanical errors!”



Lesson 1

Look at Disappearing Plants

This lesson introduces the subject of plant conservation with a look at six endangered species. It begins with a simple identification game and ends with students making the kind of big decision that conservationists must make: *Which of these species would we try to save first?*

WORKSHEET:

Please see Appendix 1

Procedures:

Step 1

On each of the six pages (Appendix 1) is an illustration, a photo, and a dried specimen of an endangered species. Go to smithsonianeducation.org/botany to print specially formatted PDF versions of those images. Cut out the images and arrange them into three sets: illustrations, photos, and dried specimens.

Step 2

Ask students to match the images of the six species. With young students, focus attention on the plants' most salient features—the leaves. When the matching is complete, begin a discussion of the students' reasons for their choices. To equip them with some vocabulary for the discussion, display the leaf chart in Appendix 1.

Step 3

Hand out copies of the six pages (Appendix 1) so that students can better compare the illustration, photo, and dried specimen of each species. As a class, consider: *If a scientist can take a picture of a plant, are there any advantages in having an illustration?*

One of the major advantages is the depiction of details seen only through a microscope, such as the seeds of the Atamasco lily. The illustrator can also emphasize specific details (such as the roots of the goldenseal), eliminate distracting details (such as the other species seen with the lady's slipper), and show many of the parts of a plant at once.

Step 4

Let students know that plant conservationists must often prioritize their attempts to save endangered species. Ask them to imagine that they are conservationists. As a class, use the information on the six pages to decide: *Which of these species are most in need of attention? Do any seem more worth saving than others?*

The students' considerations might include the number of surviving specimens, the size and vulnerability of the natural range, and even the plant's value, or potential value, to people.

Follow-Up Discussion:

As a class, consider: *If an endangered animal like a panda goes extinct, is it a greater loss than if a plant goes extinct?*

If students answer yes for emotional reasons, let them know that scientists often respond in the same way. As British naturalist Colin Tudge writes: "the big, showy animals [are] the most intelligent, and intelligence is a rare biological quality that we surely ought to respect."

Also consider: *Is animal life dependent on plant diversity?*

In the view of Smithsonian botanist Gary Krupnick: "Each species has a place in the world for a reason. It's food for an animal. It's a host to a fungus. It's a cog in a wheel, and when you take out one little piece the whole thing falls apart. Alternatively, each species might also be useful for humans."

As an example of usefulness, he cites the case of the rosy periwinkle. Medicinal properties of this plant helped to increase the survival rate of childhood leukemia from 10 percent in 1960 to the current 90 percent. Today, the plant's native habitat in Madagascar is almost completely gone.

"There might be the cure for AIDS or cancer in any species," says Krupnick. "Before that species goes extinct, we should do everything we can to understand it."

Source

Smithsonian in Your Classroom, 2011
Smithsonian Institution, SmithsonianEducation.org

Lesson 2

Botanical Illustration

By Alice Tangerini

Alice Tangerini has illustrated more than 1,500 species of plants for the Smithsonian. Here she adapts her methods for a classroom lesson. Because color is superfluous to the recording of a species, she works only in pencil and ink. All that is needed for the lesson are pencils, fine black markers, tracing paper, photocopy paper, and access to a photocopier.

As a botanical illustrator, I am the eyes of the botanist. My illustrations describe the plant and its parts in a visual form. Let me tell you how I do it.

First, I make a full-size photocopy of a herbarium specimen. I use this to trace the overall outline of the larger parts of the specimen, such as the leaves and how they are attached to the stems.

Next, I make several pencil sketches on translucent drafting film of the various parts of the plant. Throughout this process, I consult with the botanists who are publishing the scientific description.

Once the final pencil sketches are approved by the scientists, I arrange them in a 12" x 15" composition. Sometimes I scan the sketches into a digital file so I can resize them to fit.

Lastly, I place another transparent film over my sketches and trace the final image in ink. At this stage, I add many fine details that show the visual texture of the original specimen.

Through the years I have demonstrated a modified version of this method at schools in the Washington, D.C., area. In just a few simple steps, your students, too, can make a botanical drawing.

Procedure:

Step 1

First, the class will gather real plants and photocopy them. Choose plants or part of plants (such as leaves or leafy or flowering branches) that will fit within an 8.5" x 11" copy. Make sure that each specimen can be pressed down fairly flat against the glass. Cover the specimen with a sheet of white paper. Make the copy using the photo or halftone setting to pick up the subtle tones of the plant and the pattern of the veins of the leaves. Experiment with darker and lighter exposures.

Step 2

Use the photocopy as the "master." Place a sheet of tracing paper over it. Trace the plant outlines in pencil, focusing on the shapes of the structures. Then fill in details such as leaf veins.

To better see the drawing, remove the tracing sheet from the photocopy and place it on a sheet of blank white paper. Refine the drawing by referring to the specimen itself. Add details that may have been overlooked in tracing.

Step 3

For the final drawing, use an ultra-fine black marker. Place another sheet of tracing paper over the pencil drawing. Secure the sheets with tape at the corners. Trace the previous tracing with the marker, but leave out any of the sketchy pencil lines. The plant structures should be neatly and clearly defined.

Step 4

To draw any detail of the specimen that is too small to trace—a small flower, for instance—go back to Step One and make an enlarged photocopy of the detail. You might include a ruler in the photocopy so that you'll have a measurement of the detail in its actual size.

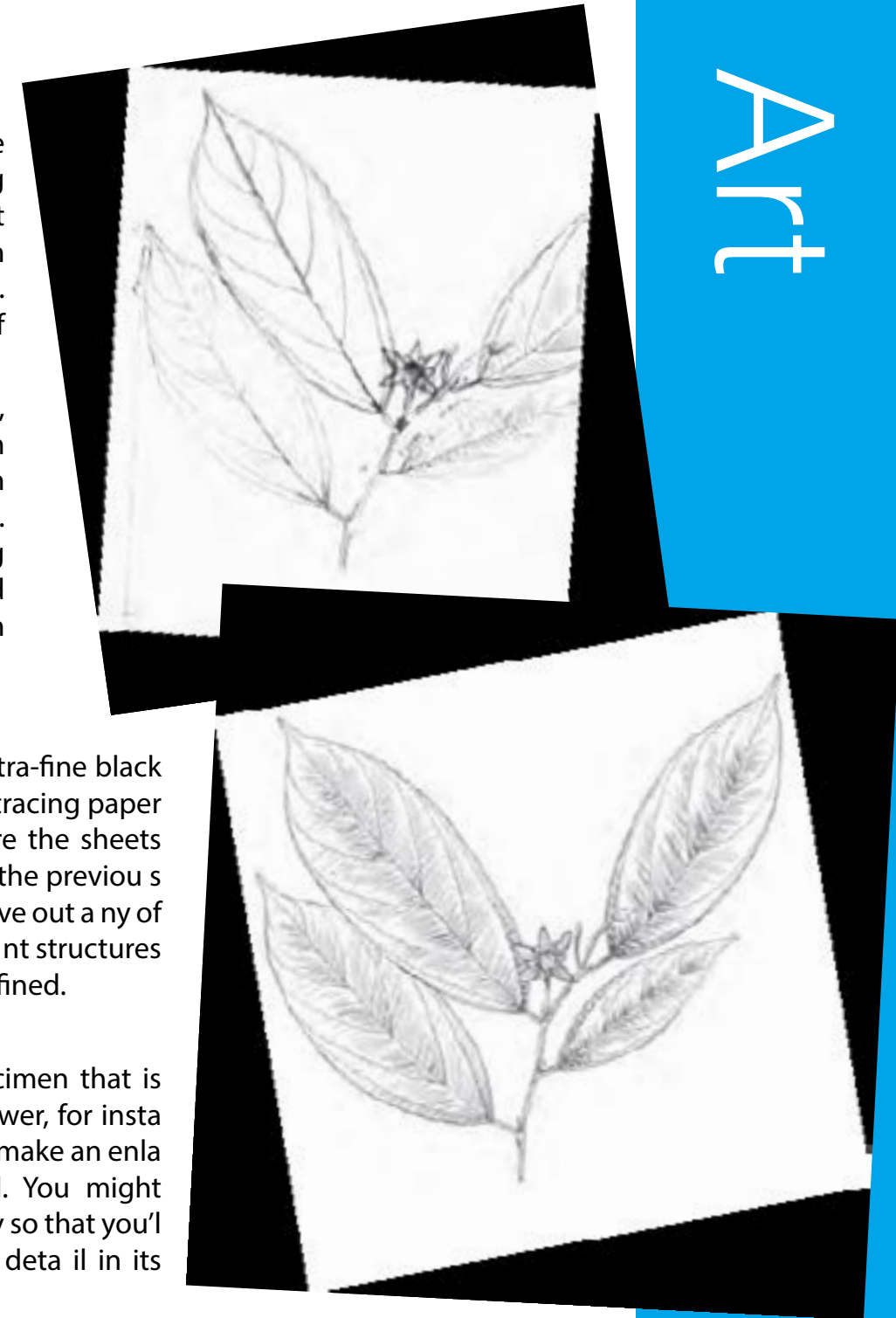
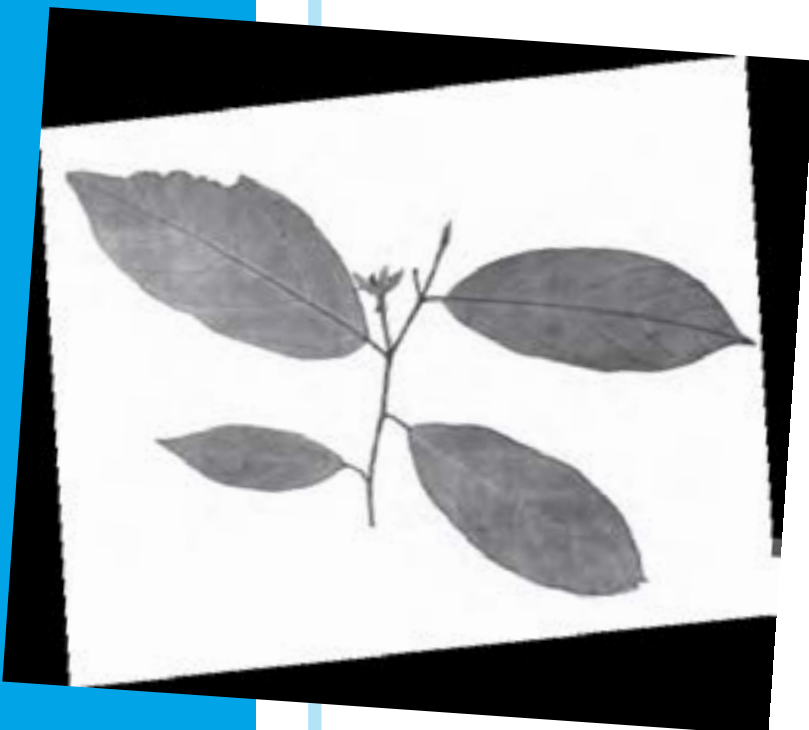
Repeat the steps, but include this drawing of the detail on the same sheet as the final tracing. Be sure to include the scale of the enlargement.

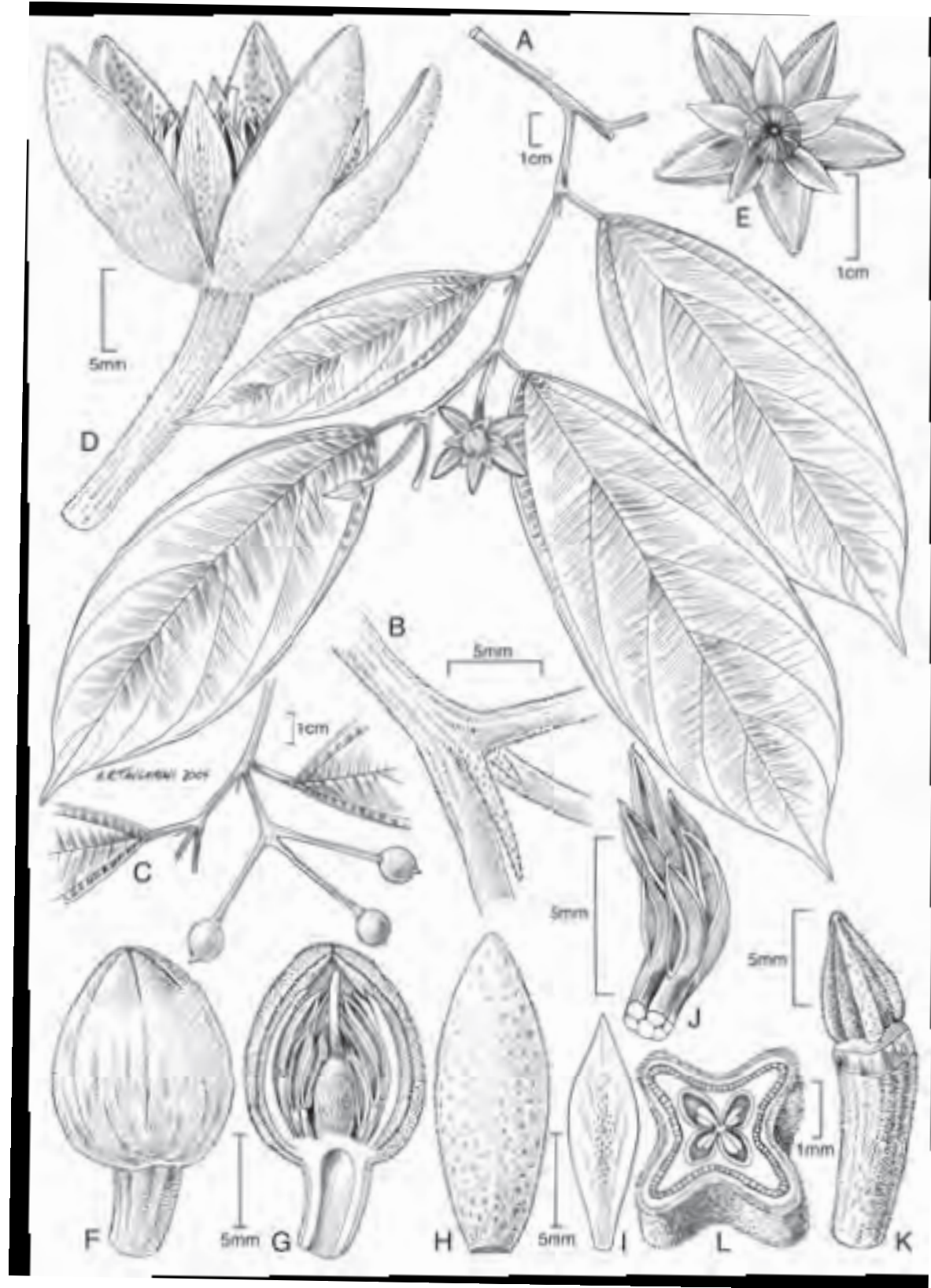
At this point, apply any finishing touches to the drawing, such as line shading or stippling, to give the plant a more three-dimensional appearance.

You now have a botanical illustration!

Source

Smithsonian in Your Classroom, 2011
Smithsonian Institution, SmithsonianEducation.org





The Environmental Art Movement

Subjects:

Art, Science

Setting: Classroom, Outdoor Classroom

Instructional Time:
2 class periods

Grade Level

Expectations:

ART.VA.I.HS Apply skills and knowledge to perform in the arts.

ART.VA.II.HS Apply skills and knowledge to create in the arts.

ART.VA.IV.HS Understand, analyze, and describe the arts in their historical, social, and cultural contexts.

ART.VA.V.HS Recognize, analyze, and describe connections among the arts; between the arts and other disciplines; between the arts and everyday life.

Lesson Summary:

In this activity, students will expand their definition and understanding of art, become familiar with various examples and concepts of environmental art, and create their own environmental artwork.

Learning Objectives:

At the conclusion of the lesson, students will be able to:

- Recognize environmental art examples and explain goals of movement
- Identify various approaches within the environmental art movement
- Express their relationship with the environment through the creation of their own work of environmental art

Background: Fragile Beauty

The environmental art movement, also known as Land Art, Earthworks, or Earth Art, originated in the late 1960s. At that time, a small number of artists turned away from urban-based, commercial art. Responding to a growing awareness of environmental issues, they typically worked on a large scale in remote locations, producing works that used natural materials and/or transformed the natural landscape. Since the artworks themselves were often inaccessible and generally ephemeral in nature, they became widely known chiefly through photographs. Robert Smithson, Michael Heizer, Walter De Maria, Richard Long, and Nancy Holt were key figures in this movement.

In their class at the Island School, students learn to apply formal artistic principles to artwork that involves the environment, either as a source of materials or as a source of inspiration. They study examples of the work of many well-known

The Environmental Art Movement

environmental artists, and are asked to create their own artistic works that are representative of various approaches to environmental art. Ultimately, students come to expand their definition of art, and to re-examine and express their personal relationship with the environment through art.

Teacher Notes:

Photographs of the work of well-known environmental artists are readily available on the web or in encyclopedias of modern art. See the Resources section for some recommendations. Examples of the work of Island School students will also be posted on the sitesALIVE! website. This is clearly a case where “a picture is worth a thousand words.” Showing students various examples of artist- and student-created environmental art will stimulate classroom discussion as well as encourage students’ imaginations.

Locally available materials are likely to differ significantly from those available on Eleuthera. Thus, students’ creative pieces will reflect their own environments as well as their feelings and personal styles. If recommended materials are not readily available, photographs of natural objects from old magazines or digital images from the Internet may be substituted. Depending on the maturity of students and the availability of natural materials in the immediate vicinity of the school, you may decide to take students outside to gather materials or alternatively to have students gather them near home and bring them to school in a bag. Before students begin to construct their artwork, encourage them to consider a central idea or theme to build upon. Such ideas may range from the relatively concrete (e.g., spring or trees) to the abstract (e.g., freedom or anger.) Depending on a student’s choice of theme, manmade materials may be introduced into the otherwise natural artwork to create a contrast or “interruption.”

If possible, use a camera to capture each student’s finished artwork. At the Island School, digital images are often made of student pieces. This creates a permanent record of each student’s work, while eliminating the need for adhesives and reducing the total amount of material needed, since the same materials can be used by multiple students in different classes. It also permits manipulation of images if desired and the creation of slide shows. If a more permanent artwork is desired, posterboard and adhesives such as glue (preferably), tape, or staples should be provided to mount the materials and keep them in place.

Vocabulary

Earthworks, environmental art, land art, landscape, metaphor

Materials

Examples of the work of well-known environmental artists and/or digital images of Island School student art projects, natural objects (e.g., leaves, fallen tree branches, pebbles, soil, sand, stones, etc.); **Optional:** camera, posterboard, glue or other adhesives, photos or digital images of natural objects

Procedures:

Step 1

Have your students write an initial personal definition of environmental art, a definition that they will revisit as they learn more. To help them refine their definitions, have them consider examples that are not typically regarded as environmental art, such as gardens, landscape paintings, and outdoor sculpture.

Step 2

Students at the Island School study several approaches to environmental art and create different pieces of art that are reflective of the style of each approach. These approaches include art as a mechanism of integration, interruption, involvement, implementation, and imagination. See the Resources section for additional information on these approaches. Introduce some or all of these artistic approaches to your students, providing several illustrative examples of the work of the artists belonging to each approach. Discuss commonalities among such examples that help to distinguish one approach from another. Then, challenge students to create an artwork that conforms to one of these stylistic approaches. Provide additional references for students to consult in class. Once students have completed their artwork, have them write a brief summary of how their work reflects the philosophy of their chosen artist or school.

Extension Ideas:

As a culminating activity, have students set up their work as in a gallery and hold an art show, inviting peers and adults to view their works. Also, consider emailing digital images of your students’ work to the sitesALIVE! staff, who will consider posting them on the website.

Source

<http://www.sitalive.com/oil/tg/private/oiltgart.pdf>

Other Outdoor Classroom Art Projects



Garden Fence:

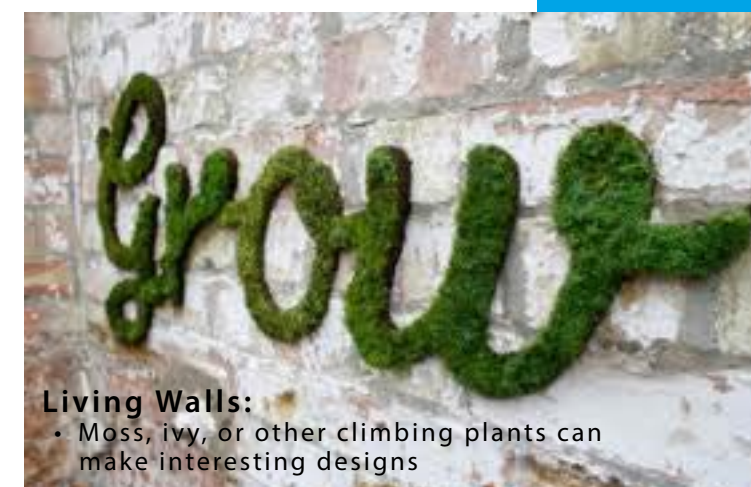
- Decorate hubcaps, reuse old materials as art
- Math: how much fencing needed
- Hands-on Skill building: construction

Chalk Walls:

Brick/stone walls or chalkboard paint allows students to express their creativity over and over again



Silhouette Todem Poles



Living Walls:

- Moss, ivy, or other climbing plants can make interesting designs



Rain barrels:

- Decorative contests
- Chemistry: what water is made of, pH levels
- Physics: water properties and transformations
- Math: volume and mass of water



Student Mosaic:

- Use tiles, broken glass, pottery, porcelain and more to create a beautiful image



Reused Material Garden Elements



Chalkboard Paint



Personalized Tiles:
• Cover walls, trails, the ground and more with these individual projects



Reused Bottle Sculpture



Pressed Spoon Labels



Language Arts

Poetry Inspired by the Garden

Subjects:

English Language Arts

Setting: Classroom and School or Community Garden

Instructional Time: approximately 50 minutes

3 MNN

Behavioral Outcome:

Be physically active every day as part of a healthy lifestyle.

Goal: In this lesson students will choose an item from garden, describe it in as much detail as possible and use those details to create a poem.

Learning Objectives:

The students will write a poem inspired by the garden that includes sensory details.

Vocabulary:

Haiku: a traditional Japanese poetic form that consists of three unrhymed lines of 5, 7, and 5 syllables respectively. The total syllable count is 17 syllables. The subject matter for a haiku is usually nature.

Grade Level

Expectations:

CE 1.1.1 Demonstrate flexibility in using independent and collaborative strategies for planning, drafting, revising, and editing complex texts.

CE 1.1.3 Select and use language that is appropriate (e.g., formal, informal, literary, or technical) for the purpose, audience, and context of the text, speech, or visual representation (e.g., letter to editor, proposal, poem, or digital story).

CE 1.1.4 Compose drafts that convey an impression, express an opinion, raise a question, argue a position, explore a topic, tell a story, or serve another purpose, while simultaneously considering the constraints and possibilities (e.g., structure, language, use of conventions of grammar, usage, and mechanics) of the selected form or genre.

Supplies:

- MyPyramid poster <http://teamnutrition.usda.gov/educators.html> (Teacher note: MyPyramid for Kids is for children 6-11 years. If the majority of your class is over 11 years of age use the adult MyPyramid.)
- Copies of "Poetry Inspired by the Garden" (one per student)
- Copies of scoring rubric (one per student)
- Paper, pens or pencils

Poetry Inspired by the Garden

Advanced Preparation:

- Make copies of Poetry Inspired by the Garden, student page (one per student)
- Make copies of scoring rubric for poem (one per student)

Procedures:

Step 1

Review MyPyramid with the students. Asks students for examples of each food group that they can or do grow in the garden. Tell students that today they will write poetry inspired by the garden. Most of today's class will take place outside in the school or community garden setting. Review with students any appropriate behavioral expectations before going outside.

Step 2

Before going outside, prepare students for the writing assignment. In this assignment, students will practice including sensory details in their writing. Ask students, what are the five senses? (sight, touch, smell, taste, sound). Tell students that for today's writing assignment, they will choose an item from the garden and describe it as fully as possible, including all sensory details. Tell students to include as many details as possible, because their notes will later form the basis for a poem that they will write.

Step 3

Take students outside to the school or community garden setting. Students should bring with them: directions for writing assignment, pencil or pen, and a hard surface on which to write (such as a binder or book). Have students choose a spot to sit or stand where they will not be distracted by others. Each student should choose one item from the garden and begin to take notes, including as many details as possible.

Step 4

When students have finished their note taking on an item from the garden, bring them back to the classroom. If it is a nice day outside, you might want to take an extra walk around the outside of the school building for physical activity!

Step 5

Once back in the classroom, have students choose words and/or phrases from their note taking to be used in the construction of a poem. One suggestion is to have students circle words and/or phrases from their notes, and then use only these words and/or phrases in a poem. Have students think of "magnetic poetry." (Magnetic poetry is where one constructs a poem from a given list of words). Another suggestion, especially for students requiring more structure in the creation of a poem, is to have students create a haiku.

A haiku is a traditional Japanese poetic form that consists of three unrhymed lines of 5, 7, and 5 syllables respectively. The total syllable count is 17 syllables. The subject matter for a haiku is usually nature.

Step 6

Have students revise the poems, either in class or for homework. Have students use the rubric below as a guide, or you can refer students Peter E. Murphy's Style Sheet for Revising Poetry (<http://www.pbs.org/wnet/foolingwithwords/index.html>).

Step 7

Have students turn in their finished, revised poems. Assess the poems based on your own rubric, or use the rubric included in the assessment section of the lesson plan.

Assessment: Poetry Inspired by Nature Rubric

	Excellent	Average	Needs Work
Overall Impact	The poem allows the reader to think about the subject in a new way or in a more powerful way than before.	The poem allows the reader to envision the subject.	The poem does not allow the reader to envision the subject.
Sensory Details & Word Choice	The poem uses sensory details to create vivid images that significantly add to the meaning of the poem. Word choice is precise.	The poem uses sensory details to create images that add to the meaning of the poem. Most word choice is precise	The poem does not use sensory details. Words are unclear and/or misused.
Grammar, Mechanics, & Spelling	There are few to no errors in grammar, mechanics and spelling in the poem.	There are some errors in grammar, mechanics and spelling in the poem.	There are many errors in grammar, mechanics and spelling which make the poem difficult to understand.

WORKSHEET:

Please see Appendix 2

Extension Ideas:

As an exercise in point of view, have students write (poetry or prose) from the point of view of an item from the garden (fruit, flower, vegetable, stem etc)

Source

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Extension, Children,
Youth, Families
& Communities,
Michigan Nutrition
Network
DRAFT -School
Garden Nutrition
Education

Produce in Promotion: A Lesson in Persuasion

Subjects:

English Language Arts

Setting:

Classroom and School or Community Garden
Note: it is suggested that this lesson be taught in September or October, when many of the fruits and vegetables discussed in this lesson will be readily available.

Instructional Time:

One session: 50-55 minutes;
Follow-up session: 20 minutes (in class, or assigned as homework)

3 MNN

Behavioral Outcome:

Eat fruits and vegetables, whole grains, and fat-free or low-fat milk products every day.

Goal:

In this lesson students will discuss successful advertising techniques, understand the definition of propaganda, and apply these techniques in the creation of an original, persuasive advertising campaign for Michigan fruits and vegetables.

Learning Objectives:

Students will create original, persuasive advertising campaigns for Michigan produce, to be distributed to a nearby elementary or middle school.

Grade Level Expectation(s):

CE 2.2.1 Recognize literary and persuasive strategies as ways by which authors convey ideas and readers make meaning (e.g., imagery, irony, satire, parody, propaganda, overstatement/understatement, omission, and multiple points of view).

CE 3.4.2 Understand that media and popular texts are produced within a social context and have economic, political, social, and aesthetic purposes.

CE 4.1.5 Demonstrate use of conventions of grammar, usage, and mechanics in written texts, including parts of speech, sentence structure and variety, spelling, capitalization, and punctuation.

Supplies:

- MyPyramid poster
<http://teamnutrition.usda.gov/educators.html>
- Copies of Michigan Vegetable and Fruit Guide (one per pair of students)
- Poster Board or Colored Paper (one piece per pair of students)
- Markers, colored pencils, crayons
- Paper, pen or pencils
- Cameras
- Paper, pens or pencils

Advanced Preparation:

- Make copies of Poetry Inspired by the Garden, student page (one per student)
- Make copies of scoring rubric for poem (one per student)

Procedures:

Session One:

Step 1

Review the nutrition education advertisements (video and print) by the Ad Council available at <http://www.adcouncil.org/default.aspx?id=475>

Which do the students like the best? Why? Review MyPyramid and the MyPyramid promotions at this website by the Ad Council.

Step 2

Tell students that today we will examine advertising techniques. Ask students, do food companies use persuasive techniques to make you want to buy that product? What kind of persuasive techniques do they use? (Possible responses could include: companies often show young, beautiful, happy people enjoying the product; people are often shown enjoying the product with many friends; food companies often have a catchy song or slogan; companies often show an example of their food or drink in the advertisement to appeal to our hunger or thirst, etc).

Step 3: Think

As a warm-up, have students individually brainstorm a list of restaurants and product brands and their advertising techniques. Have students concentrate on food advertising (restaurants and brands of products). For each example of a food advertisement that students think of, have them write about:

- the places in which the food advertisements appear (TV commercials, radio, billboards, etc).
- if the brand and/or restaurant has slogans or songs/jingles associated with it
- if the brand and/or restaurant has recognizable characters/mascots associated with it
- the audience: to whom are these food advertisements directed?

For example, have students think of a popular fast-food restaurant. Where do the advertisements for this restaurant appear? Is there a slogan associated with this restaurant? What is the name of the character associated with this restaurant? To whom are the advertisements directed?

Step 4: Pair

Have students pair up to discuss their lists.

Step 5: Share

Have each pair share an example of a food advertisement with the class. Ask students not to repeat any brands or restaurants that have already been mentioned so that the class hears a variety of food advertising techniques.

Produce in Promotion

Step 6:

Ask students, what makes these advertising campaigns successful? Brainstorm a list of as a class. Write students' responses on the board or an overhead projector.

Step 7:

Ask students if they think any of the food advertising campaigns could be considered propaganda.

(According to the Webster's New World College Dictionary, Fourth Edition, propaganda is defined as: any systematic, widespread dissemination or promotion of particular ideas, doctrines, practices, etc to further one's own cause or to damage an opposing one).

Step 8:

Ask students if they have ever heard of an advertising campaign and/or slogan for any types of Michigan fruits or vegetables. If students have not heard of an advertising campaign for any fruits or vegetables, ask students, why do you think that there are not (or we are not aware of) any advertising campaigns for fruits and vegetables? (Possible answer: big companies have more money to spend on advertising than farmers).

Step 9

Share Victory Garden propaganda created by the US government during World War II. Why would the government encourage people to grow their own food? Discuss.

Step 10:

Working in pairs or small groups, have students create an (poster) advertising campaign for Michigan produce, keeping in mind the list of characteristics of successful advertising. Remind students to be persuasive! Each pair or small group will create an advertising campaign for one fruit or vegetable. Have students choose a fruit or vegetable from a hat, or choose from the list of MI produce. (Note: It is suggested that students choose a fruit or vegetable that are readily available or in season.) Have students keep in mind their target audience for their advertising campaign. Possible audience(s) include: elementary school students or middle school students. Students should work to develop a slogan for their fruit or vegetable which should encourage people to grow the food.

Step 11:

Before leaving class, have students turn in a rough copy of their advertising campaign for teacher review.

Step 12:

As a homework assignment, each pair is responsible for finding an example of their fruit or vegetable growing in a school or community garden so that they can photograph it. These photos will be brought to class to be added to students' posters. It is suggested that students have several days in order to find and photograph an example of their fruit or vegetable. Other options include having students create original artwork.

Follow-Up Session: In class, or assigned as homework

Step 13:

Return to students their rough copies of advertising campaigns with teacher comments and/or suggestions.

Step 14:

Using the photographs of their fruit or vegetables, poster board or construction paper, markers, colored pencils, crayons, have students put together their final version of their poster advertising their fruit or vegetable.

Step 15:

Posters will be donated to an elementary or middle school for use to hang in hallways, classrooms or cafeteria.

Assessment: Poetry Inspired by Nature Rubric

The teacher may assess the posters using the attached rubric, or a scoring guide of their own.

	Excellent	Average	Needs Work
Slogan	Poster uses an appropriate catchy slogan to "hook" the audience	Poster uses an appropriate slogan	Poster does not use an appropriate slogan and/or slogan is confusing
Design & Layout	Poster has a very attractive layout and design, including color and photographs of the fruit or vegetable	Poster has an attractive layout and design, including color and photographs of the fruit or vegetable	The poster's design is disorganized and confusing; poster does not include color and/or photographs of the fruit or vegetable
Audience	The poster's message is appropriate and appealing to the target audience	The poster's message is somewhat appropriate and appealing to the target audience	The poster's message is not appropriate nor appealing to the target audience
Spelling, Grammar & Punctuation	The poster contains few to no errors in spelling, grammar and punctuation.	The poster contains some errors in spelling, grammar and punctuation.	The poster contains many errors in spelling, grammar and punctuation, which make the poster difficult to understand.

Vocabulary:

- Slogan: a catch phrase used to advertise a product
- Propaganda: any systematic, widespread dissemination or promotion of particular ideas, doctrines, practices, etc to further one's own cause or to damage an opposing one

Extension Ideas:

- Grow the vegetables or fruits that the students discuss.
- Students can have a poster competition within their class. Which campaign for Michigan produce is the most persuasive and innovative? Award a prize.
- Have students write an essay in which they must persuade the target audience to: not eat as much fast food, exercise more, eat more fresh fruits and vegetables instead of processed foods, etc
- Have students write a letter in which they must persuade local restaurants to offer more local Michigan produce, researching and then citing the benefits for using fresh, local food. After the editing and rewriting process, students can send the final versions of their letters to the restaurants.
- Have students write a letter in which they must persuade the school board to use more local Michigan produce in school cafeterias, researching and then citing the benefits for using fresh, local food. After the editing and rewriting process, students can send the final versions of their letters to the school board.
- Students can create a 30 second video (similar to a television commercial), advertising their fruit or vegetable
- Students can prepare a report or presentation of the vegetable for which they've developed an advertising campaign. Students can focus on the food origin, growth process, who typically eats the food, how to prepare it, etc.
- If possible, students can bring in a large container from home to grow their vegetable for which they've developed an advertising campaign. Students could also journal on the ongoing growth process.
- Apples, cherries, and blueberries all have big campaigns (not compared to Pepsi however). Have students research and compare dollars spent by different types of food products (cherry industry vs. Burger King. Etc).

Source

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DRAFT -School Garden Nutrition Education

Nutritional Issues Presentations

Subjects:

English Language Arts

Setting: Classroom grow lab, Greenhouse or Garden

Instructional Time:

Several class periods as needed

3 MNN Behavioral

Outcome: 1) Eat fruits and vegetables, whole grains, and fat-free or low-fat milk products every day.
2) Be physically active every day as part of a healthy lifestyle.
3) Balance caloric intake from food and beverages with calories expended.

Goal: In order to strengthen student leadership; students will create a nutritional issues presentation for an educational audience (middle school). Students will identify nutrition and garden issue topics based on the 3 MNN Behavioral outcomes and develop a presentation that outlines the pros and cons of the issues.

Learning Objectives:

The students will acquire knowledge and skills in community leadership for present and future use. Become knowledgeable of, and familiar with, a variety of local, state, national and international issues facing nutrition and gardening.

Advanced Preparation:

- Make copies of the issue presentation guidelines, outlines, and rubrics

Grade Level Expectation(s):

CE 1.3.2 Compose written and spoken essays or work-related text that demonstrate logical thinking and the development of ideas for academic, creative, and personal purposes: essays that convey the author's message by using an engaging introduction (with a clear thesis as appropriate), well-constructed paragraphs, transition sentences, and a powerful conclusion.

Supplies:

- Copies, one per student MyPyramid Poster. <http://teamnutrition.usda.gov/educators.html>
- Various art and presentation supplies (since the subject of the demonstrations are so diverse, supplies will vary)

Nutritional Issues Presentations

Procedures:**Step 1****Introduction:**

Play Cookie Monster's "Healthy Food" rap available at: http://www.sesamestreet.org/video_player?p_p_lifecycle=0&p_p_id=videoPlayer_WAR_sesameportlets4369&p_p_uid=4371dd33-1552-11dd-8ea8-a3d2ac25b65b

Ask the students how they feel about Cookie Monster rapping about healthy food instead of cookies. Explain that some people didn't like this change in his eating habits. Discuss why they think Sesame Street made this video. Discuss nutrition problems related to diet. Introduce the students to the assignment by introducing and explaining the rules and guidelines for the creation of the issues presentation (see nutritional issues presentation guidelines).

Step 2

Stimulate class discussion on possible nutritional issue topics (see the following list to get started):

- Organic vegetables vs. Non-organically grown vegetables
- Fresh market nutritional value vs. Grocery store (processed) nutritional value
- School lunch program: friend or foe
- Vegetarian diets vs. traditional diets
- Cooking practices: olive oil vs. butter or margarine
- Age appropriateness of video games
- Fad Diets (No or Low Carbohydrate)

Step 3

Remind the students of the presentation guidelines and then let them get to work in their small groups writing an outline (see student worksheet), creating props, and writing a script. Instruct the students that the script should list their names and approximately what they say (like that of a manuscript for a play).

Step 4

Have each group present their presentation in-front the class to gain feedback and offer improvement before it is publically demonstrated through peer review.

Step 5

Organize between student and elementary or middle school classes to schedule a presentation date for the presentation in front of that group. Assess the groups based on their ability to follow the issue presentation guidelines and procedures while taking into account the feedback they gained from their peer evaluation in class.

Assessment:

Students will be assessed based on the average of their score between their in-class presentation and their classroom visit presentations. It is also suggested to take an in-class group participation grade.

Answer Key:

Nutrition Issues Scorecard & Elementary/Middle School Presentation Rubric

WORKSHEET:

Please see Appendix 3

Extension Ideas:

Using bullets, provide ideas for follow up activities that extend the learning from this lesson.

- Arrange for students to also present to school and community groups
- Enroll your students in student organizational competitions (modifications may be needed to fit the contest areas)

Websites**Nutrition websites:**

www.wholegrainscouncil.org

www.wheatfoods.org

<http://aggie-horticulture.tamu.edu/Kinder/sgardens.html>

<http://www.kidsgardening.com/>

<http://host3.netricks.com/~northcoa/GardenBasedNutritionEducation-i-127-109.html>

http://www.northcoastnutrition.org/files/GreenBean-Jen_finaldraft4.pdf

<http://www.egarden.org/wizard/>

Source

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DRAFT -School Garden Nutrition Education

Math

Geometry, Gardens & Nutrition

Subjects:

Math - Geometry

Setting: Classroom and School Garden area

Instructional Time:

1-2 class periods (55 to 90 minutes)

3 MNN Behavioral

Outcome:

- Be physically active every day as part of a healthy lifestyle.
- Eat fruits and vegetables, grains and fat – free or low – fat milk products every day

Goal: The purpose of this lesson is to encourage students to experience and use mathematics in order to make informed decisions regarding activity and calories and healthy nutrition.

Learning Objectives:

Students will design a square – foot garden using unusual geometric shapes such as octagons, ellipses or concave decagons, for example. The garden must be between 50 and 100 square feet or 6 by 12 square meters. Students will design a square – foot garden to include at least four different types of vegetables or fruits, beans and grains. Each food must be included. Students will construct two or more square – foot gardens using two of the designs.

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Grade Level Expectation(s):

G1.4.1 Solve multistep problems involving angle measure, side lengths, perimeter and area of various quadrilaterals.

G1.5.1 Know and use subdivision or circumscription methods to find area of a polygon.

G1.5.1 Know, justify and use formulas for the perimeter and area of regular n – gon and formulas to find interior and exterior angles of a regular n-gon and their sums.

Supplies:

- Grid paper (use <http://incompetech.com/graphpaper/lite/>)
- Approximately 8 pieces of 2 X 6 untreated lumber (about \$40) (Note: Some treated lumber is not safe for growing food.)
- Galvanized nails or screws (3 – inch or longer)
- Hammers, Shovels, Garden rake or cultivator
- One cubic yard of topsoil or soil from your facility (up to \$25)
- Four bags of 2 – cubic foot sphagnum moss (\$20)
- One – half cubic yard of compost (about \$15)

Advanced Preparation:

You may want to find a copy of "Square Foot Gardening" (see references) to see how Bartholomew's philosophy works. Students should already know how to determine the area of most polygons and conic sections (circles and ellipses). If a student chooses to do a concave polygon he/she will need to divide the shape into known shapes and sum the areas or use grid paper and sum the trapezoids. This lesson will likely need to be done in the spring after learning area and perimeter, and because the soil and outside temperature is consistently above freezing.

It is suggested you get in touch with your school garden coordinator (if your school district has one) or your local Michigan State University Extension agent to see how best to set – up the garden and receive assistance on the technical aspects of this lesson.

Safety Issues:

When constructing the garden students should have gloves and maybe clear safety glasses. The lumber should be pre – cut to the dimensions for the garden. It is also best to pre – drill the nail/screw holes. At no time should students operate a power saw.

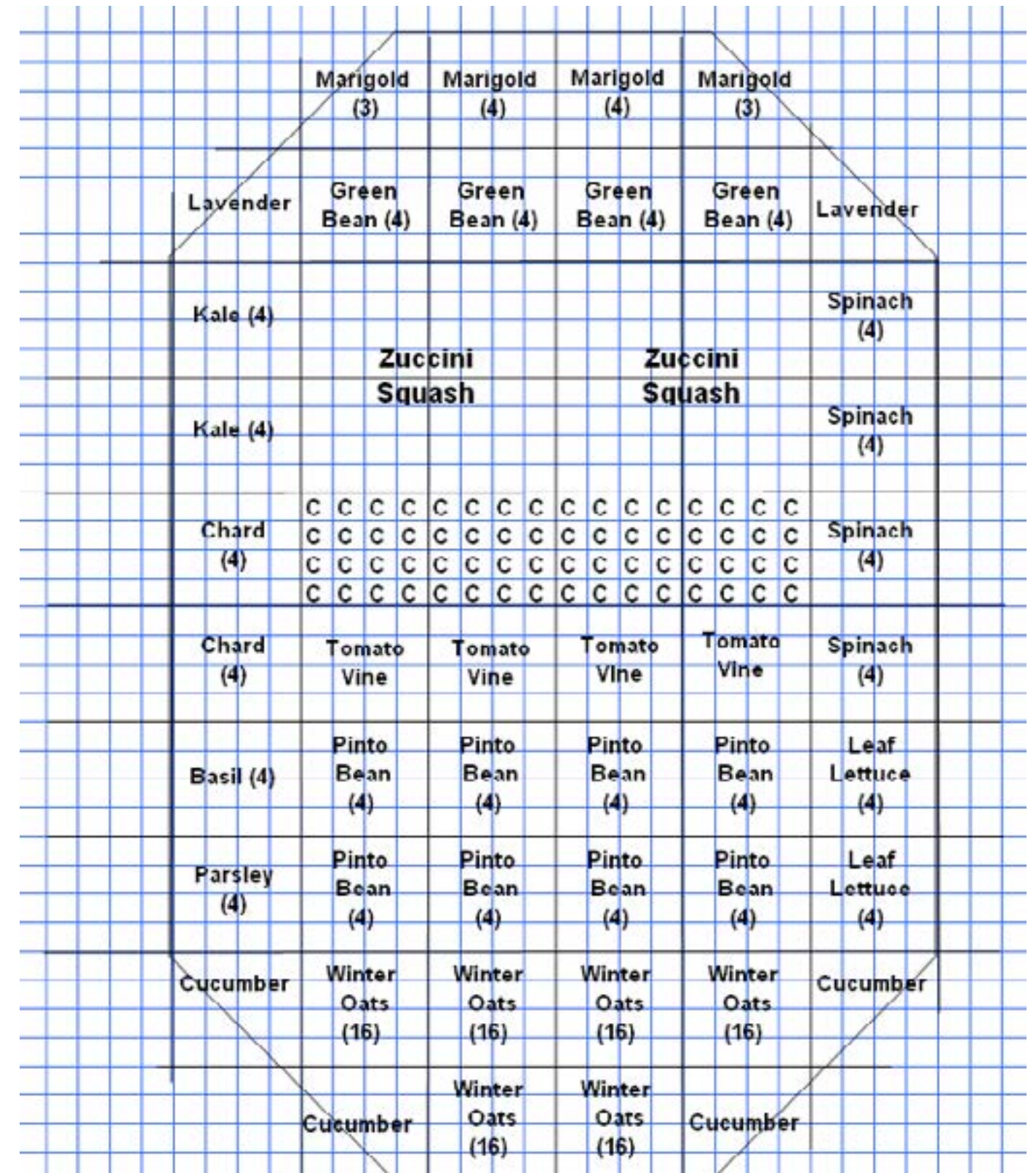
Procedures:

Student should choose a shape they want to use for their garden design. It can be regular, equilateral, curved, elliptical or any type of polygon. Many shapes are possible.

Note: In the long run some shapes are not easy to build, or maintain (such as irrigation, possibly mowing around, etc). If this is a 'dream garden' and the students will go through the design process without building the beds then it may be easier to allow for more creative shapes. It is not recommended to build a star shaped garden at school.

- Student starts by drawing the shape on grid paper using a ruler. Set the scale at "one grid square is equal one – sixteenth square foot", and each edge of the grid square is then one – quarter of a foot (3 inches). On the next page is an **example illustration.** →
- The student can calculate the area for their garden using the squares or using the sides if it is a regular and has a known formula.
- Student multiplies the area by 0.5 since the soil depth is six – inches. This gives the volume of soil they will need to fill it. Remember that one cubic yard is 27 ft³.
- Now the student uses the grid to place the plants they will choose. Refer to the table below to determine how many plants they can plant in a square foot. It is suggested they use a letter code to put the plants in each grid square for those that take up little space like carrots and radishes. For example, put a capital C in each square for each carrot plant. A tomato plant however, can just be written

Example Student Garden Design



Please see Appendix 4 for another example

Geometry, Gardens & Nutrition

- out as Tomato because it will take up sixteen grid squares. An example garden design is in the Appendix. Remember that the garden must include three of the My Food Pyramid groups (fruits and vegetables, beans, grains). A list of these is included below.

Plant type	Spacing (plants per sq. ft.)	Plant type	Spacing (plants per sq. ft.)
Amaranth	1	Marigold	4
Asparagus	2 per 4 squares	Millet	1
Basil	4	Mint	1
Bean (Black, Fava, Green, Lima, Pinto, Soy)	4	Muskmelon	1
Beet	16	Oats	Many
Blueberry	1 per 4 squares	Okra	1
Broccoli	1	Onion	16
Cabbage	1	Oregano	1
Carrot	16	Pansy	4
Cauliflower	1	Parsley	4
Chard	4	Petunia	4
Chives	1	Pea	8
Cilantro	4	Pepper	1
Corn	1	Potato	1
Cucumber	1	Radish	16
Daisy	1	Salvia	4
Eggplant	1	Spinach	9
Geranium	4	Strawberry	1
Lavender	1	Summer Squash	1 per 4 squares
Lettuce	4	Fall Squash	1 per 4 squares
		Tomato	1
		Wheat	Many

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- Once the designs are finished, make an overhead of each. The best designs will be voted to be included in the making of the garden for the school. Criteria could include shape, variety, unusual plants, unique theme, etc.
- It is suggested no more than four of the designs be constructed since they may take more than one or two class periods.

Worksheet(s):

Student Page, Appendix 3
Student Score Card, Appendix 3
Oral Presentation Rubric, Appendix 3

Tomatoes Take Over the Earth!

Subjects:

Science, Computers & Internet, Math

Setting: Classroom and Computer Lab

Instructional Time: NEED!

Goal: The purpose of this lesson is for student to gain familiarity in using math to further understand biological processes.

Learning Objectives:

Students will determine the biotic potential of a tomato plant by counting the seeds of one tomato and then calculate the number of plants after three generations using an Excel spreadsheet.

Grade Level Expectations:

L1.2.4 Organize and summarize a data set in a table, plot, chart, or spreadsheet; find patterns in a display of data; understand and critique data displays in the media

L1.3 Counting and Probabilistic Reasoning

S1.1 Producing and Interpreting Plots

S4.2 Application and Representation

Supplies:

- Journal
- Journal Insert Sheet (Appendix 3)
- Access to Excel if electronic copy is desired

Source

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Procedure:

1. Write in your journal the following investigation question:
 - How many descendants can one tomato plant leave behind in just three generations if every seed were to germinate, grow and produce fruit to its capacity?
2. Record in your journal your guess (prediction) of the number of descendants that one tomato plant can leave behind in just three generations.
3. Now graph out your prediction on the journal insert sheet (below).
4. Now calculate using the journal insert sheet, the number of tomato plants that one tomato can produce in just three generations.
 - Assume that tomato plants can self-pollinate and that each plant makes 100 fruits each season and then dies.
5. Make a line graph of the population growth of your tomato over three generations on the journal insert sheet.
6. What kind of growth pattern does the graph show?
7. What will happen in just a few more generations?
8. Why doesn't this happen in real life?
9. Use the terms exponential growth, limiting factors, and carrying capacity in a short paragraph to describe the results that you have graphed out:

Note: An Excel sheet can be programmed so that students only have to enter the amount of seeds and Excel will automatically graph the result.

Assessment:

Spreadsheet checklist and answers to questions.

Source

Lessonplanspage.com

Plants Sweat Too!

Plant Transpiration

Subjects:

Math, Computer & Internet

Setting:

Outdoor classroom, indoor classroom and computer lab

Instructional Time:

Two class periods

Grade Level

Expectation(s):

L1.2.4 Organize and summarize a data set in a table, plot, chart or spreadsheet

S3.1 Data Collection and Analysis

Supplies:

- Medium sized leafy plant
- Plastic sandwich bag
- String
- Computer lab access to virtual lab

Goal: This great real-world and virtual plant transpiration lab also uses spreadsheets and e-journals mailed to the teacher

Learning Objectives:

Students will identify the factors and processes of plant transpiration in context of the water cycle.

Procedure:

- Students will be divided into teams.
- Each team is given a plastic sandwich bag and some string.
- Students proceed outside to search the campus for various types of trees and shrubs.
- Next, students put the baggie around a small branch with leaves and tie the string around the branch tightly so water vapor cannot escape.
- Now the students record observations and collect plant type and location data. If several trials can be done, the observations will be more accurate.
- After a day or two, students return to the plants and collect the baggies with water inside from transpiration.

- Then in the lab, students can measure the amount of water each plant produced .
- Students can weigh the leaves of the plant that were inside the baggie.
- Now they can calculate how many milliliters of water was produced per gram of leaf material.
- Students will also complete the online virtual lab (link below) that tests various factors of plant transpiration (if available).
- Students write down data on a spreadsheet that is then automatically graphed.
- Students also write down answers to questions in the electronic journal that is then emailed to the instructor.
- Students also conduct a sister outdoor lab capturing water from trees and bushes around campus.

Virtual Lab Link:

http://www.mhhe.com/biosci/genbio/virtual_labs/BL_10/BL_10.html



Assessment:

- Outdoor lab data and graph
- Program graph and journal

Source

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Vegetable Wheel

Geometry

Subjects:

Math - Geometry

Setting: Classroom, School Garden or Greenhouse

Instructional Time:
2-1 hour Sessions

3 MNN Behavioral Outcome:

- Eat fruits and vegetables, whole grains, and fat-free or low-fat milk products every day.

Goal: Students will utilize math (geometric) concepts while developing a useful tool working toward better nutrition through the use of a variety of vegetables.

Learning Objectives:

The students will...

1. Demonstrate the ability to draw a circle with a give radius and calculate and draw equivalent sectors within the circle.
2. Create a vegetable wheel which includes the nutritional value of vegetables according to color groups.
3. Utilize options from their vegetable wheels to start plants for a personal nutrition garden and label for information.

Grade Level Expectation(s):

G1.5.2 Know, justify, and use formulas for the perimeter and area of a regular n-gon and formulas to find interior and exterior angles of a regular n-gon and their sums.

G1.6.4 Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.

G.1.7.1 Find an equation of a circle given its center and radius; given the equation of a circle, find its center and radius.

Vocabulary:

Sector (circles) - the plane figure enclosed by two radii of a circle or ellipse and the arc between them.

Nutrients - a substance that provides nourishment essential for growth and the maintenance of life.

Advanced Preparation:

- Obtain vegetables from each color group and cut into bite size pieces for each student to taste test. Better yet, ensure that the school garden contains vegetables from each color group and use those!
- Develop a small scale example of the circle wheel.
- Provide information on nutritional value of vegetables of different colors. (nutritiondata.com)
- Procure seeds, soil & peat pots.

Procedures:

Step 1

Review MyPyramid recommendations using the poster as a visual aid. Discuss USDA recommendations and how close the students think their diets achieve this. If not, what can they do to improve? Ask the students if they like vegetables? Which ones do they like?

Step 2

Taste test vegetables from the garden. If practical, move to the garden and taste test vegetables outside. Ask the students what similarities/differences do you see in these vegetables? Why are vegetables important for a healthy person? Why might people choose certain vegetables to eat? Do you think knowing the nutritional content and variety of vegetables encourages people to chose to eat more vegetables? What might encourage you to eat more vegetables?

Step 3

Return to the classroom. Have students create a circle which has a radius of 3 to 6 inches on cardstock and cut out 2 of them.

Step 4

Divide one circle into 5 equal sectors. If students use a protractor, each section would have an angle of 72 degrees.

Supplies:

- MyPyramid poster. <http://teamnutrition.usda.gov/educators.html>
- Fresh raw Vegetables (at least one kind from each color group) enough for bite size portions for each student and 1 whole for identification purposes. (If possible, have students harvest vegetables from the school garden.)
- Card Stock, 2 sheets per student
- Construction paper, colored pencils, markers, enough for the class to use.
- Compass, protractor, rulers, scissors. (enough for all students to share in small groups)
- Packets of seeds for variety of vegetables.
- Peat pots, recycled nursery pots of other recycled containers, enough for 5 for each student
- Soil medium for each pot (Professional seed starting mix recommended (e.g. Baccto)
- Craft sticks (5 for each student)
- Brass brads (1 for each student)

Vegetable Wheel Geometry

Step 5

Assign each sector a color of the rainbow (red, orange, yellow, green, blue/purple). Note, combine blue and purple as the only blue fruit is blueberry. Have students label their wheel and include the following information: List at least 3 fruits and/or vegetables of that color and their nutritional value of each. (i.e, % of vitamins, minerals etc.) Provide students time to research this information online at www.morematters.com

Step 6

Keeping the center intact for the brass brad, cut 1 sector out of the second circle, then attach the circles together at the center with the brass brad.

Step 7

Have students “decorate” the top circle including the following:

Title – Vegetable Wheel

Student Name

Date/Class/Period

Step 8

Have students use their own vegetable wheel, choosing one vegetable from each group, and collect seeds for that type of vegetable plant.

Step 9

Have students get 5 pots, 5 craft sticks, soil and seeds (see above).

Step 10

Have students write the name of each vegetable on one end of one side of the craft stick and the nutrients provided on the back at the same end.

Step 11

Students should plant about 5 seeds per pot and insert corresponding popsicle stick to identify seedling as it grows. (Planting a few seeds ensures that they will have at least one sprout. They can always thin them out later.)

Step 12

Have students water and care for seedlings, provide planting instructions for them to follow when seedling is to plant in their personal garden or school/ community garden.

Extension Ideas:

- Create wheels for the other food groups
- Make Bulletin Board with the information
- Develop a huge wheel with all of the food groups & nutrient options.
- Go beyond just using the wheel as a way to reinforce the math skill by having students turn them into spinners, and play a math game.

Source

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Education

Science

Life Science
Social Science
Natural Science

Massive Migrations

Subjects:

Science, Math, and Geography

Setting: Classroom and School Garden area

Instructional Time: 50-60 minute class period

Goal: Students will map and calculate the migration routes of Arctic species to learn about animals that spend part of their lives in the Arctic and how they are connected to other parts of the world for food and shelter.

Learning Objectives:

- Measure the distances traveled by migratory Arctic bird species.
- Calculate percent difference between migratory bird routes.
- Identify Arctic species that spend parts of the year in their own local areas.
- Explain how migratory Arctic species meet their habitat requirements in various regimes.

Advanced Preparation:

- Sign up for computer lab time.

Grade Level Expectation(s):

B3. 4 Changes in Ecosystems

B3.5 Populations

B3. 5x Environmental Factors

B3.5d Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages

Supplies:

- Map of North America
- Computer with internet access
- Science notebook

Background:

A habitat is the place where a species' requirements for food, water, cover, and places to raise young are found (distinguished from an ecosystem,

which is the set of interactions between living and nonliving components in the environment). Migratory birds require three different habitat types: breeding and nesting areas, where they lay their eggs; non-breeding areas (often used to find food, water, and shelter); and migratory stopover locations as the birds move from the breeding to the non-breeding areas. Some animals such as caribou migrate to areas where food is more plentiful and where they can safely have offspring. The caribou migrate from southern, inland areas of Alaska and Canada to arctic coastal plain in the summer. High winds on the coastal plain help keep away mosquitoes and warble flies which are parasites of the caribou.

Most arctic wildlife species are temporary residents; they move to more favorable climates during the harshest time of the year. However, some species spend the entire year in the arctic ecosystem. Year-round resident birds such as the ptarmigan, raven, ivory gull, bald eagle, and dovekie have thicker feather than migrants such as arctic terns, snow geese, eiders, and sandhill cranes. The best time of year for birds to live in the arctic is during the summer months with long days in which to find food, warm temperatures, and plenty of insects! In May, thousands of birds descend upon the thawing tundra to begin their reproductive cycle. As the top soil layer of the tundra thaws, the remaining permafrost below the surface prevents the melt waters from draining, creating standing pools, called "thaw lakes", and marshy soil. For migratory birds, the process of egg-laying and rearing of young must be a fast one, as the summer months are few and quickly pass.

Most tundra birds lay their eggs directly onto the ground, in a slight depression. Some, like the golden plover, line their nests with vegetation such as moss, grass and leaves. American golden plovers and black-bellied plovers have their young in the arctic during the summer months, then travel about 6,000 miles each winter to South America! They use Texas and other states on the way as a stopover, to take advantage of warm temperatures and plentiful food before completing their long journey. *Flight of the Golden Plover: The Amazing Migration between Alaska and Hawaii*, Debbie S. Miller (1996), is an informative book about the impressive migration of the golden plover. Arctic terns make the longest migration of any species on earth, traveling from the northern arctic to the southern Antarctic each year, a distance of 25,000 miles (40,000 km) total or about 11,000 miles (17,700 km) each way.

Arctic loons breed on tundra lakes and winter mostly on the U.S. Pacific coast. Snow geese nest in the arctic during the summer, traveling from their winter homes in the Gulf of Mexico, a distance of 2,000 miles.

Snowy owls may migrate depending on prey availability- if there is enough

List of Selected Arctic Birds & States They Migrate Through:

Alabama – Ruby-crowned Kinglet
 Alaska – Redpoll
 Arizona – Fox Sparrow
 Arkansas – Mallard
 California – Snow Goose
 Colorado – Bohemian Waxwing
 Connecticut – Greater Scaup
 Delaware – Black-bellied Plover
 Florida – Peregrine Falcon
 Georgia – Gray-cheeked Thrush
 Hawaii – Golden Plover
 Idaho – Short-eared Owl
 Illinois – Northern Flicker
 Indiana – Dark-eyed Junco
 Iowa – Sharp-shinned Hawk
 Kansas – Smith's Longspur
 Kentucky – Merlin
 Louisiana – Long-billed Dowitcher
 Maine – Least Sandpiper
 Maryland – Tundra Swan
 Massachusetts – Golden Plover
 Michigan – Oldsquaw
 Minnesota – Red-throated Loon
 Mississippi – Northern Waterthrush
 Missouri – American Pipit
 Montana – Golden Eagle
 Nebraska – Wilson's Warbler
 Nevada – Green-winged Teal
 New Hampshire – Dunlin
 New Jersey – Canvasback
 New Mexico – Sandhill Crane
 New York – Semipalmated Sandpiper
 North Carolina – Semipalmated Plover
 North Dakota – Rough-legged Hawk
 Ohio – American Tree Sparrow
 Oklahoma – Savannah Sparrow
 Oregon – Brant
 Pennsylvania – Lapland Longspur
 Rhode Island – Horned Grebe
 South Carolina – Ruddy Turnstone
 South Dakota – Northern Shrike
 Tennessee – Yellow-rumped Warbler
 Texas – White-crowned Goose
 Utah – White-crowned Sparrow
 Vermont – Snow Bunting
 Virginia – Lesser Scaup
 Washington – Varied Thrush
 West Virginia – Rusty Blackbird
 Wisconsin – Snipe
 Wyoming – Townsend's Solitaire

prey in their home habitat, they don't need to migrate, but if there isn't enough prey, they will migrate south. Alaska's snowy owls then to spend autumns in the prairies and marshlands of Canada.

Sandhill cranes breed and lay their eggs mainly in the marsh grasses of the arctic and winter in grasslands throughout the southern and mid-western U.S.

Caribou are well-known travelers across the tundra. These herbivores are attracted to the abundant lichens and grasses of the arctic, and spend winter farther south in the shelter of the taiga's trees. They are excellent swimmers, which is essential since there are many rivers to cross along their way.

The Porcupine caribou herd today numbers about 130,000 to 150,000 individuals. As spring approaches each year, the herd begins a 400-mile migration northward along three principal routes from its boreal forest wintering range. Their destination is the coastal plain of the Arctic National Wildlife Refuge. By mid-May, the first pregnant cows arrive, followed soon by the rest of the herd. Calving reaches a peak in early June. The narrow coastal plain between the Brooks Mountain Range to the south and the Arctic Ocean to the north is ideal for calving and the early nurturing of the young. Thick fields of protein rich cotton-grass provide nourishment. Ocean breezes deter swarms of mosquitoes. Predators in this season are few. The coastal plain is so well-suited for calving that, although it is only one-fifth the size of the calving area used by the Central arctic caribou herd, six times as many Porcupine caribou inhabit it. By early September, the young calves are strong enough to initiate their migration southward and the cycle begins again. *A Caribou Journey*, by Debbie S. Miller (1994) is a story of caribou migration, including information on the natural history of caribou which would complement this activity.

Massive Migrations

Procedures:

Step 1

Assign students a migratory bird species from the U.S. Fish & Wildlife Service Arctic National Wildlife Refuge, <http://arctic.fws.gov/birdpost.htm>.

Step 2

Students will use the Cornell Lab of Ornithology website, <http://www.allaboutbirds.org/guide/search.aspx>, to discover more about the migratory bird they were given or chose. Questions and answers should be recorded in the science notebook. Have each student sketch their bird utilizing best practices for a scientific drawing, such as at http://bioserv.fiu.edu/~biolab/labs/1011/supplemental_materials/Scientific%20drawings.pdf, (can be generalized for all scientific sketches in high school) and answer these questions about their bird:

- What does their species eat?
- What are its habitat requirements for food, water, and shelter?
- What are its habitat requirements for raising young?
- How far do they migrate? Go to <http://www.infoplease.com/atlas/calculate-distance.html>. Type in "Arctic National Wildlife Refuge" for "from" and then the closest city and the state for your migratory bird for "to".
- Predict challenges they face during migration? Ask students to visualize what challenges they would face if they had to migrate for to find warmer weather, food, shelter, and water...

Step 3

Compare the distances of different species migration routes.

- Ask students to gather distances from four other groups.
- Create a chart and or bar graph in the science notebook that denotes the migratory bird species and the distance flown during its migration. Be sure students are including all applicable labels.
- An optional or additional task would be to create the migration distance to scale outside, using string and tape measures or meter sticks. For example on foot on the schoolyard could equal 200 miles (or whatever increments make the most sense based on your pool of migratory birds). Students could then sketch what they observe and write answers to these questions.
 - Which species has the longest migration?
 - The shortest?
 - Why do you think birds would travel on these long journeys?
 - What makes the journey worthwhile for them? Why not just stay?

Worksheet:

Please see Appendix 5

Assessment:

- Service Learning: Have your students commit to one of the service learning projects described via this link, **Flying Wild**, <http://www.flyingwild.org/aboutus/learning.htm>.
- Create expectations for your students based on the service learning rubric found at <http://www.peacecorps.gov/wws/educators/servicelearning/pdf/rubric2010.pdf>.

Student Resources for Further Learning:

- Atlas of Bird Migration: Tracing the Great Journeys of the World's Birds*, editor, Jonathan Elphick
- The Audubon Society, <http://www.audubon.org>
- The Smithsonian Migratory Bird Center, <http://nationalzoo.si.edu/scbi/migratorybirds/default.cfm>
- Celebrate Urban Birds– citizen science opportunity, <http://www.birds.cornell.edu/celebration/>
- Careers in Ornithology, <http://www.ornithology.com/careers.html>

Resources:

- List of Selected Arctic Birds and States They Migrate to or Through: Check the list of Arctic birds below to see which bird is an example of a species that summers in Alaska and winters in your state. In addition to these, there are likely many other local species in your area with similar migration patterns.
- Smithsonian National Zoological Park – Migratory Bird Center: <http://nationalzoo.si.edu/scbi/MigratoryBirds/Education/default.cfm>
 - Songbird kit-loaner chest of all things birds
 - Computer-based games
 - Migration Game
 - Online Coloring Book
 - Citizen Science (all ages)
 - Neighborhood Nestwatch
- U.S. Fish and Wildlife Service: http://www.fws.gov/educators/E_birds.html. Has both educator and student pages.

Source

"Massive Migrations" from Arctic NatureScope Kit, National Wildlife Federation 2001
www.nwf.org/nationalwildlifeweek email: educators@nwf.org

Pollinator's Journey

Subjects:

Science, Language arts, & Social studies

Setting: Classroom and School Garden

Instructional Time: 2 class periods

Goal: Students will perform a role play about a threatened migratory pollinator that will deepen their understanding and stewardship of pollinator species and their interdependence on their ecosystem to survive.

Learning Objectives:

- Describe and explain the relationship and its importance between 4 different pollinators and their host plant(s).
- Use maps and graphs to track the path of migratory pollinators.
- Describe and explain at least 4 threat causes and their effects on pollinator species.
- Discover at least 4 pathways to reduce and/or extinguish the effects caused by threats on pollinator species.

Grade Level Expectation(s):

B3.2.C Draw the flow of energy through an ecosystem. Predict changes in food web when one or more organisms are removed

B3.4 Changes in Ecosystems

Supplies:

- Science notebook
- Flower anatomy diagram
- Pictures of monarch butterflies, lesser long-nosed bats, organ pipe cacti, and milkweed
- Maps of southern Arizona, the Sonoran Desert, and Mexico (classroom map or student atlas would work).
- Books on pollination, flowers, monarch butterflies, and nectar-feeding bats (check with your librarian).

Background:

Flowering plants are much more common than non-flowering plants. Many people believe that the success of flowering plants is due in large part to the flower's close relationship with animals in the process called pollination.

Many flowering plants depend on animals to reproduce. Bees, butterflies, hummingbirds, bats, ants, moths, beetles and others visit flowers in search of food. In the process, animals pollinate the flowers, bringing their reproductive cells from one plant to another of the same species. Pollination leads to fertilization, the development of new seeds and, in some plants, fruit. The young seeds (either in fruit or not) may be carried by wind, water or animals to new locations where, if all goes well, they will grow into new plants.

How does the process of pollination work? Flowers contain a plant's reproductive parts, including the male anther and the female pistil. (See diagram). The structure of the flower forces the male anther, holding pollen grains, to brush up against the pollinating species while it is looking for its food, the nectar. The female pistil includes the stigma, which is sticky and collects pollen from the bodies of animal visitors, and the egg, called an ovum. When pollen grains fertilize an ovum, a new seed begins to develop.

Plants, rooted in one place, must face the challenge of transferring pollen to another flower of the same species. Some flowers rely on wind to carry pollen grains, while others use water. Animal pollinators, however, give plants an advantage as they may deliver pollen directly to the flower. While collecting nectar from the base of a flower, pollinators like bees brush against pollen from the flower's anther. The bee ends up carrying a load of pollen on its body. At the next flower the bee visits. Some of that pollen reaches the female reproductive parts while the bee feeds. For other animals, the exact way they collect and deliver the pollen is different (hummingbirds sometimes collect pollen on their heads!), but the function is the same. The pollination relationship is mutually beneficial to flower and animal one gets food while the other receives help reproducing.

Over time, flowers have developed adaptations to ensure that the best pollinator for their species will visit and return often to feed. In fact, flowers' fragrance, bright colors, nourishing nectar and varied shapes are considered adaptations to attract certain pollinators. For example, the bright colors of flower petals are thought to help flowers stand out against a green background. Many flowers, such as a Black-Eyed Susan, have a bull's-eye pattern of color to focus animal attention on the part of the flower with pollen and nectar. Violets have both a weak bull's-eye pattern as well as "nectar guides" - a pattern that radiates out from the nectar cup and leads animals to the part of the flower where the nectar, anther and stamen are found. Many flowers have nectar guides, which aren't always visible to the human eye.

Pollinator's Journey

Birds and bees find different flowers attractive largely due to differences in the animal senses. Birds have a poor sense of smell, but keen color vision. Bees use both color and odors to find a suitable flower. The shape of the flower also plays a role in determining the kind of pollinator who can feed from the flower. Butterflies must have a perch to land on while feeding. Hummingbirds can hover in front of the flower and so don't need a place to land. Pollinators have also adapted to ensure that they will have access to flower nectar. Animal adaptations include sense of smell, color preferences, beak shape (especially noticeable in hummingbirds) and tongue length.

Pollinators have a critical role in both agricultural and natural ecosystems. Crop plants depend on pollination to produce much of the food we eat—from wheat and oats to corn and tomatoes. In fact, scientists estimate that every third bite of food humans eat is made possible by the act of pollination. Pollinators are also key to maintaining the health and biodiversity of wildlife habitat. Many flowering plants will not produce seeds for the next generation, such as new oak trees or milkweed plants, without the aid of animal pollinators. A habitat that doesn't have young to replace the old of all species will eventually become less diverse—a few types of plants may become dominant, and in turn, the habitat will be able to support fewer animal species.

In this decade, conservation biologists discovered a disturbing trend. Pollinator populations have declined drastically. Domesticated honeybee populations dropped 25% between 1990 and 1998, mostly due to the spread of a parasitic mite. Wild bee populations face risks from pesticides and habitat loss, and other pollinators, such as birds, bats and butterflies, have also suffered declines. Migratory pollinators appear especially vulnerable to habitat loss and other threats. In the United States many migratory pollinators are in peril. For example, the lesser long-nosed bat pollinates cacti such as the organ pipe and saguaro common to the Sonoran desert landscape. The bat, along with migratory pollinators such as the rufous hummingbird, white-winged doves and monarch butterflies, must move from bloom to bloom to take in enough energy on its 2,000 mile or more journey to Mexico to survive.

Along this nectar corridor, human development, extensive planting of non-native species (that pollinators can't feed on) and the destruction of "stopover" areas by pesticides and human alterations work together to reduce the number of these migrants. For instance, monarch butterflies depend on the milkweed plant for food and a place to raise young. The milkweed is often a target of large-scale herbicide spraying along roads and on farms.

Advanced Preparation:

1. Post pictures of pollinator species "characters" and plants for the play – long-nose bats, monarch butterflies, organ pipe cacti, milkweed plants and humans. Feel free to provide many more examples. The resources at the end of the lesson will provide you with other ideas.

2. Collect books from your school library that reference desert ecosystems, Sonoran Desert, and any of the pollinators you are highlighting for the lesson.
3. Check out Discovery Education Streaming at <http://streaming.discoveryeducation.com/>—there are great video segments related to pollination, bat pollinators, Arizona's desert ecosystem, bees, and monarchs. Contact your school's or school district's Discovery Education administrator to obtain your passcode if you do not have an account already.

Procedures:

Day 1

1. Introduce at a cognitively appropriate level the main idea of pollination – flowering plants and their pollinators have adapted to each other to the point that one may have trouble surviving without the other. Show a picture of the attached flower and ask students to reproduce this image in their science notebook using proper science drawing techniques. Around the flower ask students to write or quickly sketch pollinators; see what they come up with before giving these examples, such as bees, butterflies, birds, bats, and others. Next prompt your students by asking what would happen to the pollinators without the flower? Outline the role that pollinators play in maintaining the health of an ecosystem and its biodiversity.
2. Explain some key pollinators are threatened (from honeybees to hummingbirds) are now threatened due to parasites, habitat loss, pesticides, and introduced species. Explain in a cognitively appropriate manner the effects of a major loss of pollinators could be dramatic. Ecosystems could change their character, as trees and plants once common, begin to disappear. Agriculture could also suffer huge losses, which might lead to less food being produced. Now that some information has been introduced students will create a circle map demonstrating what they know, then create a class circle map showing a collaborative effort from the students and allow students to make additions and ask questions before moving on.

Day 2

3. Today students will focus on pollinators that migrate between the U.S. Sonoran Desert and tropical Mexico. Scientists are especially concerned about migratory pollinators, such as the ones on the Sonoran Desert. Use a map to point out the Sonoran Desert as well as Mexico. These pollinators get food along their journey from flowers along what's called a "nectar corridor". Along the nectar corridor, the pollinators move north or south from one area to the next at the same times that flowers on which they feed are blooming. That means they always have something to eat on their journey. However, these corridors are suffering. Introduced (non-native) plants are outcompeting some of the plants the pollinators rely on for food. Much of the land along the corridor has been built on or converted to roads or farms. People have

Pollinator's Journey

used pesticides in some area that kill the plants relied upon by migrants. Not having enough plants to feed on during the journey reduces the number of pollinators that can survive.

4. Read the following story to students once out loud. Next, split the students up into groups of 5. Together they will have to create a similar story that portrays pollinator's relationship with flowering plants, threats to pollinators, and ways people can help (these are the student's objectives). Give them no more than 30 minutes to prep; this is more like improv.
5. Post the objectives of the role play to help guide and focus students. Give time reminders in at after 10, 20, and 25 minutes have passed. Gather students together and watch each group's performance. They will be assessed on how well they addressed the objectives.

Assessment:

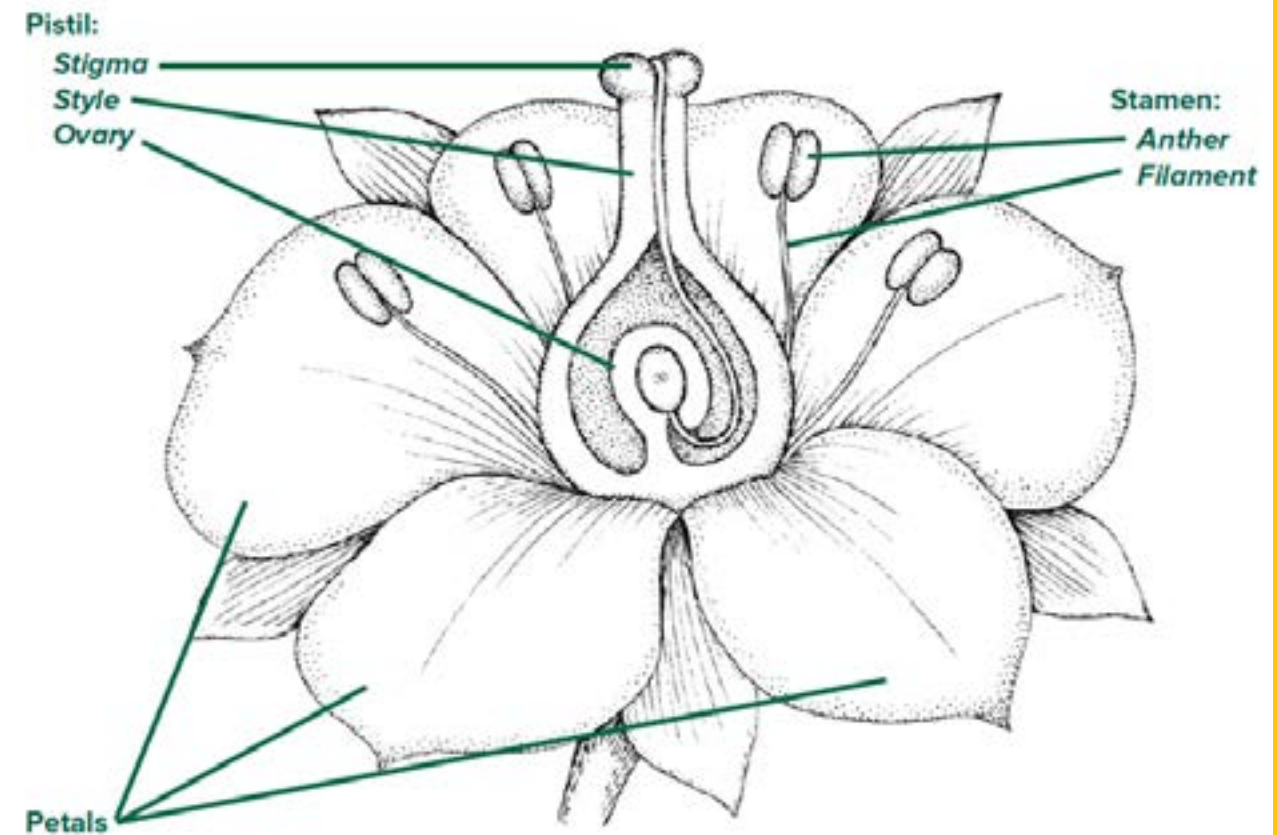
- Choice 1: Divide a science notebook page in half or use manila paper and fold it in half. Have students draw a picture of an entire scene showing many pollinat plants and at least four pollinators i.e. long-nose bats, bees, hummingbirds, etc., on one side or part of the page. Students will then write on the other half of their page a paragraph about the relationship between pollinators and plants focusing on the importance of pollinators, at least 3 threats to pollinators and 4 human helps. Sentence and paragraph structure will be determined based on student ability, but should be evaluated based not only on conceptual understanding but grammatical competence.
- Choice 2: Have students create a multi-flow Thinking Map demonstrating their understanding of the cause and effects associated with threats to pollinators.
- Choice 3: Participate in a Pollinator Live citizen science project over a determined period of time. Determine your student outputs that would show the student's conceptual understanding of the objectives from the top of the lesson.

Citizen Science:

Pollinator Live - <http://pollinatorlive.pwnet.org/teacher/citizen.php>

An extensive list of citizen science opportunities directly related to pollinators.

Parts of a Flowering Plant



The Pollinator's Journey Play:

Narrator

It is early fall in the beautiful Sonoran Desert of Arizona. Long-nosed bats and monarch butterflies live here in the summer. Soon, they must start a long journey south where they live in the winter. The nights are starting to get cooler. The flowers that bats and butterflies feed on have begun to fade. It is time to begin their journey to Mexico.

Stage Directions

Bats pretend to fly while feeding on cacti. Butterflies will fly and land next to milkweed flowers to feed. When students hear the word "cooler" they should begin to shiver (although these animals do not shiver in reality, this is a good tool for conveying the idea of the changing season). As the bats and butterflies try to continue to feed, the cacti and milkweed flowers sit down and drop their heads. The butterflies and the bats all know it is time to begin the journey. They leave the scene.

Suggestion: There is no role for humans in this scene. Perhaps have that group be wind or act as flowers just for this scene.

Pollinator's Journey

Narrator

Each year the pollinators follow the same route to Mexico, called a nectar corridor. They stop at the same places each year to rest and feed on flowers. But this year, one of the rest stops is missing! A new golf course stands where there were once hundreds of flowers to feed on and cover to hide in. A few flowers remain, but many of the pollinators have nothing to eat. Without food, some pollinators get very tired. They don't have the energy for the long trip. Some bats and butterflies die. Others move on.

Stage Directions

Have bats and butterflies start on one side of the room and move together across the room. The flowers stand facing each other, forming a corridor for the group of pollinators to move through. As the pollinators pass, the flowers should move to the front of the corridor line. The Humans group should form a football huddle to represent the new golf course, right in the nectar corridor (flowers nearby have died during the construction and sit on the floor with their heads dropped). One cacti and one milkweed will remain standing. Bats and butterflies feed on the flower, but all other pollinators are tired and moving slowly. One out of three of the pollinators should lie down on the floor to show they have died (they should act as humans in next scene). The other pollinators leave to continue the journey.

Narrator

Arriving at their winter home, there are fewer bats and butterflies than usual. New buildings and highways have destroyed some of the usual rest stops along their journey. Herbicides sprayed along highways may poison butterflies. Breaking up habitat into smaller areas makes the journey harder, as cities, houses and highways fragment wild habitat into smaller pieces. But those that have made it can live in peace for awhile.

Stage Directions

The remaining bats and butterflies arrive at their winter home, where the flowers are all in bloom. As the teacher talks about the threats facing pollinators, the humans should act out the actions of: building, spraying herbicides, and cutting down trees and shoveling over wild habitat.

Narrator

In spring, the weather warms. It's time for pollinators to begin their return journey to Arizona. The flowers have started to fade. The bats and butterflies depart.

Stage Directions

Bats and butterflies are feeding on flowers. Slowly, flowers begin to sit down and drop their heads to show they are not in bloom anymore. The bats and butterflies may use human cues to show they are getting hotter, such as wiping sweat from the brow or fanning themselves (like shivering, this is a human way to deal with heat, but will help get the idea across). Humans sit out during this short scene.

Narrator

Near the end of the journey, the bees and bats are very tired. While some stop-over spots are still rich with nectar, others have been destroyed. If only there was a flower-filled field over the next hill. Suddenly, they see flowers in bloom. It's a rest stop lost years ago to development and it looks inviting again. The flowers sit in a garden next to a large school building. Students have been working hard to create wildlife habitat on their school grounds. They've selected the exact plants that they know these migrating pollinators are looking for, and they have added bat boxes to their habitat. Hungry, the pollinators fly down to the garden to feed on flowers. In the garden, they see children weeding around the cacti and milkweed and watering young plant seedlings. The pollinators all get enough to eat. They are ready for the final miles of their trip, well-fed and prepared to go on. Flapping their wings, the bats and butterflies fly away, leaving the children quiet with awe and happy that they have helped to make the pollinators journey a successful one.

Stage Directions

Humans and flowers should all be on one side of the classroom. Flowers are in bloom, while humans are tending to the Schoolyard Habitat. The bats and butterflies are flying, obviously tired and slow, toward the garden. They swoop down to the flowers and feed on the nectar. Once they have all had a chance to feed, they move much more quickly, and fly away with much more energy. The humans stare at them in awe and smile while the bats and butterflies leave the room/area.

Resources:

- U.S. Fish and Wildlife Service Pollinator's Page: <http://www.fws.gov/pollinators>
- Center for Sonoran Desert Studies: <http://www.desertmuseum.org/pollination/>
- What Lives in the Sonoran Desert?: <http://www.nps.gov/archive/cagrkids%20corner/fun%20facts/What%20lives%20in%20the%20SD/What%20lives%20in%20the%20Sonoran%20Desert.htm>
- Thinking Maps®: <http://www.thinkingmaps.com/products.php>
- Dinah Zike's Notebook Foldables®: <http://www.dinah.com/>

Source

"Pollinator's Journey" from Pollinators NatureScope, National Wildlife Federation 2001
www.nwf.org/nationalwildlifeweek email: educators@nwf.org

Sustainability Posters!

With Recycling, Composting, Water Conservation, Organic Gardening, Repurposing & Biofuel facts created by Student groups

Subjects:

Ecology, Science

Setting: Classroom and Computer Lab

Instructional Time:
2 class periods

3 MNN Behavioral Outcome:

- Sustainable Practices, stewardship

Goal: Students will assess human population and its impact on local ecosystems and global environments

Procedure:

Essential Question:

How can we contribute to a healthier environment?

Day1

Class will be broken up into groups. Each group will be given a topic that must be researched using laptops or computers. Topics include:

- Recycling
- Composting
- Water Conservation
- Organic Gardening
- Repurposing (This can be for home use, construction, etc.)
- Biofuels

Grade Level Expectation(s):

B3.4 Changes in Ecosystems

B3.4x Human Impact

B3.5 Populations

B3.5x Environmental Factors

Each group must research their topic and state ten important facts and/or benefits of this environmental strategy. Groups may include different examples of each topic and how they are important (ex: Low-flow Shower Heads: Why important? How much water can be saved?...).

Groups can write these ten important facts on paper or they can be saved to one group member's school drive or flash drive.

Day 2

Each group will be given a poster size paper.

- Each group must come up with a unique, proper and relevant name for their poster.
- One group member will then list one of the ten important facts on their groups paper.

Once finished, each group will pass their poster to another group in a clockwise fashion around the classroom.

- With each new poster, each group must write down a different fact.
- Therefore, each poster should be different because each group should have ten different facts to share.

When all groups have finished adding their information, the poster must be returned to the original group.

- Once the original group gets their poster back they can make a choice to add art to the poster in hand or they can create a new poster to present.
- If students prefer to use the computer, they can create a PowerPoint presentation using the information gathered on their poster paper.

At the end of class, each group will present their posters or PowerPoint!

- Then post these around the room to help remind ourselves what we can do everyday to help contribute to a healthier environment!
- Also ask administration to run the Powerpoint slides during lunches to help increase awareness and sustainability in your community.

Source

Hot Chalk Lesson Plans Page

<http://lessonplanspage.com/sciencesearthdayecologysustainabilityposters912-hm/?ux-=%25%7C10-143473-143474-143475%7C>

The Value of a Garden

Subjects:

Biology

Setting: Classroom and School Garden

Instructional Time:
1 class period (or 60 minutes)

Goal:

Students will gain an understanding of the multiple social, environmental, economic, and health benefits and services gardens provide.

Learning Objectives:

- Describe and explain the types, uses, and benefits of gardens

Grade Level Expectation(s):

B1.2: Scientific Reflection and Social Implications

B3: Interdependence of Living Systems and the Environment

Supplies:

- Regular printing paper cut in half vertically to create large rectangles, enough for all students to have at least 3
- Markers
- Small stickers (green, yellow, red)
- Tape



Procedure:

- In cooperation with other class members, brainstorm a list of different gardens. For example, home gardens, botanical gardens, community gardens, gardens at retirement communities for senior citizens, Japanese gardens. Ask them to indicate whether they have participated in any gardens or gardening before?
- List all the ideas on the board
- Next, have each student choose one of the gardens on the list created. Write all the benefits provided by that garden to people, neighborhoods, and the overall ecosystem. For example, does the garden provide food? A place for people to talk with people from other cultures? An “outdoor lab” where learning takes place? A place to conserve genetic diversity?
- Write down the main ideas on separate pieces of paper, written large enough for the entire class to read.
- Go around the class and have students read one of their cards out loud, allow an explanation if necessary, and post it on the board. As the teacher, you can have a general organization of benefits by scale: at the individual, group, community, and overall ecosystem level.
- Continue to ask around the classroom so that all the cards are placed on the board. Have students identify ones that are similar and group them together
- Give each student seven stickers—two green, three yellow, and two red—and have them “vote” by placing their stickers on the papers on the board. The green votes are for what they consider the most important benefits, the yellow are for lower ranked, but still important, and the red are for what they consider unimportant.
- Lead class in discussion of the traits they found similar and valued. Use the thoughts that come out of the voting and discussion to frame the following classes in the unit.

Homework:

Read *The Weight of a Petal: The Value of Botanical Gardens* article by H. Bruce Rinker

<http://www.actionbioscience.org/biodiversity/rinker2.html>

Annual Outcome Assessment:

The following section will detail how to conduct an assessment of one of the annual outcomes stated previously—students will be able to make informed recommendations for what to plant in the garden the following growing cycle.

Situation for Students to Provide Evidence

Students will be asked to create a final report for the class, which will ask them to synthesize all that they have learned throughout the year. The teacher will ask the students to create recommendations for what to plant in the garden for the following growing cycle (essentially the next academic year) and to ensure that all recommendations are substantiated by information learned throughout the course. Students will be asked to have a garden diagram and a written section that thoroughly explains their plans for the following year.

Acceptable Evidence of Attainment

If students are able to create a rich report—using diagrams, pictures, relevant use of classroom material and knowledge gained through the year, and clear writing—that details how to use the garden space the following year, then they demonstrate a thorough understanding of the course material. In order to create a report that is acceptable, it will have to synthesize the topics touched on throughout the year and be specific to the garden space at the school.

Criteria for Evaluation

The four criteria chosen for the evaluation are: application of ecological concepts, evidence, organization, and mechanics. The first deals with the scientific principles addressed throughout the course (i.e. soil composition/health, plant cycles/needs, crop rotation, biodiversity, etc) to ensure that students are able to reflect on their scientific education and their implication and applications in the broader scheme. To ensure that students are not simply regurgitating class lecture, but can also conduct research, the criterion of evidence is stressed. Finally, because literacy is an important factor to ensure, especially with the Common Core standards, the organization and mechanics of the paper were chosen as the final two points to consider.

Four-level Scoring Rubric Criteria	4) Outstanding	3) Competent	2) Basic	1) Needs Improvement
Application of Ecological Concepts	Plan demonstrates clear understanding of garden needs in short and long term Shows use of 6 or more plants, Clear recommendation on care and fertilization cycles and times	Plan demonstrates understanding of garden needs (i.e. companion planting, replenished soils, crop rotation) Shows use of 5 or more plants, Good recommendation on care and fertilization	Plan demonstrates some understanding of garden needs Shows use of 5 plants, Some recommendation on care and fertilization	No demonstration of garden needs Shows use of fewer than 3 plants, No recommendation on care and fertilization
Evidence	Well researched, includes more than 3 major references and relevant others. Refers to relevant class materials and notes, Exceptional references to personal experience in garden	Sufficiently researched, includes 3 major references and relevant others Refers to relevant class materials, Many references to personal experience in garden	Adequately researched, with 2 or fewer major references. Little reference to relevant class materials, Some references to personal experience in garden	Poorly researched with no major references. No reference to relevant class material, No references to personal experience in garden
Organization	Outstanding use of visual images to illustrate topics with clear explanations Progress of thoughts and ideas always logical, Document is easy to read with no formatting problems.	Clear garden plan with an image and clear explanation Progress of thoughts and ideas logical, Document is easy to read and has no major problems	Adequate garden plan with explanation Progress of thoughts and ideas sometimes logical, Document format could use improvement to increase understanding	No garden plan and no explanation Progress of thoughts and ideas not logical, Document is confusing to read and has many formatting errors
Mechanics (Spelling, grammar)	No errors in spelling, grammar, or punctuation, No syntax errors, Little passive voice	No common spelling and grammatical mistakes, Few syntax errors, Some passive voice	Some spelling and grammatical mistakes, Some syntax errors, Substantial passive voice	Many spelling and grammatical mistakes, Many syntax errors, Passive voice throughout paper

Source

November 2004, Marianne E. Krasny, Paul Newton, Linda Tompkins
Actionbioscience.org

Who Can Live Here?

Subjects:

Biology, Environmental Science/
Studies, Geography

Setting: Classroom, School
Garden or Greenhouse

Instructional Time:
2-3 class periods (120 minutes)

Goal: Students assess the fitness
of a habitat for a specific species.

Learning Objectives:

The students will be able to...

1. Locate habitat elements on a specific site.
2. Assess site's potential as a suitable habitat for a specific species.
3. Identify an area of the site that would include the most habitat elements for a specific species.

Advanced Preparation:

Identify a suitable study site for students, either on or near school grounds. Study sites should potentially provide habitat for at least 4 to 7 different species.

Grade Level Expectation(s):

B 1.1 Scientific Inquiry

B 1.2 Scientific Reflection &
Social Implications

B 3.2 Ecosystems

B 3.4x Human Impact

B 3.5 Populations

B 3.5x Environmental Factors

Supplies:

- Tools for observing wildlife: field guides, binoculars, hand lenses (optional)
- Habitat worksheets

Procedures:

Step 1

To evaluate the fitness of a habitat for a specific species, the students will first need to:

- Research the needs of animals native to the area. Assign each student (or allow students to choose) a different animal that is found or could be found at the study site. Assign animals from a variety of phyla.
- Identify the specific habitat needs of the animal—food, water, cover, and places to raise young.
- Describe the habitat type at the site and evaluate it for each of the habitat components and the impact of humans.
- Rate the habitat in terms of each component on a scale of 1 to 10, with 1=poor and 10=excellent.
- Analyze the findings to evaluate the quality of the site for this animal.
- A guide to assist the students in this task is included at the end of this activity.

Step 2

After the students have analyzed their individual species, the class should compile their findings to assess the overall wildlife habitat quality of the site. Record all of the data on a chart displayed in the classroom on the board, overhead projects or computer screen:

Who Can Live Here?

Discuss the answers to the following questions:

- Which animals had the highest total score? Lowest?
- Which components had the highest score? Lowest?
- For which animals would the habitat be the easiest to improve? Most difficult?
- Which habitat component is the easiest to improve? Hardest?
- Do different animals need different site enhancements?

Discuss different enhancement possibilities that might improve the habitat quality rating. Have the students break into groups according to the animals or components on which they would most like to focus. For example, a group may wish to focus on one component, such as water, or on one species for which one or more components were not appropriate. Have them draw up simple plans to improve the quality of the habitat and present them orally to the class.

The class should discuss each plan:

- How likely is it that the plan will improve the quality of this habitat?
- How feasible (in terms of time, cost, legal issues, etc.) is the plan?
- What community resources might be needed to implement the plan?
- What other information would they need to carry out their plan?
- Does the plan of one group affect the plan of another?
- Can any of the plans work in tandem?

Who Can Live Here?

Assessment:

1. Describe another location in the community familiar to the students. Provide photographs, maps, or diagrams if needed. Ask them what they would include in a survey of that site.
2. Give students the results of another survey (perhaps completed by another class for another site), and ask them to suggest a plan to improve habitat quality at that site.
3. Using inventory information, students write a site description and speculate about wildlife species that may have lived there once but are no longer seen there.

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Habitat Components

PLACES TO HUMAN

SPECIES FOOD WATER COVER RAISE YOUNG COMPATIBILITY TOTALS

Species A.....

Species B....

Species C....

Species D....

Species E....

Etc.

Worksheet:

Please see Appendix 6

Source

VITY SCHOOLYARD HABITATS PROGRAM

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What are Our Local Treasures?

Subjects:

Social Science, Local History, Art

Setting: Classroom and School Garden area

Instructional Time: 50-60 minute class period

Goal:

- Students will use investigative and creative skills to identify community resources and their social, cultural, and environmental value

Learning Objectives:

- Explore personal and collective views of treasures as people, places and values that a community has.
- Outcome: an initial “treasure map” of the community.

Advanced Preparation:

- Contact guest speakers
- Make arrangements for field trip to local site

Supplies:

- Map of North America
- Computer with internet access
- Science notebook

Grade Level

Expectation(s):

P2 Inquiry, Research, and Analysis

P3 Public Discourse and Decision Making

P4 Citizen Involvement

CG2 Resources

CG3 Patterns of Globalization

C6 Citizenship in Action

What are Our Local Treasures?

Procedure:

Have students answer the following:

What are treasures?

How might we define treasures? Explore students' special places. Make a treasure map of students' special places.

What are the different treasures our community values?

Interview parents and neighbors about what is special to them in their community. Create initial definition of what a community treasure is. Discuss a research plan for searching out and documenting treasures.

Who are our treasures?

Meet a treasure: Invite a town elder to come and visit and share view of history and what is important to living well. Outcome: Portrait of a Treasure.

Where are our treasures?

Visit a treasure. Visit a local "special place" on a field trip and investigate it through a variety of lenses. Discover its historical, ecological, aesthetic and fun "stories." When you return to class ask students to represent why they think this place is a treasure.

What is happening in our community to help protect our treasures?

What threatens our treasures? Share community activist presentation of threatened green space as example.

What treasures are important to preserve?

Are there treasures in our community that are threatened in some way? Invite a guest speaker from a group that is working to preserve ethnic heritage/cultural heritage. Is this something that we want to and can do something about. Explore possible class service project.

What do I want to know about our community treasures?

Research Project: Students work in groups to define, document and preserve a community treasure. Students become experts on a particular kind of treasure i.e. "peaceful places expert," "natural places expert," "threatened places expert," "safe places expert."

Assessments:

- Individual Portfolio of Community Map of Treasures as defined by class and student
- Group Presentation of Research on Local Treasures,
- Service Component that educates audience about community treasures
- Personal Reflection on Essential Question: What are our local treasures? How are they important to me?

Food Traditions Interview

Subjects:

Art, Life Science

Setting: Classroom, Outdoor Classroom, Garden, or Field space

Instructional Time:

One 30-minute period to plan the interview, one to conduct the interview, and one for discussion and wrap-up

Learning Objectives:

In this lesson, students interview an elder or someone from another culture to learn about foods in different times or places. This gives students broader insight for thinking critically about their own food choices.

Goal: Cross-generational exchanges can be deeply enriching for both students and elders. They give older adults a chance to share some of their life experiences with children, and expose children to the information and guidance older people can offer. Likewise, having a conversation about food with someone from a different culture can be enlightening. There are many countries where families eat little or no processed food and some countries where people grow the majority of what they eat. In this lesson, an elder or someone from another culture provides a unique and personal perspective on foods and food traditions, giving students a basis for examining their own eating habits with a critical eye.

Grade Level Expectation(s):

P2 Inquiry, Research, and Analysis

P3 Public Discourse and Decision Making

P4 Citizen Involvement

CG2 Resources

CG3 Patterns of Globalization

C6 Citizenship in Action

Supplies:

- Sample interview questions
- Video-recording equipment (optional)

Background:

From a societal point of view, the American diet has changed dramatically in the last 50 years. Advances in agriculture, transport, and production, as well as greater cultural diversity, have brought us food that is much more varied than it used to be. Technological advances have also increased the efficiency of food production, making food cheaper and more convenient.

However, many of these changes have taken a toll on personal and public health. Pre-packaged and processed foods have decreased meal preparation time and made it easier to eat quickly on demand. The increased use of products such as high fructose corn syrup has made high-calorie, supersized food items much more available. More meals are being eaten away from the home. As a result, many Americans are eating both more food and poorer quality food than was eaten by previous generations.

Americans' average daily calorie intake increased between 1970 and 2000 by nearly one-quarter (24.5%), or about 530 calories, with a greater proportion of the diet coming from refined flours, sugar, and fats.¹ Larger portion sizes, more snacking, and less nutritious food contribute to the current obesity epidemic and contribute to the significant rise in coronary heart disease, type 2 diabetes, hypertension, and other diseases.²

While we don't necessarily want to return to what some perceive as the "good old days," we can learn from our elders and those from different cultures about food choices for greater health and satisfaction. Traditional cultures often embody accumulated wisdom about food, with rituals, manners, taboos, and culinary traditions that help people discern what, when, and how much to eat. As food reporter Michael Pollan suggests, eating only things that great-grandmothers would recognize as food would go a long way toward a healthier diet.

Advanced Preparation:

- Identify a guest for the class to interview. The ideal guest grew up in a household that cooked mostly from scratch, using staples and fresh ingredients, and would enjoy talking with students about his or her experiences. The guest may be a grandparent or other elder, or someone who grew up in a culture or country where scratch cooking was the norm.
- Explain to your guest the purpose of the interview, and arrange a suitable time for the interview. If you would like to record the interview, ask permission to do so.
- If you will be recording the interview, set up the necessary equipment.

Procedures:

Lesson Introduction

Ask students to picture a grandparent or other older person in their lives and think about these questions: How do you think the foods he or she ate as a child were different from what you eat today? Do you know someone from a culture that is different from yours? When you compare your family's foods and eating customs to theirs, how do they differ?

Explain that you have invited a guest to speak to the class about foods and food preparation from the guest's childhood days. Share some information about the guest, and ask students what they might want to learn from him or her.

Conducting the Lesson

Step 1

Give students a copy of the sample interview questions, and read over the questions together.

Step 2

Work with students to determine which of the sample questions would be appropriate for your guest, and whether there are any they would like to add or change. Explain that strong interview questions are typically open-ended and elicit stories that are more interesting than one- or two-word responses. Discuss boundaries for questions, making clear what should and should not be asked.

Step 3

Plan a logical order for the interview questions, and decide who will ask each question. Point out that the best interviews are typically a combination of planned and spontaneous questions. Encourage students to listen carefully during the interview so that they can ask further questions about the guest's stories.

Step 4

Model good interviewing strategies such as making eye contact, taking notes, and asking follow-up questions ("How did you feel when that happened?" or "Can you tell us more about that?") to probe for more information. Allow time for students to practice interviewing each other using some of the planned interview questions.

Step 5

Discuss expectations for appropriate behavior throughout the guest's visit.

Step 6

On the day of the interview, introduce your guest to the class. Have students ask questions as planned. If you are recording the interview, be sure the equipment is ready to go.

Step 7

As the interview unfolds, pay attention to student questions and guest responses, and guide further questioning as appropriate. Also notice what aspects of your guest's experiences seem to capture your students' interest, and plan to build on those in the wrap-up.

Discussion and Wrap-Up:

Lead a discussion about the interview, with questions such as:

- What did you learn from the interview?
- How were our guest's foods and eating habits different from yours?
- What was most interesting or surprising to you?
- What food or preparation technique from the interview would you want to try?
- Did the interview help you understand – or make you question – anything about the foods you eat?

Direct students to write personal thank you letters to your guest. In their letters, students should include at least one thing they learned from the interview and one thing they would like to try.

Extension Ideas:

Class Cookbook. Families often pass down favorite recipes from generation to generation or from friend to friend. Have students talk with their family members about family favorites, and bring in a recipe to share with the class. Collect the recipes into a class cookbook, and give each family a copy. Encourage students to try one or more of their classmates' recipes.

Community Salad. Ask each student to bring a piece of fruit (or several pieces of small fruits like grapes or cherries) to make a community salad. Be sure to note any food allergies. Collect the fruit the day before you plan to make the salad, and supplement with additional fruit as needed. On salad-making day, have students wash their hands and cut up the fruit. Toss all the fruit together in a large bowl, and serve.

Source

Food Traditions Interview, Center for Ecoliteracy
Copyright © 2012 Center for Ecoliteracy
Published by Learning in the Real World, www.ecoliteracy.org

Food First: An Inquiry into Local Food Issues and Service Learning

Subjects:

Service-Learning, Civics

Setting: Classroom, School Garden or Greenhouse

Instructional Time:
2-3 class periods (120 minutes)

Goal:

- Students will be exposed to a variety of food related issues.
- Students will learn and practice consensus skills in developing an action plan.
- Students will uncover the answers to their overarching questions.
- Students will acquire the essential understandings.
- Students will demonstrate progress toward attaining the standards being addressed.

Grade Level Expectation(s):

- P2 Inquiry, Research, and Analysis
- P3 Public Discourse and Decision Making
- P4 Citizen Involvement
- CG2 Resources
- CG3 Patterns of Globalization
- C6 Citizenship in Action

Learning Objectives:

Students will understand that...

- Our actions (buying and consuming food) have an impact on our bodies, the environment, and the well being of our community.
- Individually and in small groups we can make a positive difference in our school and community.

Unit Summary/Local Story:

This unit is based on a “Civics in Action” course open to high school seniors and is focused on service learning. One component of the class is focused on food issues. Students begin with a “sampling” of food related issues through readings, videos, speakers, taste tests, research, and field trips. Ideally they will then survey the school and/or larger community about food-related concerns, come to the consensus about a project, and develop an action plan that they will then carry out and evaluate.

As seventeen and eighteen year-olds, these students are ready to be out in the larger world doing “real work”. The opportunity to design their own projects and the learning of consensus skills usually means increased commitment on their part. It is hard to predict what type of project or projects each group will choose but there will likely be discussion on working with the elementary school students on nutrition information, harvesting and producing their own food, a public information campaign on the importance of local agriculture, school wide composting, school garden, and greenhouse projects The Fall 2004 class decided to launch the school and community garden.

Overarching Questions:

- What are the major food issues in our school, community, and country?
- How can we learn more about them?
- How does the larger economy affect our local food sources?
- How does advertising affect what we eat?
- How does what we eat affect our health and environment?
- How can we improve our health, our environment, and our local economy?
- What does a balanced healthy meal look like?
- What vitamins and minerals does our body need to be healthy?
- What are the nutritional benefits of local foods?
- Who are the key players in our regional food system?

Assessment Plan

Performance Tasks:

- Pre-Assessments
- Focusing questions
- Discussions and group work
- Timeline, map, short response
- Presentation
- Reaction and reflection
- Interviews
- Consensus decision making
- Survey

Lesson Summaries

Lesson 1: Why Do We Eat What We Eat?

Students learn why we eat the foods we do and develop an understanding of how eating and food have changed. Students will also participate in a mock “national food crisis simulation.”

Lesson 2: Trace the French Fry

An Introduction to the Food System (from French Fries and the Food System by Sara Coblyn) Students will learn about how our food is grown, processed, and distributed, and its impact on the environment.

Lesson 3: Obesity Epidemic

Students learn about obesity in America and how it is affecting our health and economy.

Lesson 4: The Selling of Food—Ad Busters

Students examine the influence of the media and advertising on food choices.

Lesson 5: GMOs: What’s That?

Students learn about Genetically Modified Organisms and their role in the food system.

Lesson 6: Local Community, Local Concerns

Students discuss their concerns as well as the concerns of their peers, families, and farmers around food in their local community. Students visit a local farm to interview farmers.

Lesson 7: The Service Project: Launching the School Garden

Students create a giant garden “to do” list and begin to develop plans for launching a school garden.

Source

VERMONT Farm to School: Food, Farm & Nutrition Curriculum Units, VT FEED • www.vtfeed.org

Lesson 1: Why Do We Eat What We Eat?

Goal:

Students learn why we eat the foods we do and develop an understanding of how eating and food have changed. Students will also participate in a mock “national food crisis simulation.”

Setting: Classroom, School Garden

Instructional Time:
90 minutes

Topics:

- Nutrition
- Local Food Production
- Food Politics
- History & Social Sciences

Inquiry/Focusing Questions:

- Why do I eat certain foods?
- How has eating and food changed over the years?
- What might happen to this community if we had a national food crisis?

Supplies:

- Flip chart paper and markers
- Copies of Mrs. Moore’s journal (visit your local historical society for historical documents): www.vermonthistory.org
- Michael Pollan article, The (Agri)Cultural Contradictions of Obesity, www.nytimes.com/2003/10/12/magazine/12wln.html
- National Food Crisis Simulation handout (Appendix p. 200)

Grade Level Expectation(s):

- P2 Inquiry, Research, and Analysis
- P3 Public Discourse and Decision Making
- P4 Citizen Involvement
- CG2 Resources
- CG3 Patterns of Globalization
- C6 Citizenship in Action

Procedure:

Have students answer the following:

- Pre-assess student knowledge about foods that people in Chelsea might have eaten 200 years ago—chart or write on board.
- Read from Mrs. Moore’s journal (or any from a journal of a community member from the early 1900s) and add any additional items the group may not have listed.
- List common foods of Chelsea students today—chart. Discuss where these foods come from (food map).
- Pre-assess with the following questions: Ask how did we get from there to here? Are there advantages and disadvantages of either diet?
- Assign the Michael Pollan article “The (Agri)Cultural Contradictions of Obesity” and ask students to make a timeline of farm practice and policy in the USA. Answer the question: according to Pollan, why do we eat what we eat? (This is homework.)
- Count off into small groups and read the handout National Food Crisis Simulation. Create a map and list local food producers and wild food possibilities.
- Present to larger class and discuss the importance of local food availability.

Assessment:

- Pre-Assessment of student knowledge about foods
- Focusing questions related to understanding place
- Discussions and group work
- Timeline, map, short response

WORKSHEET:

Please see Appendix 7

Source

VERMONT Farm to School: Food, Farm & Nutrition Curriculum Units, VT FEED • www.vtfeed.org

Lesson 2: Trace the French Fry: An Introduction to the Food System?

Goal:

Students will learn about how our food is grown, processed, and distributed, and its impact on the environment.

Setting: Classroom, School Garden

Instructional Time:
90 minutes

Topics:

- Agriculture
- Sustainability
- Economics
- History & Social Sciences

Inquiry/Focusing Questions:

- How is our food grown, processed and distributed?
- How does this impact our environment?

Supplies:

- *French Fries and the Food System: A Year Round Curriculum Connecting Youth With Farming And Food*; by Sara Coblyn, The Food Project, 2003.
- Two potatoes: (one from local Michigan farm; one from Idaho)
- Handouts on local and conventional food systems (found in book)
- Energy Used in Producing Food (found in book)
- Chart paper
- Markers
- Masking tape

Grade Level Expectation(s):

P2 Inquiry, Research, and Analysis

P3 Public Discourse and Decision Making

P4 Citizen Involvement

CG2 Resources

CG3 Patterns of Globalization

C6 Citizenship in Action

Procedure:

- Compare and contrast two potatoes—one from a local Michigan farm and one from Idaho. Pre-assess the group’s knowledge about the visible and invisible differences of both.
- Define a food system.
- Divide the group in half and hand out pieces of a local, sustainable food system and pieces of a conventional, global system.
- Each group develops a “map” using these pieces.
- Groups present.
- Discuss the handout on energy used to produce food and the impact food production has on the environment.

Assessment:

- Pre-Assessment of group knowledge about food differences
- Presentation of food system
- Discussion about energy production

Source

VERMONT Farm to School: Food, Farm & Nutrition Curriculum Units, VT FEED • www.vtfeed.org

Lesson 3: Obesity Epidemic

Goal:

Students learn about obesity in America and how it’s affecting our health and economy.

Setting: Classroom, School Garden

Instructional Time:

90 minutes

Topics:

- Food, Nutrition, Health

Inquiry/Focusing Questions:

- Why are so many Americans obese?
- How is obesity affecting children? Adults? Our economy?

Procedure:

- Pre-assess student knowledge about *MyPlate*, general nutrition, and fad diets.
- Watch the ABC documentary *How to Get Fat Without Even Trying* and discuss dieting, obesity, type II diabetes, and any other relevant articles or current news around the issue.
- Look over various food diagrams in small groups making some observations about the differences and developing questions about the process of food diagrams.
- Ask students to represent what they ate yesterday on their own diagram.
- Assign an article for homework and ask students to write a short reaction to both articles and a reflection of their own diet.

Assessment:

- Pre-Assessment of *MyPlate* and general nutrition information
- Reaction and reflection after watching the documentary

Grade Level Expectations:

P2 Inquiry, Research, and Analysis

P3 Public Discourse and Decision Making

P4 Citizen Involvement

C6 Citizenship in Action

Supplies:

- Copy of ABC documentary *How to Get Fat Without Even Trying* (can be sourced/downloaded online)
- Copies of current articles on obesity, health and nutrition
Copies of food diagrams from various cultures

Lesson 4: The Selling of Food—Ad Busters

Goal:

Students examine the influence of the media and advertising on food choices.

Setting: Classroom, School Garden

Instructional Time:
90 minutes

Topics:

- Food, Nutrition
- Advertising/Marketing

Inquiry/Focusing Questions:

- How does advertising influence our food choices?

Procedure:

- Pre-assess student knowledge about marketing techniques used in advertising.
- Discuss different techniques used with food marketing (food photography, parent manipulation, the “cool factor”, junk food masking as healthy food, etc.).
- Look through magazines and choose two food ads to analyze.
- Present food ads and analysis to class.
- Discuss how advertising influences our decisions.
- Introduce an article on health and obesity and assign for homework.

Assessment:

- Pre-Assessment of student knowledge related to marketing & advertising
- Presentation
- Group discussion about the effects of advertising on our health

Grade Level

Expectation(s):

- P2 Inquiry, Research, and Analysis
- P3 Public Discourse and Decision Making
- P4 Citizen Involvement
- CG3 Patterns of Globalization
- C6 Citizenship in Action

Supplies:

- Old magazines
- Current health and obesity related article

Source
VERMONT Farm to School: Food, Farm & Nutrition Curriculum Units, VT FEED • www.vtfeed.org

Lesson 5: GMOs: What's That?

Goal:

Students learn about Genetically Modified Organisms and their role in the food system.

Setting: Classroom, School Garden

Instructional Time:
90 minutes

Topics:

- Food
- Business
- Agriculture
- History & Social Sciences

Inquiry/Focusing Questions:

- What are GMOs?
- Are they beneficial or harmful?
- Do we know what is in our food?

Procedure:

- Pre-assess students on GMOs.
- Watch *Deconstructing Supper* and fill in film notes (could be pre-assessment).
- Discuss film and issues of GMOs.
- Plan a field study at The Farmer’s Diner or a local restaurant that sources locally grown foods (meet with owner and farm liaison).
- Interview the owner of the diner about local, organic and GMO issues.

Assessment:

- Pre-Assessment of GMOs
- Interview
- Group discussion

Grade Level

Expectation(s):

- P2 Inquiry, Research, and Analysis
- P3 Public Discourse and Decision Making
- P4 Citizen Involvement
- CG2 Resources
- CG3 Patterns of Globalization
- C6 Citizenship in Action

Supplies:

- Video *Deconstructing Supper* (can be sourced/downloaded online)
- Film notes on board
- Permission slips
- Money for restaurant field trip—fund raise or ask students to bring from home

Source
VERMONT Farm to School: Food, Farm & Nutrition Curriculum Units, VT FEED • www.vtfeed.org

Lesson 6: Local Communities, Local Concerns

Goal:

Students discuss their concerns as well as the concerns of their peers, families, and farmers around food in their local community. Students visit a local farm to interview farmers.

Setting: Classroom, Local Farm

Instructional Time: ½ day

Topics:

- Connecting with local farmers

Inquiry/Focusing Questions:

- What concerns do we have around food in our community?
- What concerns do our peers, families, and local farmers have about food in our community?

Procedure:

- Set up a field study at Luna Bleu Farm to discuss farmers' concerns.
- Train students in survey taking, looking at questionnaires & examples.
- Design a survey to be conducted for school and local community.
- Conduct a survey.
- Design questions for interviewing farmers.
- Trip to local farm to interview farmers (some service work too?).
- Debrief the field study.
- Tabulate the survey.
- Ask students to brainstorm a list of ideas for service project connected to addressing these concerns.

Grade Level Expectation(s):

- P2 Inquiry, Research, and Analysis
- P3 Public Discourse and Decision Making
- P4 Citizen Involvement
- CG2 Resources
- CG3 Patterns of Globalization
- C6 Citizenship in Action

Supplies:

- Copies of surveys

Assessment:

- Survey (product & performance 2.1, 2.13)
- Interview (performance 2.1)
- Discussion (anecdotal 1.13)
- Brainstorm list (task 2.2, 2.13)

Lesson 7: The Service Project: Launching the School Garden

Goal:

Students create a giant garden "to do" list and begin to develop plans for launching a school garden

Setting: Classroom, potential Outdoor Garden space

Instructional Time: 90 minutes

Topics:

- Service learning

Inquiry/Focusing Questions:

- How can we launch the school garden and build in community support?

Procedure:

- Create the giant "to do" list
- Decide on committees and leadership roles (design, community relations, publicity, video documentation, fundraising/ budget, curriculum connections, group morale/teamwork, etc).
- Create individual rubrics for the service project; ask students to identify goals and standards for learning connected content, skills, and teamwork.
- Confer with students.
- Decide on a schedule (one "hands-on" day working in garden with a planning session the day before).
- Work and have fun in the garden! Photograph, video, and reflect in garden journal.
- Discuss ways in which to create school and community involvement (survey class meetings and elementary classes, and include their ideas in

Grade Level Expectation(s):

- P2 Inquiry, Research, and Analysis
- P3 Public Discourse and Decision Making
- P4 Citizen Involvement
- CG2 Resources
- CG3 Patterns of Globalization
- C6 Citizenship in Action

Supplies:

- Create a garden journal
- Cameras, video cameras, etc.
- Paper and masking tape
- Work gloves, shovels, rakes, wheelbarrows, and other garden implements

Food First: Lesson 7

in the planning stages; create a series of school wide and community work days).

- Organize and implement these ideas!
- Group assess the project—what went well and what was challenging?
- Self-assessment and reflection using self-designed rubric.
- Leave a list of suggested next steps for future groups in the garden journal.

Assessment:

- Group assessment
- Self-designed rubric
- Garden journal
- Student documentary

WORKSHEET:

Please see Appendix 8



Art

Math

Science

Social
Studies

Appendix

Botany and Art Lesson 2: Botanical Illustration



Illustration © Julie Martinez



Photograph © 2010 Yuichi Momma

ATAMASCO LILY

(Zephyranthes atamasca)

Also called “rain lily,” this fragrant (and poisonous) flower was described by colonists at Jamestown. Scientists are now finding promise of anti-cancer properties in its bulb. While flourishing in several states, it is threatened at the edges of its range: in Maryland, where it has been found in only one site, and in south Florida, where it shares a diminished habitat with the Florida panther.

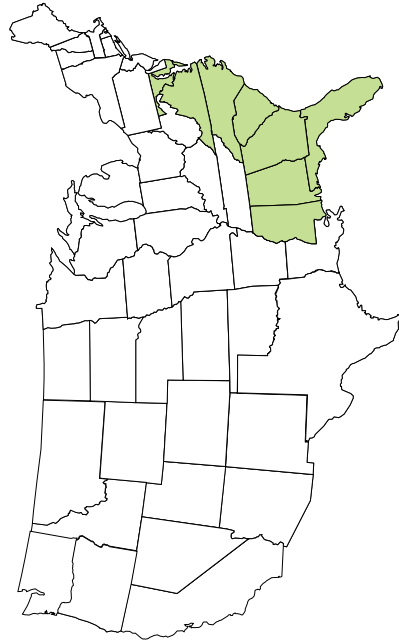




Illustration © 2008 Jee-Yoon Koo

BOWL FLOWER

(Cypripedium japonicum)

Only 200 individual specimens of this orchid remain in the wild in South Korea, where it is a protected species. Numbers are higher in China and Japan, but recent genetic studies indicate that it is a naturally rare plant. In China, it shares bamboo-grove habitats with the giant panda.



Photograph © 2010 Yuichi Momma



GOLDENSEAL

(Hydrastis canadensis)

The root of the goldenseal is used as an herbal remedy—it contains antibiotic and anti-inflammatory alkaloids. Thriving in the shade of the eastern forests, it was threatened first by loss of forestland and then by global demand for its root. State governments began listing it as endangered in the 1990s. The roots of cultivated plants are sold legally, but tend to be expensive. The collection of wild plants, therefore, continues.



Illustration © 2003 Wendy Halbroder



MARSH GENTIAN

(Gentiana pneumonanthe)

The rare Alcon blue butterfly depends on this plant and an ant species for survival. The butterfly's caterpillar has a smell similar to the ant's larvae. The caterpillar feeds on the plant until found by ants. Mistaking the smell, the ants carry the caterpillar back to their nest to raise it as if it were one of their own. When the caterpillar becomes a butterfly, it beats a hasty exit from the nest—before the duped ants can kill it! Both plant and butterfly are threatened by the shrinking of European marshland.



Illustration © 2008 Gillian Barlow



YELLOW LADY'S SLIPPER

(Cypripedium parviflorum)

According to a 1920s guide to botanical medicine, the root of this orchid was used to treat disorders ranging from "muscular twitching" to "gloom." Valued today for the beauty of its shoe-shaped flower, the plant is protected against "orchid poachers" by several state governments. For reasons not yet known, its numbers are declining drastically even in protected areas.



Illustration © 2003 Kathleen Garretts



4. The portfolio should include items described in A and B below, and will be limited to ten pages single sided or five pages double sided maximum not including the cover page. The cover page will include the title of the issue, and names. A maximum of ten (10) points will deducted for exceeding the maximum amount of pages and/or for not including the cover page obtaining required information.

A. A cover sheet and bibliography.

1. Cover sheet as described in section six above.
2. A bibliography of all resources and references cited which may include personal interviews and any other supporting material.

B. Summary:

1. Summary should answer questions like the following:
 - Explain why the issue is important now.
 - What is the nature of the issue and who is involved?
 - How can the issue be defined and describe history?
 - What caused the issue and risks/benefits of the issue?
 - Is their disagreement on how the issue could be solved?

5. Time Limits: Five minutes will be allowed for set up. The presentations will be a maximum of 15 minutes in length. The presenters will receive a signal at 9:30 minutes and at 14:30 minutes. At 15 minutes, the timekeeper will stand and remain standing until the presentation is done. A maximum of 5 minutes for questions and answers will be allotted. Questions and answers will terminate at the end of 5 minutes. Five minutes will be allowed for take down. The timekeeper should record the length of the presentation and report to the judges. The exact total minutes and seconds must be recorded showing undertime or overtime for which deductions will be made. Deductions of 2 points will be made for each minute (or major fraction, thereof) over 15 minutes and 4 points for each minute (or major fraction, thereof) under 10 minutes based on the timekeeper's record.

6. The judges may ask questions of all individuals of the presenting team. Each individual is encouraged to respond to at least one question from the judges.

Nutrition Issues Presentation Student Page

Nutrition Issue Presentation Outline

Name: _____

NUTRITIONAL ISSUE OUTLINE

Your presentation may include any combination of actions, words, and charts on any subject pertaining to nutrition or gardening.

TOPIC:

RESEARCH CONDUCTED ABOUT THE ISSUE:

Information:	Source:
Information:	Source:
Information:	Source:
Information:	Source:
Information:	Source:

Pros:	Cona:
-------	-------

SUMMARY QUESTIONS:

- Explain why the issue is important now.
- What is the nature of the issue and who is involved?
- How can the issue be defined and describe history?
- What caused the issue and risks/benefits of the issue?
- Is their disagreement on how the issue could be solved?

Name _____ Date _____ Hour _____

SUMMARY QUESTIONS

INTRODUCTION

(Create a corny theme for your demonstration that you can use throughout the presentation and then finish with a strong conclusion that relates to the corny theme):

BODY:

Issue 1 (all issues discussed must talk identify both the pros and the cons of the issue):

Issue 2 (all issues discussed must talk identify both the pros and the cons of the issue):

Issue 3 (all issues discussed must talk identify both the pros and the cons of the issue):

Conclusion (Tell the audience what you “told them”, review your demonstration in the form of a summary that repeats or fits into the corny theme you used in your introduction):

Nutrition Issues Presentation Student Page

Nutritional Issues Score Card

Team Name: _____

	Pts. Poss.	Pts. Given
1. Introduction (statement of the issue and it's importance)	20	
2. Pro View Point (supporting evidence-that is current, organized well, and complete)	20	
3. Con View Point (supporting evidence-that is current, organized well, and complete)	20	
4. Summary * summarize pro's and con's * don't take sides	20	
5. Overall Presentation (participation of each team member, quality and power of presentation, creativity and stage presence)	20	
6. Questions	25	
7. Portfolio (Bibliography and summary of topic)	A. (Bibliography & Cover Sheet)	10
	B. Summary of Topic	30
Deductions for time (4 pts./minute{or fraction of} under 9 min. 30 seconds) (2 pts./minute{or fraction of} over 15 min. 30 seconds)		
Grand Total	130	

Oral Presentation Rubric : Elementary/Middle School Nutrition Demonstration Evaluation

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Preparedness and Organization	Student is completely prepared and has obviously rehearsed.	Student seems pretty prepared but might have needed a couple more rehearsals.	The student is somewhat prepared, but it is clear that rehearsal was lacking.	Student does not seem at all prepared to present.
Enthusiasm and Tone of Voice	Facial expressions and body language generate a strong interest and enthusiasm about the topic in others.	Facial expressions and body language sometimes generate a strong interest and enthusiasm about the topic in others.	Facial expressions and body language are used to try to generate enthusiasm, but seem somewhat faked.	Very little use of facial expressions or body language. Did not generate much interest in topic being presented.
Speaks Clearly and at Appropriate Level	Speaks clearly and distinctly all (100-95%) the time, and mispronounces no words.	Speaks clearly and distinctly all (100-95%) the time, but mispronounces one word.	Speaks clearly and distinctly most (94-85%) of the time. Mispronounces no more than one word.	Often mumbles or can not be understood OR mispronounces more than one word.
Content and Objectives Addressed	Shows a full understanding of the topic.	Shows a good understanding of the topic.	Shows a good understanding of parts of the topic.	Does not seem to understand the topic very well.
Hands-on and Visual Aids	Included class in the learning process and did more than lecture to the class	Included class in the learning process	Tried to involve students in the lesson, but mostly lectured	Does not seem to include class and mostly talked to them, not involving them in the process.

TOTAL _____

Grading Scale:

18-20 A

16-17 B

14-15 C

12-13 D

0-11 F

Nutrition Issues Presentations Student Worksheet

Name: _____

NUTRITIONAL ISSUE PRESENTATION

I. Objectives

1. To provide an opportunity to expose a wide variety of students to the selection, research, planning and presentation of a nutritional issue.
2. To acquire knowledge and skills in community leadership for present and future use.
3. To become knowledgeable of, and familiar with, a variety of local, state, national and international issues facing nutrition and gardening.
4. To understand the principles and fundamentals of nutritional issue analysis.
5. To further the awareness of nutritional issues in the local community.
6. To promote integration of nutritional issue analysis in local school academic subject matter areas.
7. To promote career choices by providing an opportunity for individuals to become acquainted with professionals in the industry.
8. To foster teamwork, leadership and communication skills.

Geometry, Gardens & Nutrition: Addition Info, Examples & Worksheet

Background: Square-ft Gardens

Square – foot gardens are a simple way to create space for growing vegetables, herbs or ornamental plants. Typically they are made by using 2 X 6 lumber in a 4 foot by 8 foot bed. Plants are then planted or seeds sown according the design. For example, large plants like tomatoes need a full square foot of space, and squash need 9 square feet of space (3 feet by 3 feet); whereas, spinach or beets can be planted with 12 to 16 plants in a square foot. The book “All New Square Foot Gardening” by Mel Bartholomew explains in thorough detail how to design and install a raised – bed garden using the square – foot technique.

The reasons for designing a raised bed square – foot garden are to conserve space and permit maintenance to happen without walking on or next to the plants. Plants in a four by eight foot bed can be reached from any side. Of course, a bed that is eight by eight would be too wide. Therefore, the design should not be too wide so that maintenance can happen easily. Probably five or six feet is as wide as a bed should be so the gardener can reach to the center.

References:

Bartholomew, Mel, “All New Square Foot Gardening”, Cool Spring Press, 2006.
 Kock, Pamela, ,et. al., “Growing Food”, Teachers College Columbia University, 2007
 Robert Larson Duyff, “Complete Food and Nutrition Guide,” 3rd Edition, 2005, American Dietetic Association, John Wiley & Sons, Inc., Hoboken, New Jersey.
 MyPyramid Website Home Page: <http://www.mypyramid.gov/>

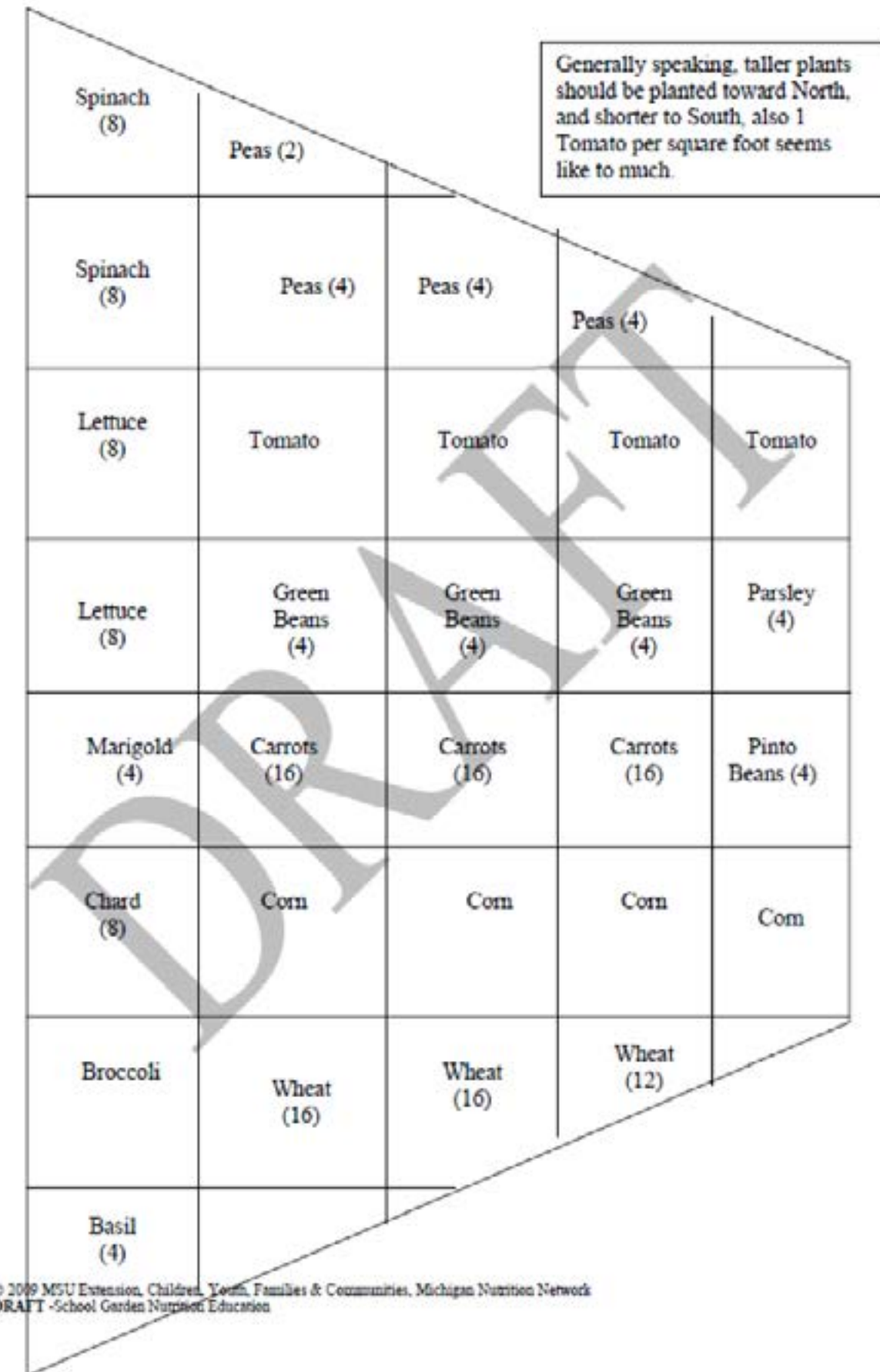
Example Student Illustration

See corresponding page

Student Work Page

See page 131

Example Student Garden Design



Geometry, Gardens & Nutrition Worksheet

Name _____ Date _____ Hour _____

The following questions should help you and your teacher process through designing and building your square – foot garden.

1. What shape did you choose? Why?
2. What is the area of your shape? What is the volume of the soil you will need?
Hint: Volume = Area of your shape time the depth of the garden in feet. Show or explain how you calculated the area especially if the shape is not regular or does not have a formula.
3. What plants do you want to grow in this garden? Why?
4. Attach your design to this question sheet.
5. Which garden designs do you like the best out of all the classes? Why?

Assessment

You have designed the following garden shown on the back of this page.

- (1) Explain the purpose of using the square – foot garden method. (20 pts)
- (2) Explain how to calculate the area and volume. (50 pts.)
- (3) Explain why the design includes the chosen plants (think food pyramid). (30 pts.)

Which birds travel from the Arctic Refuge to or through your area?

Each summer, birds use the Arctic Refuge to nest, raise young, feed, or rest. They then migrate to destinations in the States and beyond. This map shows some birds that may visit your area.

Arctic National Wildlife Refuge
 907/456 4210 800/767 4546
 arctic_refuge@fws.gov
 http://arctic.fws.gov/

AMERICA'S NATIONAL WILDLIFE REFUGE SYSTEM...
 Conserving the Nature of America

Student Worksheet - Who Can Live Here?

SCHOOLYARD HABITATS PROGRAM

Name: _____
 Date: _____
 Site: _____
 Location: _____

Part 1: Natural History

Wildlife Species:

Description of animal:

Specific Needs of Animal

Food: _____

Water: _____

Cover (all types: nesting, wintering, storage, resting, and protection):

Places to Raise Young:

Part 2: Habitat Characteristics

Habitat Type: (check all applicable)

Who Can Live Here?

Mixed Forest	Shrub
Lake	Park
Forest	Shrub with some trees
River	Houses, many trees, mowed lawn
Agricultural Field	Schoolyard
Pond	Houses, few trees and little lawn
Mixed field/shrub	Neighborhood
Stream	Buildings, scattering of trees, little or no lawn
Mixed field/shrub/some trees	Business Area
Wetland	Other _____

Briefly describe the habitat at the site you're investigating, including major vegetation and wildlife known to be on site: _____

Part 3: Habitat Component Rating

A. Food

1. Does this site provide food for this animal? Yes No

2. If yes, list foods found on this site: _____

3. Are foods limited to one or more seasons? Yes No

4. If yes, which seasons? Winter Spring Summer Fall

Rate "Food" from 1 to 10: _____ ("10" is excellent quality; "1" is poor quality.)

B. Water

1. Does this site provide water for this animal? Yes No

2. If yes, list water sources found on this site: _____

Rate "Water" from 1 to 10: _____ ("10" is excellent quality; "1" is poor quality.)

C. Cover

Animals require different types of cover. Place "yes" next to those cover types that your animal requires, then decide if this site meets the needs for the animal. If yes, list possible places where the animal may find cover on your site.

COVER TYPE NEEDED BY ANIMAL? FOUND ON SITE? LOCATIONS (BE SPECIFIC)

Breeding/Nesting

Nursery

Roosting/Resting

Hibernating

Protection

Other

Rate "Cover" from 1 to 10: _____ ("10" is excellent quality; "1" is poor quality.)

E. Places to Raise Young

1. Does the site provide adequate places to raise young? Please explain.

Rate "Places to Raise Young" from 1 to 10: _____ ("10" is excellent quality; "1" is poor.)

Part 4. Human Compatibility

Are there human activities on this site? Yes / No

If so, list: _____

Are these activities compatible with this animal inhabiting this site? Explain.

Rate "Human Compatibility" from 1 to 10: _____ ("10" is excellent quality; "1" is poor.)

Part 5: Management

What is the total rating for this animal at this site? _____

Based on this total habitat evaluation, could this animal live on this site? _____

Why or why not? _____

Does the animal live on this site to your knowledge? Yes No

If not, why not? _____

Can this site be easily improved for this animal? Yes No

If yes, how? _____

Lesson 1: Why Do We Eat What We Eat?

FOOD FIRST LESSON SERIES

National Food Crisis Simulation

A scenario from the future...

The OPEC nations are protesting an American invasion of Iran and are enforcing an oil blockade. Gas and food prices have skyrocketed as a result. The President has made a plea to all Americans to conserve energy. Food rationing is being implemented.

During WWI and WWII (and other times of crisis), Vermonters have always been extremely resourceful growing and supplying much of their own food. Times are changing, however, and many family farms have disappeared.

You, the selectboard of Chelsea, have agreed to meet in an emergency session to try and map out our local food supply. If you can identify where potential food sources are located, then a plan can be put into place. An emergency town meeting can be called to explain this plan and receive community input. There is not much time; people are starting to panic. The goal is to feed everyone, and prevent hoarding and skyrocketing prices.

As a group, identify who produces what in Chelsea and the surrounding towns (produce, fruit, meat, eggs, dairy, syrup, bread, etc.). It doesn't matter how small an operation is, everyone can help! What can be gathered from the wild? Where?

Make a list and map out the location of these producers and food when possible.

Lesson 7: The Service Project - Launching the School Garden

FOOD FIRST LESSON SERIES

Individual Rubric

In order to stress the educational and service aspect of this group project, students will be asked to assess and reflect on their learning in the following ways:

- Student-designed rubric for content, skills, and teamwork
- Final group evaluation of the project when it's complete (will be discussed later)
- A short reflective paper describing one's personal development and participation

Designing the Rubric

A rubric can be a simple tool that sets and describes standards in three or more categories (fair, good, excellent).

This project has three components (content, skills, and teamwork) in which a rubric should be designed.

Content:

You should decide on the specific content you will be most motivated to learn and bring back to this project. Suggestions: garden design (paths, beds), impact shade has on the garden, soil conditions, how to grow certain veggies, compost design, raised beds and regular rows, beneficial plants and animals, organic gardening, green house design and growing, watering systems (drip irrigation etc.), seed saving, pest control, etc.

How will this be learned? (*interviews, field trips, book/web searches, experiments...*)

How will this new learning be shown? (*write up for a three year plan, presentation, visual...*)

How do fair, good, and excellent show in this process?

Skills:

Everyone is helping to lead one of the garden committees. All of these tasks require civic and social skills. You should be challenging yourself to step out of your comfort zone in some way—academically, physically, socially, emotionally, or ethically. There are plenty of opportunities to interact respectfully with people who have different value systems and/or styles (elementary kids, elders, community members, the media, etc.)

Teamwork:

Strong communication skills make a project go more smoothly as do organization, tolerance for diversity, a positive attitude, leadership, and collaboration. Working together to address a real community need and to actually launch such an ambitious project takes a team! There may be bumps in the road but this group has many talents! Set a few goals in this area and describe fair, good, and excellent efforts towards this.

Lesson 7: The Service Project - Launching the School Garden

FOOD FIRST LESSON SERIES

Student Roles & Responsibilities (examples)

Press/Media Managers

- List of media contacts
- A “blurb” for the school website
- Keep a daily journal of school garden project (we might publish it!)
- Ask researchers (or do it yourself) to find some info on wild parsnip as a little “side” tidbit to inform the press (and our journal) about this non-local invasive plant!!

Group Dynamics/ Group Spirit

- Schedule and lead some group activities (or arrange for others to lead them)
- “Catch up” anyone who has been absent
- “Check-in” with negative or grumpy group members (maybe outside of class?)—is there something that could be done? Or do they just need a reminder about their impact on the group?
- Remind food “presenters” to bring their food experiments—every day!!!
- Help get desks in a circle every day (or remind others to help!!)
- Remind people to raise hands, no side talking, no letter/note writing, etc.
- Is there a game we could play on the bus or our field trip? (cosmic countdown?)

Researchers

- Compost design (straw bale; bins)
- Soil testing
- Send away samples to UVM Agricultural Extension
- School garden designs, use and summer maintenance
- 4H programs? Grange? Friends of Chelsea, UVM Master gardeners?
- Sunlight amount? Solar “gadget” to determine amount of sun
- Pros/cons of raised beds
- Drainage issues!

Donations/ Fundraising/ Volunteer Services

- List of items needed/“wish list”
- List of donators for a thank you letter later
- Figure out who might be able to raise funds at farmers’ market (we’d need some visuals or something)

Student Roles & Responsibilities Continued...

- Write up a “blurb” about the project for fundraising letters/phone calls. (One should be addressed to Friends of Chelsea School soon!! Who should it go to? Before October!).
- How much \$? What does it buy?

Organizers & Detail Support

- Keep notes & lists
- Collect permission slips for trips
- Organize field trip to Luna Bleu Farm
 - Call Suzanne Long (two weeks from now)
 - Forms for office (bus and permission)
 - Let cafeteria know! (about food)
 - List of students on announcements for other teachers to know
- Are you willing to word process stuff for other group members?
- Should we organize a school garden bulletin board in our room or some place to put “stuff”?
- Help organize a community work day for the garden (Oct 2nd/ Sue Rogers knows about it)
 - Posters? Call/ email Friends of Chelsea School?
- Make a chronological to-do list

Documenters

- Digital camera!! Easy photo prints!
- Photos of field trips
- Print out stills for school bulletin board and journal
- Are we making a documentary of this?
- Interview each student about the school garden?

Interview Teachers

- Can we get some photos on the school web page?
- Can we get some beautiful blown-up framed photos to put in the cafeteria?

Public & Community Relations

- Get a land map (put a copy in garden journal)
- Schedule time and contact neighbors—ask them about concerns, ideas they might have
- Weekly, put up pictures/photos and small, beautiful updates on the bulletin board in the cafeteria to “educate” and update school on this project
- Keep a list of “thank yous” for cards