Developing an Experiential Curriculum for Sustainable Agriculture and Food Systems Education

by

Alexandra Dart

Honors Capstone

Supervised by

Dr. Daniel Levin

Spring 2010

Submitted to the
University Honors Program
American University

In partial fulfillment of the requirements for graduation with
General University Honors
Bachelor of Arts Degree

April 2010

Abstract

Facing concurrent crises in personal health, economic stability, global justice, and environmental wellbeing, our society is waking up to the consequences of a century of careless, unbridled consumption. Recognizing that responding to these crises will require today's youth to reconsider some of the fundamental elements of our daily lives, this curriculum uses the modern food system as a framework for exploring present challenges and empowering young people to design a sustainable future. The curriculum is grounded in experiential education theory, a transformational approach that engages students in meaningful experiences and reflection. The activities within the curriculum support a framework of core ideas about agriculture and food systems developed in consultation with experts in the fields of sustainable agriculture and agricultural education. Through a week of quality educational experiences, ranging from simulations about crop biodiversity to exploring a grocery store and a sustainable farm, students will expand their understanding, develop a sense of personal investment, and build the skills needed to respond to modern challenges and work towards a better world.

Table of Contents

Developing an Experiential Curriculum for Sustainable Agriculture and Food Systems Education

In a 2007 speech at the University of Pennsylvania School of Design commencement ceremony, designer and educator Dr. David Orr articulated a set of four facts that, whatever one's opinions, "will fundamentally shape the world in which [we] live and work" (para. 3). Those facts have to do with our capacity to connect to nature, our upholding of justice in an increasingly crowded world, our ability to deal with the limits of the physical world, and our potential for survival in a less stable environment. Orr begins by pointing out that Americans spend more than 95 percent of our time indoors, leading to a disconnection that author Richard Louv refers to as "nature deficit disorder" (as cited in Orr, 2007, para. 4). We have lost our sense of place and our connection with the non-human world. Secondly, the world is getting crowded. A growing population of close to seven billion people, all demanding an ever-higher standard of living, vies for finite resources. As a result, the gap between rich and poor grows daily, imposing unthinkable injustices on more than one-and-a-half billion people. After decades of careless resource consumption by the affluent, we have reached the end of cheap fossil fuels. This third fact pushes us to scramble for alternatives lest we face a volatile economic future. Our addiction to cheap fossil fuels over the past century has led to the fourth fact. The planet's climate is changing because of the greenhouse gases accumulating due to human activity, and though we cannot be sure of the exact consequences of the changes, the scientific community is confident that they will be profound (Orr, 2007, para. 4-7).

These four facts call into question the sustainability of our society. Sustainability refers to our ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. Those needs fall under three umbrellas, collectively referred to as the "three pillars" or "triple bottom line" of sustainability: environmental, sociopolitical and economic. The 2005 Millennium Ecosystem Assessment (MEA), called for by the United Nations Secretary-

General, appraised the state of the planet's resources and the consequences of ecosystem changes for human well-being. The MEA observed that "human activity is putting such strain on the natural functions of earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted" (Hirsch, 2005, p. 5). Furthermore, the MEA team asserted that if we do not acknowledge this reality and prevent it from worsening "we place in jeopardy the dreams of citizens everywhere to rid the world of hunger, extreme poverty, and avoidable disease—as well as increasing the risk of sudden changes to the planet's life-support systems from which even the wealthiest may not be shielded" (p. 5). Many of the dangers themselves are rooted in our effect on the natural world, but their sources and consequences extend well beyond environmental concerns. They are matters of justice, spirituality, pleasure, safety, politics, health and so many other facets of society, thus, a sustainable future requires consideration of all three pillars.

This is a staggering realization for today's youth. Even more alarming is society's present lack of a meaningful response to the hole dug over the past century. Well over half of teenagers surveyed in a 2005 Kaiser Family Foundation survey said that they "feel things have gotten pretty seriously off on the wrong track" in the United States. Seventy percent of respondents in the same survey believe that pollution will be a bigger problem when they are their parents' age than it is today, and only sixteen percent think it will be less of a problem (Kaiser Family Foundation, 2005). Today's generation of children faces a lower average life expectancy than their parents, the first such trend in recent history (Commonwealth of Massachusetts, 2007, par. 2). As a generation, we are rightfully pessimistic. As Orr (2007) explains, "optimism is a prediction that the odds are in your favor…hope is the faith that things will work out whatever the odds…hopeful people are actively engaged in defying the odds or changing the odds" (para. 9). We cannot sincerely be optimistic, but we cannot afford to lose hope either. Ensuring a stable, better world for ourselves and future generations requires definitive action now. We must reshape the way we live to make it sustainable.

This reality has inspired me to pursue change. My academic and extracurricular pursuits at American University have centered on an exploration of the global food system as it relates to the environment, culture, politics, and economics. The manner in which today's food system developed and the condition in which it currently exists embody the characteristics of our broader global crisis. That is, the current global food system was not designed with sustainability in mind, and so it is wrought with an incredibly complex set of consequences in each of the pillars of sustainability. The economic sustainability of the system comes into question when one considers, for example, the enormous government subsidies that transfer tax dollars to the pockets of industrial corn and soy producers. The rising input costs of a petroleum-dependent system also challenges its economic future These include such issues as fresh water contamination and shortages, biodiversity loss, cancer caused by agricultural chemical toxicity, unsafe working conditions, and rising input costs, to name a few. Because of these wide-ranging and deeply-ingrained issues, redesigning the global food system is both an enormous challenge and essential to fashioning a sustainable society.

Exploring agriculture and food systems and taking action to address their problems, both individually and collectively, are important and meaningful ways for young people to engage in the movement for sustainability. To that end, I intend to design a curriculum that will provide middle and high school students an intensive, weeklong exploratory experience that develops their understanding of and engagement with food systems and sustainable agriculture. In the following paper I discuss the theory behind using an experiential approach in education, the evidence for its effectiveness, and how such an approach is appropriate for engaging students in contemporary issues such as sustainability and social justice. I go on to explain the methods that underlie experiential education and how it will be applied in the context of this curriculum. The next section explains how I selected the core ideas on which the curriculum will focus and how the curriculum is organized. A day-by-day outline of the five-day curriculum and sample lesson plans follow; I intend

to construct complete lesson plans for the full five-day curriculum after receiving feedback from experts in the field on the sample lesson plans.

Conceptual Framework: Towards an Intensive Experiential Approach

If we recognize the importance of fostering a generation that is aware of the significance of food and agriculture in creating a sustainable future and will engage in transforming the current system, we must choose an appropriate means of educating students about it. The complexity and dynamism of the topics being addressed by this curriculum demand an equally dynamic and multifaceted educational approach. In approaching the question of the sustainability of our food system, education should allow students "to better understand and interact with complex systems and environments in order to understand first-hand the interconnectedness of all things and their [own] place in the web" (Proudman, 1992, p. 22). An experiential approach provides this opportunity by engaging students in real experiences and critical reflection, as substantiated in the following discussion of theory and research.

A Theoretical Basis for Experiential Education

The 20th century educational philosopher, John Dewey (1916) asserted, "there is no such thing as genuine knowledge and fruitful understanding except as the offspring of *doing*" (emphasis original, p. 321). This sentiment echoes that of previous thinkers including seventeenth century educator John Ames Comenius and philosopher Jean-Jacques Rousseau. Comenius (1967) spoke to the impact of experience and "sensuous perception," stating that they "lead to the permanent retention of knowledge". Rousseau explained the failure of merely teaching *about* things rather than teaching the things themselves, contending, "You think you are teaching what the world is like; he is only learning the map" (as cited in Desmond, Grieshop, & Subramaniam, 2004, p. 34).

These ideas formed the basis for Dewey's future work on the philosophy of experiential education. He recognized that life and traditional education include a plethora of experiences, but

that experiences themselves are not inherently educative. In *Experience and Education* (1938), Dewey explains that experiences, even interesting and exciting ones, can actually be mis-educative if they "produce a lack of sensitivity and of responsiveness" (p. 13). An experience's potential to be genuinely educative depends on its *quality*, which comprises both the enjoyableness of the experience and its influence upon later experiences. Thus, education methods must be organized to ensure quality of experience. The methods should make experiences meaningful by encouraging the learner to reflect on the experiences, connect them with past experiences, and apply abstractions from them to future actions (1938). The role of educators, Dewey said, is to facilitate this progression, providing students with agreeable experiences that will help to open up, rather than shut down, their access to future growth experiences, thereby expanding their likely contributions to society (1938, p. 16-17).

Another father of the experiential education philosophy is Brazilian educator, Paulo Freire, who maintained that learning occurs most effectively through engagement with and reflection upon concrete situations (1973). He insisted that traditional education's "banking" method, in which students are viewed as empty vessels to be filled by a teacher's recitation of facts, is at best misguided and most often fuels ignorance, apathy, and oppression (1970). Going beyond Dewey's notion of educator as facilitator of experience, Freire sought to dissolve the power dynamic between teacher and student in favor of collaborative dialogue in which the teacher and student interact on the same level and learn from each other. He believed that these approaches would awaken students' consciousness and increase their self-efficacy (1973). Freire, like Dewey, saw this type of learning as a means of educating "the entire person for participation in a democratic society" (Kraft, 1986). Freire's theories highlight two critical elements of experiential theory. First, the subject matter that an activity, discussion, or experience addresses is important for creating the knowledge on which students will base future learning and action. Second, experiential education goes beyond content

and simply increasing knowledge to build students' capacity to understand and act on all manner of experiences and complex issues (Itin, 1999, p. 93-4).

Over the last century, educators have expanded upon the theories of Dewey, Freire and other pioneers of experiential education, such as psychologist Jean Piaget and educator Maria Montessori, to create a unified understanding of experiential learning and a framework for experiential education. David Kolb (1984), an American educational theorist, suggested an experiential learning theory that combines experience, perception, cognition, and behavior in a holistic integrative perspective. A model of this perspective would follow a cycle of "(1) action that creates an experience, (2) reflection on the action and experience, (3) abstractions drawn from the reflection, and (4) application of the abstractions to a new experience or action" (Itin, 1999, p. 91). Kolb (1984) defined learning from such a model as "the process whereby knowledge is created through the transformation of experience" (p. 38). This definition emphasizes "the process of adaptation and learning as opposed to content or outcomes," and recognizes knowledge as "a transformational process, being continuously created and recreated" (p. 38). His proposed model of experiential learning gave rise to much of our current experiential education approach.

Inherent in experiential theory is intentionality. Bill Proudman, former president of the Association for Experiential Education (AEE), stresses, "experiential education is not simply "learning by doing"" (1992, p. 20), harking back to Dewey's suggestion that experiences themselves are not enough to achieve educational goals (1938). The experience is only one piece of the learning cycle, and must be interpreted and framed by other pieces of the educational model. Like Dewey, Proudman (1992) and current AEE President, Dr. Christian Itin (1999), see reflection and analysis as key to transforming experiences into meaningful learning. Both also describe experiential education as "a student-centered process that impels students toward opportunities for taking initiative, responsibility and decision-making" (Proudman, p. 20), emphasizing the students' ownership over

and accountability in their own education (Itin, p. 93). The process allows students to use their own past experiences as a lens through which to view new ones and create personal meaning through reflection and analysis of the experiences. In this way, experiential approaches are intentional, working to create quality education opportunities that consider prior knowledge, set up key experiences, and then encourage students to synthesize understanding from the two through critical reflection.

Experiential education goes well beyond rote memorization and reading, writing, and arithmetic, building broad skills that prepare students to interpret and adapt to a wide range of information and situations. That is, the experiential approach serves as both a vehicle for learning all kinds of academic and non-academic material and an opportunity to develop tools for lifelong learning. On one level, experiential methods help students connect with the material and find value in it so that the new knowledge sticks. On another level, it aims to prepare students for the unforeseen challenges of our ever-changing world by cultivating active minds that are both eager and able to grapple with new subjects.

Using Experiential Education to Address Global Issues

The ever-increasing complexity and dynamism of society brought on by factors such as globalization and population growth is creating a range of complex problems with which present and future generations must grapple. As David Orr (1992) puts it, our future as a society rests on whether the public understands the relation between sociopolitical realities, economics, and the health of natural systems and how those three collectively – sustainability – affect well-being (p. 90). An education that elucidates these connections, Orr says, recognizes their complexity, integrates sustainability across subject areas, is place-based, relies on experiences and reflection on those experiences, builds practical skills, and changes behavior (1992, p. 90-92). The United Nations Educational, Scientific and Cultural Organization (UNESCO) "seeks to integrate the principles,

values, and practices of sustainable development into all aspects of education and learning, in order to address the social, economic, cultural and environmental problems we face in the 21st century" (2005). These educational goals and the related goals of societal transformation will require passionate and committed students and citizens with a capacity to think critically and work cooperatively. Experiential education cultivates knowledge and high-level cognitive skills, in addition to developing a feeling of personal connection to and investment in the subjects about which one is learning. In this way, experiential education "emphasizes critical social action and a stance embodying moral accountability and socio-political responsibility" (Andresen, Boud, & Cohen, 199, p. 237).

Those feelings of moral accountability and social responsibility are unique outcomes of an experiential approach that do not usually result from traditional, non-experiential methods of teaching, according to Dr. Peter Higgins of the University of Edinburgh School of Education (2009). He explains that the hallmarks of experiential education, such as "a willingness to trust students; to depend less on simplistic models of input, process, and predictable outcome; to accept uncertainty, and to be "small people in a big educational landscape"" (p. 53), are essential in order to instill a sense of responsibility in the students. The "awareness of consequences of actions and taking responsibility for them is vitally important in both local and global citizenship [making an educational approach that produces those results] pertinent to the big issues of the modern world, such as sustainability, citizenship, and personal health" (Higgins, 2009, p. 51). Further, experiential education develops critical thinkers with the independence necessary to act on feelings of moral responsibility.

Freire (1973) asserted that such capacity for social action could be developed through a critical pedagogy that raises students' consciousness and helps them understand the larger societal structure through their own experiences. He stressed a student-centered approach, mirroring that of broader

experiential theories, because of the ownership and meaning it instills in students. Finally, through the "praxis" cycle of theory, application, evaluation, reflection, and back to theory, Freire believed that students could learn to analyze and synthesize new information. Thus, Freire's approach encompassed the three critical pieces needed to prepare students to respond to future societal challenges – increasing knowledge and understanding, nurturing feelings of investment and moral obligation, and developing high-level thinking skills, including synthesis of information and critical evaluation, among others. This pedagogy seeks to give students the power and know-how to take action and, collectively, bring about social transformation.

Effectiveness of the Experiential Approach

The experiential approach is a deep and involved process as compared with the conventional "banking" approach that Freire (1970) admonishes. Recent research on the learning process, and more specifically on the outcomes of experiential education, indicates that the effort put into experiential approaches is worthwhile. Researchers such as neuroscientist Dr. Eric Jensen (2000) have found that "the brain learns best through rich, complex, and multi-sensory environments" (as cited in Roberts, 2002, p. 282). It is these conditions under which learning is solidified and skills are built. For example, in nutrition education, touching and tasting different types of foods allows students to physically understand the differences between fats, starches, proteins, and vitamins. Tasting and sticking fingers in milk samples with different levels of fat demonstrates how fats can stick to the inside of blood vessels and thus lead to health problems ("Food Is," par. 3). It is the feeling of fat between their fingers that gets students to remember what happens to fat in the body. In other words, students connect with the material through concrete experience.

The environments Jensen (2000) describes also encourage emotional engagement, which plays a critical role in long-term memory encoding (LeDoux, 1995; Roberts, 2002). Furthermore, the reflection and synthesis involved in the experiential process lend themselves to the patterning and

meaning-making processes through which the brain integrates new information into existing structures (Roberts, 2002). Research shows that certain learning conditions encourage the development and use of higher order thinking skills such as synthesizing, logical and operational thinking, and planning for the future (Caine & Caine, 1994). In order for students to engage and build their higher order thinking skills, "outcomes should be relatively open-ended; personal meaning should be maximized; emphasis should be on intrinsic motivation" (Caine & Caine, 1994, p. 85). In other words, higher order thinking results from brain-compatible learning environments. As brain-compatible learning expert Jay Roberts (2002) explains, experiential methodology embodies the brain-based approach by utilizing "enriched environments through challenge, social interaction, feedback, and active participation" (p. 284).

Studies on a number of different programs support those conclusions, showing measurable benefits from using an experiential approach. A 2004 study conducted in eleven Florida high schools examined the effects of experiential learning in local environments on students' critical thinking skills and disposition towards critical thinking. The authors of the study, Dr. Julie Ernst and Dr. Martha Monroe, assert that these are indicators of achievement, providing information on students' abilities as future learners and problem solvers. They found that environment-based programs had a significant positive effect on both the critical thinking skills and disposition towards critical thinking of 12th grade students. The experiential programs, they concluded, "are improving students' critical thinking skills and helping them become more disposed toward using these skills – skills and habits that are essential to managing the increasingly complex environmental issues that face our global society" (p. 520).

Another study of secondary school students in 2006 tested the effect on higher order thinking skills (HOTS) and lower order thinking skills (LOTS) of an experiential education approach versus a traditional approach to teaching 12th grade American Government classes (Ives & Obenchain, 2006).

The experiential-based classes integrated three elements of experiential education – student-directedness, real-world connections, and critical reflection – into classroom activities to a significant extent, while the control classes did not. Based on the results of pretests and posttests measuring both HOTS and LOTS, the students in the experiential-based classes demonstrated greater gains in HOTS than the students in non-experiential classes, while the two groups saw equal gains in LOTS (p. 71). These outcomes illustrate that experiential approaches improve students' analysis, synthesis, and evaluation skills without compromising their acquisition of facts. Thus, experiential education cultivates both knowledge and the skills to "access future growth opportunities," as Dewey put it (1938, p. 16-17), such that students will be prepared to tackle a rapidly changing world.

While these studies illustrate the superiority of experience-based learning over more traditional lecture and memorization styles, studies show that the quality of an experiential approach also matters considerably. MacKenzie and White studied long-term memory structures as they relate to learning excursions by comparing students' retention of facts and skills after they participated in one of three educational treatments. Some students participated in a program guided by experiential theory, in which students were expected to gather, record, and process information during an excursion to a mangrove forest. A second group participated in a program that included an excursion to the same location, but the excursion was entirely directed by a teacher and students were given a checklist of information to follow along as the teacher recited information about what they saw. The third group had no excursion and studied the material by reading and looking at slides in a classroom. The researchers found that the students who had participated in the experiential excursion not only learned more initially, but also "showed marked superiority over the others" in retention of knowledge and skills after three months (MacKenzie & White, 1982, p. 629-630). In order to ensure that students will hold on to the understanding and skills that they need for the future, therefore, demands attention to quality of experience.

The Experiential Approach in Practice

Creating opportunities for experiential learning requires a fundamentally different framework and set of methods than traditional classroom teaching does (Itin, 1999; Proudman, 1992). While theorists and educators have done well in developing a framework for experiential education, it is also important to note that "meaningful education is not something that can be easily packaged" (Proudman, 1992, p. 23). In fact, experiential education is a dynamic process that incorporates a multitude of factors largely out of the control of the facilitator. Simultaneously, the facilitator is implicated in the learning process, making his or her perspective and methods open to change just like those of the students. Experiential education thus comprises a sense of purpose and a set of tools that allows the facilitator to create opportunities for growth (Chapman, 1992, p. 18; Itin, 1999, p. 94; Proudman, 1992, p. 23). The role of the teacher or facilitator involves careful and reflective planning and management of the experiences.

Furthermore, experiential education aims to develop "an appreciation, understanding and involvement with ideas, other people and environments" (Proudman, 1992, p. 22) while increasing "the competency of the learner to integrate what is being learned with the actions that are required" (Itin, 1999, p. 93). The nature of experiential education implies flexibility and openness that allows students to create their own meaning from an experience. The goal of any foray into experiential education, therefore, should not be for students to acquire a particular set of facts about a subject. Experiential education is not designed for a traditional standards-based education program that expects to absorb specific content and assesses their retention of that content, though it could be used to help students learn much of what such assessments test. Experiential curricula should aim to take students beyond such dictated minutiae and instead be based on core, overarching ideas that encourage inquiry and open-ended reflection. Although students will likely acquire some of the pieces of knowledge in a standards topic area related to the experience in which they engage, each

student will reach his or her own unique understanding of the experience and not necessarily derive the same knowledge and skills from it.

Principles of the Experiential Method

Making experiences, rather than facts to be taught, the centerpiece of education distinguishes the teacher's role in experiential education from that appropriate for traditional classrooms. Instead of a dictatorial role played by the instructor in a teacher-centered model, the teacher in an experiential model acts as a facilitator of the experience by giving just enough assistance and structure for students to be successful. As Director of the Albuquerque Academy's Department of Experiential Education, Steve Chapman (1992), explains, "if the teacher carries out the role properly [in an experiential setting], students will accomplish more than they ever could on their own" (p. 17). On a basic level, the teacher's responsibility is setting suitable experiences, posing problems, setting boundaries, supporting learners, insuring physical and emotional safety, and facilitating the learning process by helping students make connections (Association for Experiential Education [AEE], 2007; Chapman, 1992, p. 17; Itin, 1999, p. 93). More broadly, the teacher attends to the quality of the experience by ensuring that the principles of experiential education are present.

Different theorists enumerate these principles somewhat differently (AEE, 2007; Itin, 1999; National Society of Experiential Education [NSEE], 1998; Proudman, 1992), but they generally agree on the following:

- A conscious mixture of content and process based on the intention of the experience
- Educators' awareness of their own biases and how those influence the learner
- Flexibility of learner and educator to respond to spontaneous opportunities for learning
- An authentic experience through engagement in purposeful endeavors that the learner to take initiative, make decisions, and be accountable for their results

- Creating investment of learners through emotional, intellectual, social, soulful, and/or physical engagement
- The presence and development of meaningful relationships: learner to self, learner to others, learner to environment, and learner to the broader world
- A safe space that allows for learning from natural consequences, mistakes, and successes and in which learners are encouraged to step out of their comfort zones
- Use of multiple teaching/learning styles to promote active engagement of all learners
- Use of reflection, critical analysis, and synthesis to create meaning and form the basis for future experience and learning
- Opportunities for learners and educators to explore and re-examine their own values

Using Core Ideas as Organizing Principles

Many of the tenets of experiential education – flexibility, meaning-making, personal engagement, etc – lend themselves to the use of core ideas as organizing principles. Attempting to teach laundry lists of state academic standards overemphasizes rote memorization and "can result in piecemeal, unintegrated, decontextualized, and meaningless learning," according to educational psychologist, Dr. Ali Iran-Nejad (as cited in Oxford, 1997, p. 40; Brooks & Brooks, 1999, p. 22). Standards-based approaches do not take into account individual differences in experience and learning styles. In contrast, educators can use broad, overarching ideas that encourage students to reflect on prior knowledge and use it to construct new perspectives on various aspects of these key themes. Such core ideas, also referred to as "wholethemes" (Oxford, 1997, p. 40; Larkin et al., 1995, p. 68-69) and "big ideas" (Littledyke, 2008, p. 10), provide conceptual frameworks that extend understanding and "allow one to predict, understand, and explain phenomena one experiences in the world as well as to solve important problems" (National Research Council [NRC], 2007, p. 221). Core ideas have a broad explanatory scope and bring together key concepts in the discipline of

focus. They can also be used to connect aspects of different disciplines so that students realize the interconnectedness of varied concepts or fields (NRC, 2007, p. 223). In this way they provide an integrating ideas and realizing the relationship between scientific concepts and real life experiences and choices.

As the National Research Council (2007) emphasizes, the big ideas around which an experiential curriculum is organized should be of disciplinary importance rather than "very abstract, domain-general core ideas" (p. 223). For example, "evolutionary theory" would be a core idea in biological science, whereas a domain-general idea would be "systems," which is too general to effectively organize students' understanding (p. 223). These relatively concrete big ideas provide the balance of content and process that lends some structure to an experiential approach (Brooks & Brooks, 1999, p. 20). They are broad enough to allow for the student-directed learning and knowledge synthesis that leads students to become invested in the material but narrow enough to make sense. Thus, using core ideas as organizing principles facilitates the attainment of goals that experiential education aims for: greater understanding, higher order thinking skills, and sense of investment and responsibility.

Curriculum Design Methodology

The draft curriculum offered here is organized around the framework and principles described above. The content and structure are tailored to an experiential approach, with the goals of increasing students' understanding of agriculture and food systems; instilling a connection between students, the food they eat, the land, and the global community; and giving students the tools to think critically about and act on issues of sustainability and interconnectedness. The program content centers on a set of core ideas that serve as organizing ideas during students' engagement in the various activities. The curriculum is intended as a five-day, full-time, residential experience in an outdoor setting and targets middle and high school students, ages 12-18. The following sections

explain the program structure and how it is informed by experiential theory. They also outline the core ideas and how I identified them. The process described led to the creation of the draft curriculum that follows, which will be sent out for review and critiquing by experts in the fields of sustainable agriculture and experiential education, with the intention of revising and completing the curriculum based on their feedback.

Identifying the Core Ideas

The core contextual framework for this curriculum began with my own experiences observing, studying, participating in, and educating about sustainable agriculture and food systems. I worked on an educational farm in Massachusetts, facilitating experiential education activities focused on hunger, poverty, culture, and sustainable agriculture for groups of all ages. I have also taken a variety of environmental studies, public policy, and agriculture-related courses as an undergraduate student, participated in conferences on sustainable farming and food, visited numerous small farms and urban gardens in the United States and abroad, and have read much of the popular literature on the subject. It is from these sources that I drew an initial list of topics that evolved into the core ideas that guide the curriculum.

In order to collect input from professionals and members of the food and agriculture education and sustainable agriculture communities, I compiled a list of major components and themes. That list came from the topics covered in contemporary, well-known literature including Michael Pollan's *The Omnivore's Dilemma* and *In Defense of Food*, Peter Singer and Jim Mason's *The Ethics of What We Eat*, Paul Roberts' *The End of Food*, and many others, as well as a variety of peer-reviewed articles. Appendix A provides a more comprehensive list of these resources. Another resource for potential core ideas is the array of food systems and sustainable agriculture curricula, lesson plans, and syllabi produce by other educators and organizations. As the sustainable food movement gains momentum, educational institutions and environmental and agricultural organizations are working to fuel it

through education. I used these existing curricula as resources for possible content, and also to determine where there are gaps in the field of agriculture and food systems education that needed to be filled.

Once I had put together a list of key content, I created an online survey to query members of the food and agriculture education and sustainable agriculture communities, asking for their input about the "big ideas" on which a sustainable agriculture and food systems curriculum for high school students should focus. The survey included the list of concepts, instructing contributors to choose the ten most important of the twenty-two listed, and to offer their own additional suggestions. Another question asked the participants to choose five of a list of twelve experiences to integrate into a week-long sustainable agriculture and food systems education program, and to offer their own additional suggestions. The responses to this question were intended to garner input and ideas for the activities and lesson plans that will comprise the curriculum. Finally, I asked respondents to share comments and feedback on their responses and the lists of concepts and activities. I sent the survey to people I know and with whom I have worked, selecting those who have experience with both education and food and agriculture matters. The respondents include professors, farmers, environmental educators, university students and professionals working on agriculture and food systems issues. Fifteen people responded. Appendix B contains the full survey and responses.

The responses confirmed my notion that sustainability is a central idea on which the curriculum must focus, and led me to choose it as the primary concept around which to organize the program. Each of the other core ideas and subtopics that the curriculum encompasses fall under one or more of the three pillars of sustainability – sociopolitical, economic, environmental – and serve to influence or be influenced by the sustainability of the food system. The survey responses largely confirmed my perspective on the levels of priority of the issues, indicating that a number of the

choices listed on the survey, while important, probably fall under the umbrellas of other, larger ideas. These larger ideas are the core ideas on which the curriculum is centered. Based on the survey results and my review of relevant curricula and literature, the curriculum was built on the following questions that feature the core ideas:

- What is sustainability?
- What do we eat and where does it come from?
- What does the modern food system look like?
- How did the current food system come to be?
- What are the consequences of industrial agriculture, sociopolitically, economically, and environmentally?
- What are the alternatives to industrial agriculture?
- What can we do to make the food system more sustainable?

These questions guide the curriculum, as portrayed in the concept map in Figure C1 in Appendix C, which organizes the core ideas and the activities and excursions of the program into a five-day schedule. As seen in the concept map and the Curriculum Outline, articulated in the next section, the curriculum outlines topics and subtopics that fall under each of the overarching core concepts. The extent to which those topics are explored will vary for each student or group of students because of the openness of the experiential approach. The marginal notes and discussion guides in each lesson plan help prepare facilitators for the range of directions in which discussions may progress. During post-activity discussions facilitators will also use the guides and marginal notes to ensure that students are making connections between the specific activities or experiences and the core questions. During, after, and in between activities, facilitators should regularly encourage students to frame their reflection and analysis within the context of the triple bottom line of sustainability. The core ideas will be presented at the outset of the program and will be referred to

throughout the five-day program in order to give students a big picture perspective, guide their experiences, and facilitate connections between the big ideas themselves.

The objective is for students to leave the five-day experience with a greater understanding of the overarching ideas, having explored how the ideas are interconnected and how they, as individuals, are connected with the food systems. Students should leave the experience with the tools needed to evaluate and respond to these and other pressing issues in the future. Finally, beyond the awareness and skills the curriculum develops, it must also present pictures of current efforts toward change and instill a sense of hope that inspires students to take action in their own lives and communities to contribute to a more sustainable future.

Developing the Program Structure

In examining existing agriculture- and food-systems-focused curricula, I found a wide variety of structures and content, ranging from isolated lesson plans for traditional classroom instruction, to curricula that connect agriculture topics to state science standards, to curricula for residential outdoor education experiences. Many of the curricula take a learning-by-doing approach, purportedly trying to improve students' learning and retention, but they lack explanations of the educational theory and research that supports their content and structure. Furthermore, many of the existing programs and lessons are not built in a way that ensures institutional memory. That is, their written materials usually do not equip facilitators to create quality experiences through the principles of an experiential approach. Without writing intention – a balance of content and process – directly into the curricula, authors cannot secure quality experiences based on their lesson plans. In response, I decided to begin developing my curriculum by researching the theory that underlies the type of program that I felt drawn to design, based on my prior experience and knowledge.

The experiential approach and use of core ideas as organizing concepts were derived from this research, as explained in the previous sections. In addition to theory, the structure is based on

feedback on and evaluations of existing programs that researchers have published online and in peer-reviewed journals. The structural components developed in this way include the duration, style, and location of the program. The program is designed to run for five full days, mostly outdoors, with activities led by facilitators at a residential location, such as an environmental, outdoor, and/or agricultural education center. The residential, outdoor aspects serve several functions. One is that doing something new in a new location excites students, which helps them engage emotionally in the experiences. Additionally, because this program is focused on agriculture and food systems, having access to gardens, farms, and the natural environment provides more opportunity for experiential learning.

The residential approach also addresses several potential challenges associated with facilitating the experiences necessary to expand students' understanding of sustainable agriculture and food systems. A group of Florida secondary agricultural educators raised some concerns in a 2006 study, for example (Arnold, Warner, & Osborne). They expressed an interest in using experiential methods, of which they "recognized multiple benefits…including increased subject matter retention among students, active engagement, use of higher order thinking skills, and academic success" (p. 30). However, the teachers also said they lack familiarity with experiential teaching methods and worried about issues such as high class enrollment, supervision and management of student activities, and modifications in teaching style (p. 30). Furthermore, most teachers are not agriculture and food systems experts and therefore may have trouble providing the flexibility that allows students to explore many different aspects of the material. Basing the program at a residential facility with specialists who facilitate the activities takes pressure off of teachers, allowing them to support students while also having their own experiences and opportunities for learning.

The duration of the program is also crucial to ensuring that students attain lasting gains. A 2006 review of 150 pieces of research on outdoor education published between 1993 and 2003 discussed

the conditions from which students derive the greatest positive results. The study asserts, "There is considerable evidence indicating that longer programmes are more effective than shorter ones" (Dillon, et al., 2006, p. 108). It specifically cites research comparing one-day and five-day versions of a long-established outdoor ecological program. The research evaluated the extent to which experiences in an environmental education program at a German national park changed students' behavior. The researcher concluded "the 5-day program explicitly provoked favorable shifts in individual behavior, both actual and intended" (Bogner, 1998, p. 17, as cited in Dillon, et al., 2006, p. 108) and that "only the residential five-day programme had any effect on behavioural levels" (Bogner, 1998, p. 26, as cited in Dillon, et al., 2006, p. 108). Based on this research and reflection on the intentions of the program as framed by an experiential approach, the curriculum fills five full days, as articulated in the curriculum outline that follows.

Curriculum Outline

The first phase of curriculum development involved researching the theory behind the pedagogical approach and laying the groundwork for the program content and structure. The second phase was to develop a curriculum outline and sample lesson plans for two of the activities featured in the program. The curriculum outline is below, and the lesson plans are in Appendix D. These materials will be shared with experts in the fields of sustainable agriculture and food systems education in order to garner feedback before constructing the complete set of lesson plans for the curriculum. The outline, below, introduces readers and facilitators to the basic framework and progression of the curriculum, providing brief descriptions of each piece of the program in chronological order.

The curriculum is organized so that each day centers around one or two of the core questions, progressing so that each day builds on the understanding cultivated during the previous days. Day One begins with an introduction to each other and the program, followed by an introduction to the

concept of sustainability so that it can be referred to throughout the week as the principal framework for analysis. Students then begin to think more specifically about what they eat and where it comes from. Day Two introduces the idea of food systems and challenges students to think about their own food system and its history. The third day focuses on the modern industrial system and how it affects society and the environment on different levels. From there, the curriculum moves to an examination of the alternatives to the industrial system on Day Four, ending with an activity that sets up Day Five. The final day revolves around the actions consumers can take to create a more sustainable food system, based on all that students have learned over the previous four days.

Each day includes breakfast, lunch, and dinner, as indicated on the schedule in Appendix C. Meals can be an opportunity for students to take a break from the focused curriculum, since five full days of organized activities is intense. However, they can also serve as another element of the curriculum as students think and converse about what they are actually consuming over the course of the week and how that consumption relates to what they are learning through the activities. The schedule also incorporates small blocks of extra time in between activities that may either become down-time in which students can relax and unwind, or may account for overflow of activities that take longer than expected.

Day One: What Is Sustainability? What Do We Eat and Where Does It Come From?

Introductions, icebreakers, warm-ups. Before beginning the food systems-focused curriculum, students will introduce themselves to the facilitator(s) and, if necessary, each other. The facilitator(s) introduces himself and leads a few icebreakers or warm-up activities that energize the students and get them ready to work together and engage in discussion.

Framing the experience. Giving students an idea of the program agenda and goals provides context for the rest of the activities, allows them to mentally prepare for different stages of the curriculum,

and helps them make connections between different activities. Students should share their backgrounds, expectations, and goals for the week so that the facilitator(s) can manage the group's expectations and tailor activities to their needs. Finally, this is also a time for the facilitator(s) to share safety rules and for the group to come to consensus on the behavioral rules and norms for the week.

The common pond. This activity serves as an introduction to the concept of sustainability, and is based on the concept of the Tragedy of the Commons – that individuals acting rationally in their own self-interest will ultimately deplete a limited common resource even if it is clear that it is not in anyone's long-term interest for this to happen. In this case, the common resource is fish in a common pond. Through a group game, students grapple with competition for scarce resources and discover what sustainability means in such a context. The activity concludes with a discussion of how students' experiences might be related to real-world situations.

Measuring food waste. After lunch on the first day, students will begin a weeklong process of weighing and tracking their food waste, or "orts," after each meal. The first session will introduce students to the logistics of collecting and weighing the food left on their plates at the end of meals. Over the course of the week, students will collect and weigh the waste and record the results on a bar graph in the dining hall. As the students learn about how their food is produced, they will consider what resources they are wasting by throwing away food and will hopefully begin to reduce their orts. At the end of the week, students will discuss how their behavior has changed during the week and how they will apply this experience to their home lives.

Defining sustainability. Students learned a basic definition of the term "sustainability" during The Common Pond activity, but this activity will help them develop an understanding of the triple bottom line that will inform their analysis of the agriculture and food system over the rest of the week. The activity asks students to choose different aspects of the world, such as endangered

species, voting rights, and industrial growth, from each of three undefined categories, that they would like to see continue beyond their own lifetimes. The students then use the groupings of those aspects to label the three categories of the triple bottom line and develop a definition of sustainability that incorporates all three pillars. They are also likely to discuss how the three pillars are interrelated.

Mapping a meal. This activity encourages students to think about what they eat and how it gets to their plates. In small groups, students will choose a meal, make a list of ingredients needed to make that meal, and map where the likely geographical origins of the ingredients. They will then add up the number of miles the ingredients traveled on different types of transportation (ships, trucks, planes, etc) from their origins to the students' plates. Using a table of carbon conversions for different types of transportation, students will add up the footprint of their meals. Each group will present their findings to the rest of the groups, and the group as a whole will discuss what kinds of foods are lower in "food miles," why our food comes from certain locations, and what other factors might matter in deciding what to eat.

Watch Food, Inc. The students will watch the recent documentary *Food, Inc* to give them a visual image of what the food system looks like, how it came to be, and what its effects are. The film helps to lay the groundwork for the activities of Day Two, giving students a broad view of the modern food system. Additionally, the film allows students to see certain aspects of the food system such as factory farms and food labs that they would not otherwise be able to see. The facilitator will be able to refer back to these images and the stories told in the film throughout the week as students delve deeper into the roots and consequences of the modern system.

Day Two: What Does the Current Food System Look Like? How Did the Current System Come to Be?

Grocery store visit. Students will take a field-trip to a conventional grocery store where they will investigate various aspects of the food that is available. During the visit they will explore the store to

collect information about labels, packaging, ingredients, store layout, organic options, etc based on a worksheet. The group as a whole will also pick a meal for which to buy the ingredients, and each small group of students will find one of the ingredients to bring back to use for their next activity. After returning from the trip, students will share their observations and discuss them in light of the *Mapping a Meal* activity, *Food, Inc*, and their prior knowledge.

Draw a Food System. Using the foods they brought back from the grocery store, students will map out the food system – the process that each ingredient went through between the farm (or lab) and their plates. This includes planting, growing, harvesting, packing, shipping, processing, packaging, marketing, selling, cooking, disposal, etc. At each step of the food system students will outline the costs and benefits of that step, considering who and what is involved in it. For example, in planting and growing a conventionally-grown tomato, synthetic fertilizers and pesticides are used and migrant farmworkers pick and pack the tomatoes for low wages. Once each group shares their food system map, the students will discuss the implications of the food system, both positive and negative.

History of the food system. This activity begins with reflection on the food system of a century ago, as well as the food systems of developing countries. Students will participate in a choose-your-own-adventure activity in which they begin as family farmers in the 1950s and make decisions about their farms as new technology becomes available. Through this, students consider how society and agriculture have changed over the past century in the United States, and reflect on what caused the food system to industrialize and become what it is today.

Day Three: What Are the Consequences of Industrial Agriculture?

Deconstructing processed foods. Students will look at some of the products of the industrial food system – processed snack foods, frozen dinners, beverages, etc – to figure out what the ingredients actually are, where they come from, and what they mean for human health. The activity will reveal

that many ingredients are derived from corn and soy, so students can then discuss why that is and what it means in terms of sustainability.

Calculating the real cost of food. In this activity some students will work in small groups to "buy" the ingredients for a meal with a theoretical ten dollars. Other students will be responsible for selling certain ingredients based on their particular characteristics – organic vs. conventional, local vs. non-local, raw vs. processed, etc – mimicking the marketing of the modern food industry. The student buying the ingredients will make decisions based on these characteristics, seeing how much they can buy with their money. Each group of consumers will explain to the rest of the groups why they chose the ingredients they did. The facilitator will then ask students to consider the consequences of their choices in terms of the three pillars of sustainability and how these might affect the "real cost" of the foods they chose.

Food fight. Using the knowledge they have gained so far about the food system, students will choose one or two topics to debate in groups, each of which will represent one of the stakeholders in the scenario. In order to encourage the group to delve into the topics that most interest them, they will have a range of scenarios from which to choose, such as whether the federal government should require food origin labels, how the industrial beef industry should be regulated, and what kind of food should be served in a school cafeteria, among others. The stakeholder groups will have time to think about their stance, and then each group will present their argument to the other groups.

Hunger banquet. For dinner, students each receive a ticket designating them as either high-, middle-, or low-income, with proportions for the group based on world poverty statistics. Fifteen percent of the students are in the high-income group and are served a normal American meal at well-dressed tables; thirty-five prevent are in the middle-income group and are served a simple meal of rice and beans at somewhat crowded, simple tables; and the remaining fifty percent are served

small portions of rice and water and sit on the floor to eat. The experience also includes other elements to help students feel immersed in their designated roles. Students are encouraged to converse within their income groups during the meal, and a post-meal discussion allows students to reflect on the experience and how the food system is associated with global hunger.

Day Four: What Are the Alternatives to Industrial Agriculture?

Visit a sustainable farm and work in the garden. Students will take a field trip to a local farm that uses sustainable practices. Before the visit students will be told to keep in mind the concept of sustainability and look for examples of how it is in play on the farm. They will take a tour of the farm, led by one of the farm owners, managers, or farm hands, who will answer students' questions about farming practices, farming as a business, etc. Students will also spend part of the morning helping in the gardens so that they gain a better understanding of the work that goes into producing food without synthetic inputs and mechanization. When they return, students will discuss their impressions of the farm and will explain the different ways they saw sustainability in practice there. They should also reflect on the advantages and disadvantages of small-scale, sustainable farms versus industrial farms. If the farmer did not talk about them, the post-trip discussion should also cover other alternative models, such as Community Supported Agriculture (CSA), urban agriculture, and growing one's own food.

Strength in numbers. This activity focuses on a particular aspect of farming practices – crop biodiversity. In the first section of the activity, students play a game that illustrates how polyculture can provide natural insurance against pests and disease, whereas monocropping requires outside inputs to protect crops. The second section invites small groups of students to plan the layout of a community garden based on information about crops' needs and services. The groups then make the case for their layouts, leading to a discussion among the large group about the factors that farmers consider when they choose what to plant.

Comparing conventional, organic, and sustainable farms. Thinking back to the three models of farming they saw in *Food, Inc* – conventional, industrial organic, and small-scale sustainable – students will now use the knowledge they have built to plan meals for several different families. In groups, students will receive a description of the family or whom they will plan meals. Each family has a different income level and level of access to grocery stores and other food vendors. Given the available options, students will try to make the best choices possible for their families, considering factors such as cost, convenience, nutrition, sustainability, etc. The groups will present their plans to the large group, explaining the circumstances with which they had to deal, and the group as a whole should discuss why those circumstances exist, how the present system reinforces them, and how alternatives might help alleviate some of the problems.

Plan a more sustainable meal. In preparation for the group's final day, they will work together to plan a dinner for Day Five. Their goal is to make the meal as sustainable as possible, and the menu should take into account what they have learned so far. Knowing that they will be spending the next morning at a local farmers market, the group will decide what ingredients to buy there and what, if anything, needs to be purchased at a grocery store. Additionally, they should think about what makes a dining experience sustainable and how they can incorporate this into their plans. They will help prepare the food and venue the following afternoon, and a discussion about the process of planning and creating the meal will happen during or after it.

Day Five: What Can We Do to Make the Food System More Sustainable?

Farmers market trip. Students will take a field trip to a local farmers market to experience aspects of alternative models for the food system. One of the goals of the trip is for students to acquire the ingredients for their dinner, so in groups they will set out to find particular ingredients. As they shop, they will talk to the vendors about how the food was grown and why it was grown that way. They should ask the farmers/vendors about why they choose to sell at the farmers market and ask

other shoppers why they are choosing to shop there. When the students return, they should share what they learned from the vendors and shoppers and reflect on the advantages and disadvantages of the farmers market model while considering conventional and other alternative options.

Measuring food waste discussion. After lunch on the last day, students will record their final wood waste data and analyze the week's data. They should discuss how and why their behavior has changed over the course of the week, considering whether what they have learned about the food system is influencing their individual behavior. Finally, they should discuss how the experience might affect their behavior at home.

Dinner prep and student-planned dinner. Students will spend their final afternoon helping prepare the food and venue for their sustainable dinner. During the meal, they should reflect on the food and set-up choices they made, including whether they are happy with the results, how it could be more sustainable, how it reflects what they have learned, etc.

Take action activity. The group's final session focuses on how they can use their new understanding to create a more sustainable food system. The activity will consist of a discussion about what the students perceive as the most important aspects of what they have learned, and how they believe the food system should change. In small groups they should brainstorm ways to accomplish those changes, which may include altering their food choices, educating others about the food system, engaging in political action, volunteering with a relevant organization, continuing to research the food system, etc.

Discussion

In order to garner feedback on the curriculum's approach and scope, I will send it to several experts in the field for review. Additionally, the first two lesson plans will be field-tested in at least one middle school and one high school classroom. Although this is not the intended setting for the curriculum as a whole, it will provide information about how well the lesson plans channel the

experiential approach and how the activities might actually play out. Based on these two sources of feedback, which include sustainable agriculture education experts, teachers, and students, I will revise the curriculum outline and lesson plans and then begin developing lesson plans for the rest of the activities.

Since many students do not have the opportunity to spend a week away from the traditional classroom setting, I recognize that this particular program design is not universally accessible. However, as the introduction made clear, the understanding and skills that the curriculum intends to impart are critical for all students if they are to design a more sustainable future. Because of this, I hope to also develop a version of the curriculum that can be modified for use in a variety of settings by both trained facilitators and traditional teachers.

Challenges to Applying Experiential Theory

The process of designing a curriculum based in experiential education theory was more complicated than I expected. I found three aspects of the interface between theory and practice particularly challenging. First, the openness and dynamism of the experiential approach is not easily packaged into a lesson plan. Second, the approach does not lend itself to teaching a specific set of information. Finally, there are certain teaching tools that I believe are valuable but do not seem to align with the experiential approach.

The nature of experiential education creates a fine line between lessons that are so open that they lack intentionality and lesson plans that do not provide the flexibility required to fully allow for student exploration. In trying to weave the experiential approach into every aspect of the lesson plans, I discovered that no matter how much I tried to anticipate and write-in every potential scenario, I could not provide the teacher or facilitator with all of the information that they could possibly need. In my past experience teaching in experiential settings, I learned that each group of students brings its own personality, passions, and prior experience to the program. Because of this,

being flexible and able to adapt to each group in the moment made many of the learning opportunities possible. Doing so requires skills that cannot be gained from reading a lesson plan, no matter how well-constructed. Ultimately, there is no substitute for having a skilled, creative facilitator with extensive knowledge of the subject matter.

Taking an experiential approach also challenged me because I initially believed that experiential education should not be used to try to teach specific information, and yet I thought I wanted students to learn about particular aspects of agriculture and the food system. I had experience facilitating education activities on fairly specific food systems subjects in what I considered to be an experiential setting, but the lessons themselves were not backed by education theory. As I thought about those lessons and began to develop the core ideas for the curriculum, I realized that while I hope students will become engrossed enough in the subject to want to learn specific, in-depth information, that is not the true goal of the program. The goals are to develop greater understanding of sustainability as it pertains to the food system, inspire a feeling of personal responsibility and efficacy, and enhance students' critical thinking skills. None of those objectives require that students learn particular pieces of information. Experiential education is, in fact, an ideal approach for accomplishing those goals.

The final dilemma I faced in applying experiential theory in this context was that not all pieces of the program content lend themselves to direct experience. For example, students will likely never have the opportunity to see factory farming or industrial animal processing first-hand, but it is undoubtedly an important piece of our food system's story. Having a visual conception of that part of the process is key to understanding where food comes from and what some of the consequences of the process are. Thus, showing video footage of those practices is as close as an education program can get to allow students to experience them. Watching film clips, however, is hardly an experiential activity. I struggled with how to fit this into the curriculum. I went back to Dewey's

writing, though, and considered his contention that everything we do in life is an experience, and what makes an experience into a learning opportunity is its quality. In this case, watching film clips could be part of an experiential curriculum as long as students spend time reflecting on and discussing them in a meaningful way.

Each of these challenges harks back to the intentionality that underlies the experiential approach. The conclusions that I have drawn from them also suggest that this type of curriculum is, in fact, adaptable to a range of situations. The keys to the success lie in a thorough and thoughtful curricular framework, a committed and skilled facilitator or teacher, and sincere investment in creating quality experience.

Conclusion

In the face of an increasingly unjust and unstable world, this generation of youth inherits the task of designing a better future. Doing so requires an understanding of the concept of sustainability and the triple bottom line, as well as the critical thinking skills to deal with the dynamic nature of today's world. Equally essential, young people need to develop a connection with the planet and other it people so that they feel a sense of personal responsibility for planetary and societal well-being. As something with which every person is connected on the most basic level, and as something that so profoundly affects our world on all levels, food is an ideal avenue through which to cultivate students' understanding, passion, and skills for creating a sustainable future.

To that end, a curriculum focused on analyzing our current food system and creating a more sustainable one was developed. The goals of enhancing understanding, instilling feelings of personal responsibility, and cultivating high-level thinking skills lend themselves to an experiential approach. The curriculum weaves experiential theory throughout each of the activities, encouraging students to bring their prior knowledge, engage actively, reflect on the activities, synthesize information, and apply their new understanding. The curriculum is centered on the overarching theme of

sustainability and a set of core ideas that facilitate the experiential learning process and provide a framework for making connections between different activities. Using a solid base of experiential theory and a well-researched set of core ideas, the weeklong program allows students to explore the roots and consequences of our modern food system and how they can use that information to envision and work towards a more sociopolitically, economically, and environmentally sustainable system.

References

Andresen, L., Boud, D., & Cohen, R. (1999). Experience-based learning. In Foley, G. (Ed.). *Understanding Adult Education and Training* (2nd ed.). Sydney: Allen & Unwin, 225-239.

Arnold, S., Warner, W.J., & Osborne, E.W. (2006). Experiential learning in secondary agricultural education classrooms. *Journal of Southern Agricultural Education Research*. 56(1), 30-39.

Association for Experiential Education. (2007). *What is experiential education?*. Retrieved February 24, 2010, from http://www.aee.org/about/whatIsEE

Athman, J., & Monroe, M.C. (2002). *Enhancing natural resource programs with field trips*. Gainesville, FL: University of Florida Cooperative Extension Service. Retrieved March 1, 2010, from http://edis.ifas.ufl.edu/fr135

Bogner, F.X. (1998). The influence of short-term outdoor ecology education on long-term variables of environmental perspective. *Journal of Environmental Education*, 29(4), 17-29.

Brooks, G.J., & Brooks, M.G. (1993). *In search of understanding: The case for constructivist classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development.

Brooks, G.J., & Brooks, M.G. (1999). The courage to be constructivist. *Educational Leadership*, 57(3), 18-24.

Caine, N.C., & Caine, G. (1991). *Making connections: Teaching and the human brain*. Alexandria, VA: Association for Supervision and Curriculum Development.

Chapman, S. (1992). What is the question?. *Journal of Experiential Education*, 15(2), 16-18.
Comenius, J.A. (1967). *The great didactic.* (M.W. Keating, Trans.). New York: Russell and Russell.

Commonwealth of Massachusetts. Senate. (2007). *An Act to Improve Quality Physical Education*, S 334, 185th Sess.

Desmond, D., Grieshop, J., & Subramaniam, A. (2004). *Revisiting Garden-based learning in basic education*. Rome: UNESCO-International Institute for Educational Planning.

Dewey, J. (1916). *Democracy and education*. New York: Macmillan.

Dewey, J. (1938). *Experience and education*. New York: Macmillan.

Dillon, J., Rickinson, M., Teamy, K., Morris, M., Choi, M.Y., Sanders, D., & Benefield, P. (2006). The value of outdoor learning: Evidence from research in the UK and elsewhere. *School Science Review*. 87(320). 107-111.

Ernst, J.A., & Monroe, M. (2004). The effects of environment-based education on students' critical thinking skills and disposition towards critical thinking. *Environmental Education Research*, 10(4), 507-522.

Food Studies Institute. (2006). *Food Is Elementary: First Semester. Lesson Summaries*. Retrieved February 3, 2010, from http://www.foodstudies.org/Curriculum/LessonSummaries.htm

Freire, P. (1970). *Pedagogy of the oppressed*. New York: Continuum.

Freire, P. (1973). *Education for critical consciousness*. New York: Seabury Press.

Golden Harvest Organics. (2009). *Companion planting*. Retrieved April 1, 2010 from http://www.ghorganics.com/page2.html

Hardin, Garrett. (1968). The tragedy of the commons. *Science*, 162(3859), 1243-1248.

Higgins, P. (2009). Into the big wide world: Sustainable experiential education for the 21st century. *Journal of Experiential Education*. 32(1), 44-60.

Hirsch, T. (Ed.). (2005). *Living Beyond Our Means: Natural Assets and Human Well-Being.* (The Millennium Ecosystem Assessment). Retrieved February 3, 2010, from http://www.millenniumassessment.org/documents/document.429.aspx.pdf

Itin, C.M. (1999). Reasserting the philosophy of experiential education as a vehicle for change in the 21st century. *Journal of Experiential Education*, 22(2), 91-98.

Ives, B., & Obenchain, K. (2006). Experiential education in the classroom and academic outcomes: For those who want it all. *Journal of Experiential Education*, 29(1), 61-77.

Jaffe, R. & Appel, G. (2007). The growing classroom: Garden and nutrition activity guide. *Life Lab Science Program*. Burlington, VT: National Gardening Association.

Jensen, E. (2000). *Brain-based learning: The new paradigm of teaching*. San Diego, CA: The Brain Store. *Kaiser Family Foundation Poll, April 26 – May 29, 2005*. Poll questions retrieved February 13, 2010, from Polling the Nations database http://poll.orspub.com.proxyau.wrlc.org/document.php?id=quest05.out_25402&type=hitlist&num=61

Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

Kraft, R.J. (1986). Toward a theory of experiential education. In R. Kraft & M. Sakofs (Eds.). *The theory of experiential education* (2nd ed.) (p. 7-38). Boulder, CO: Association for Experiential Education.

Krain, M., & Shadle, C.J. (2006). Starving for knowledge: An active learning approach to teaching about world hunger. *International Studies Perspectives*. 7(1), 51-66.

Larkin, M., Colvert, G., Ellie, E., Iran-Nejad, A., Casareno, A., Gregg, M., Rountree, B., & Schlichter, C. (1995). Applying wholetheme constructivism in the Multiple Abilities Program (MAP). *Canadian Journal of Special Education*, 10, 67-86.

LeDoux, J. (1996). *The emotional brain: The mysterious underpinnings of emotional life*. New York: Simon & Schuster.

Littledyke, M. (2008). Science education for environmental awareness: approaches to integrating cognitive and affective domains. *Environmental Education Research*, 14(1), 1-17.

Louv, R. (2005). *Last child in the woods: Saving our children from nature-deficit disorder*. New York: Algonquin Books.

MacKenzie, A.A., & White, R.T. (1982). Fieldwork in geography and long-term memory structures. *American Educational Research Journal*, 19(4), 623-632.

Massachusetts Department of Agricultural Resources. (2009). *Massachusetts-grown produce availability calendar*. Retrieved April 1, 2010, from http://www.mass.gov/agr/massgrown/images/availability_chart.jpg

National Research Council. (2007). *Taking science to school: Learning and teaching science in grades K-8* R.A. Duschl, H.A. Schweingruber, & A.W. Shouse, (Eds.). Washington, DC: National Academies Press.

National Society for Experiential Education. (1998). *Standards of practice: Eight principles of good practice for all experiential learning activities*. Retrieved February 24, 2010, from http://www.nsee.org/about_us.htm#sop

Neil, J. (2006). *Experiential education: Is it better to do intensive or intermittent experiential education programs?*. Wilderdom Outdoor Education Research & Evaluation Center. Retrieved March 1, 2010, from http://wilderdom.com/experiential/ExperientialIntensiveIntermittent.html

Orr, D.W. (1992). *Ecological literacy: Education and the transition to a postmodern world.* Albany: State University of New York Press.

Orr, D.W. (2007). *The Designer's Challenge*. University of Pennsylvania School of Design, Commencement Address. Retrieved February 3, 2010, from http://www.davidworr.com/files/U-PENN.pdf

Oxford, R.L. (1997). Constructivism: Shape-shifting, substance, and teacher education applications. *Peabody Journal of Education*, 72(1), 35-66.

Proudman, B. (1992). Experiential education as emotionally-engaged learning. *Journal of Experiential Education*, 15(2), 19-23.

Roberts, J.W. (2002). Beyond learning by doing: The brain compatible approach. *Journal of Experiential Education*, 25(2), 281-285.

Sipos, Y., Battisti, B., & Grimm, K. (2008). Achieving transformative sustainability learning: engaging head, hands and heart. *International Journal of Sustainability in Higher Education*. 9(1), 68-86.

Stanley, K., & Plaza, D. (2002). No passport required: An action learning approach to teaching about globalization. *Teaching Sociology*. 30(1), 89-99.

United Nations Educational, Scientific and Cultural Organization. (2005). *Education for Sustainable Development*. Retrieved March 2, 2010, from http://www.unesco.org/en/esd/

Appendix A

Curricular Resources

Below is a compilation of resources that informed the development of the curriculum. For those using the curriculum, the books, articles, curricula, and websites may be useful for supplementing the lessons and experiences contained in the curriculum.

Books

Belasco, W. (2008). *Food: The key concepts*. Oxford: Berg Publishers.
Bittman, M. (2009). *Food matters: A guide conscious eating*. New York: Simon & Schuster.
Brown, L. (2005). *The food security challenge in an age of falling water tables and rising temperatures*. New York: W.W. Norton & Company.
Imhoff, D. (2007). *Food fight: A citizen's guide to the farm bill*. Berkeley, CA: UC Press.
Kingsolver, B. (2007). *Animal, vegetable, miracle: A year of food life*. New York: HarperCollins.
Koeppel, D. (2008). *Banana: The fate of the fruit that changed the world*. New York: Hudson Street Press.
Nestle, M. (2002). *Food politics: How the food industry influences nutrition and health*. Berkeley, CA: UC Press.
Nestle, M. (2006). *What to eat*. New York: North Point Press.
Patel, R. (2008). *Stuffed and starved: The hidden battle for the world food system*. New York: Melville House.
Petrini, C. (2007). *Slow food nation: Why our food should be good, clean, and fair*. New York: Rizzoli Ex Libris.
Pollan, M. (2007). *The omnivore's dilemma: A natural history of four meals*. New York: Penguin.
Pollan, M. (2009). *Food rules*. New York: Penguin.
Pollan, M. (2009). *In defense of food: An eater's manifesto*. New York: Penguin.
Roberts, P. (2008). *The end of food*. New York: Houghton Mifflin.
Scholsser, E. (2002). *Fast food nation*. New York: Houghton Mifflin.
Singer, P., & Mason, J. (2007). *The ethics of what we eat: Why our food choices matter*. Rodale Books.
Standage, T. (2009). *An edible history of humanity*. New York: Walker & Company.
Vileisis, A. (2008). *Kitchen literacy*. Washington, DC: Island Press.
Watson, J., & Caldwell, M. (2005). *The cultural politics of food and eating*. Walden, MA: Blackwell.
Winne, M. (2009). *Closing the food gap: Resetting the table in the land of plenty*. Boston: Beacon Press.

Articles

Badgley, C., et al. (2007). Organic agriculture and the global food supply. *Renewable Agriculture and Food Systems*, 22(2), 86-108.
Chappell, J. (2007). Shattering myths: Can sustainable agriculture feed the world?. *Food First Backgrounder*, 13(3), 1-4.
DeWeerdt, S. (2009). Is local food better?. *World Watch*, 22(3), 6-10.
Edwards, J., Kleinschmit, J., & Schoonover, H. (2009). Identifying our climate "foodprint": Assessing and reducing the global warming impacts of food and agriculture in the U.S. *Institute for Agriculture and Trade Policy*. Retrieved from http://www.iatp.org/iatp/publications.cfm?refid=105667
Layton, L. (2009, April 27). Crave man. *The Washington Post*. Retrieved from http://www.washingtonpost.com/
Manning, R. (2004). The oil we eat: Following the food chain back to Iraq. *Harper's Magazine*, 308(1845), 37-45.

Pollan, M. (2004, October 17). Our national eating disorder. *New York Times Magazine*. Retrieved from http://www.michaelpollan.com/article.php?id=71
Pollan, M. (2007, January 28). Unhappy Meals. *New York Times Magazine*. Retrieved from http://michaelpollan.com/article.php?id=87
Pollan, M. (2008, October 12). Farmer in Chief. *New York Times Magazine*. Retrieved from http://www.michaelpollan.com/article.php?id=97
Pollan, M. (2009, August 2). Out of the kitchen, onto the couch. *New York Times Magazine*. Retrieved from http://www.michaelpollan.com/article.php?id=99
Wallinga, D., Schoonover, H., & Muller, M. (2009). Considering the contribution of U.S. agricultural policy to the obesity epidemic: Overview and opportunities. *Journal of Hunger & Environmental Nutrition*, 4(1), 3-19.

Curricula & Lesson Plans

Elementary & Middle School:

Farm to Table: Connecting Agriculture to Our Everyday Lives, New England Heritage Breeds Conservancy: http://www.nehbc.org/education.html

Kids Cook Farm Fresh Foods, Sustainable Agriculture Education (SAGE) Center: http://www.sagecenter.org

The Growing Classroom: Garden and Nutrition Activity Guide (2007), Life Lab Science Program: http://www.lifelab.org/store-curricula.html

Middle School:

GET IT! Global Education To Improve Tomorrow*, Heifer International: http://www.heifereducation.org/atf/cf/{7A2AEFD5-0AAD-45AA-930B-C5D9E4340504}/GetIt_All.pdf*

LiFE: Linking Food and the Environment: An Inquiry-Based Science and Nutrition Program, Columbia University Center for Food & Environment: http://www.tc.columbia.edu/LIFE/

Middle & High School:

Discovering the Food System, Cornell University Division of Nutritional Sciences: http://www.hort.cornell.edu/foodsys/

High School:

French Fries and the Food System: A Year Round Curriculum Connecting Youth with Farming and Food (2001) by Sara Coblyn, The Food Project: http://thefoodproject.org/books-manuals, http://thefoodproject.org/food-systems-curriculum

Mission Geography: Module 2: Where will your next meal come from?, NASA: http://www.missiongeography.org/912mod2.htm

Sustainable Agriculture Activity Guides, UC Davis Agricultural Sustainability Institute Student Farm: http://studentfarm.ucdavis.edu/edumat/saguides

Sustainable Agriculture Curriculum, An 8-Part Series, The Food Project: http://thefoodproject.org/sustainable-agriculture-curriculum

Toward A Sustainable Agriculture, Center for Integrated Agricultural Systems (CIAS): http://www.cias.wisc.edu/curriculum/index.htm

Other Resources

Agriculture in the Classroom National Directory, USDA: http://www.agclassroom.org/index.cfm

> The Agriculture in the Classroom National Resource Directory is an online searchable database that lists hundreds of educational resources designed to help educators locate high quality classroom materials and information to increase agricultural literacy among their Pre-K through 12th grade students.

Agriculture in the Classroom Resource Database, Utah State University Cooperative Extension: http://extension.usu.edu/aitc/

> Utah Agriculture in the Classroom (AITC) provides training and resources for teachers to use as a vehicle to teach across existing curriculum, helping students develop an awareness and understanding of our food and fiber system, and how agriculture impacts our daily lives.

Center for a Livable Future, Johns Hopkins University School of Public Health: http://www.jhsph.edu/clf/

> CLF provides resources in the areas of research, educational outreach, and community action with regard to farming, eating, and living for a sustainable future. Particularly useful is the access to course materials for two graduate level courses connecting food systems, the environment and public health, which are available free through the school's Open Courseware project: http://www.jhsph.edu/clf/education/.

Center for Ecoliteracy: http://www.ecoliteracy.org/

> The Center for Ecoliteracy works to integrate ecological principles and sustainability into school curricula, especially through school gardens and school lunch programs. The Center offers books; teaching guides; professional development seminars; a sustainability leadership academy; keynote presentations; and consulting services.

Charting Growth: Sustainable Food Indicators, The Wallace Center: http://wallacecenter.org/our-work/current-initiatives/sustainable-food-indicators

> Charting Growth: Sustainable Food Indicators is designed to develop indicators for sustainable community-based food systems (SCBFS), and to use these indicators to assess their current strength in the US and their growth. The website provides the most recent results of this research.

Community Food Security Coalition: http://www.foodsecurity.org/

The Community Food Security Coalition (CFSC) is a North American coalition of diverse people and organizations working from the local to international levels to build community food security. Their website provides updates and publications focused on the state of food security in the US.

Food & Water Watch: http://www.foodandwaterwatch.org

Food & Water Watch researches and advocates for safe, sustainable food production. Their website provides a wealth of up-to-date information about food and safety and sustainability issues.

FoodRoutes: http://www.foodroutes.org/

FoodRoutes is a national non-profit working to reconnect Americans to their food and food system. Their website provides a searchable library of papers and publications relevant to the food system, as well as resources for changing the system.

The GRACE Factory Farm Project: http://www.gracelinks.org/

The GRACE Factory Farm Project works to create a sustainable food production system that is healthful and humane, economically viable, and environmentally sound through the production of innovative awareness campaigns and online resources. Their website links to such interactive and informative projects as *The Meatrix, Sustainable Table,* and *The Eat Well Guide.*

The Leopold Center for Sustainable Agriculture at Iowa State University: http://www.leopold.iastate.edu/

The Leopold Center is a research and education center that works to research, educate about, and develop sustainable agricultural practices. Their website includes numerous publications and educational resources designed for the public and formal educational settings.

My Community, Our Earth, The Association of American Geographers: http://www.aag.org/mycoe/recommended_resources.htm

My Community, Our Earth approaches the complex themes of sustainable development using a geographic perspective and provides free learning resources, including interactive online activities, teacher and student guides, and links to related resources.

Sustainable Agriculture Resources and Programs for K-12 Youth (2009), Sustainable Agriculture Research & Education (SARE) Program: http://www.sare.org/publications/edguide/YouthBook_September2009.pdf

The guide is a listing of organizations and programs focused on sustainable agriculture education. It provides descriptions of each listing, along with contact information and website links.

Sustainable Agriculture Resources for Teachers, K-12, USDA Alternative Farming Systems Information Center: http://www.nal.usda.gov/afsic/AFSIC_pubs/k-12.htm

> The AFSIC provides a free listing of resources, contacts, books, websites, and articles on a range of sustainable agriculture topics.

Sustainable Agriculture Educational Materials Digital Library, Sustainable Agriculture Education Association: http://sustainableaged.org/Resources/MaterialsDatabase/tabid/76/Default.aspx

The Sustainable Agriculture Education Materials digital library is a searchable and cross-referenced database of education resources for sustainable agriculture. The library is updated regularly and includes laboratory and field exercises, annotated bibliographies/reading lists, curricula, books, Web sites, service learning projects, and internship examples.

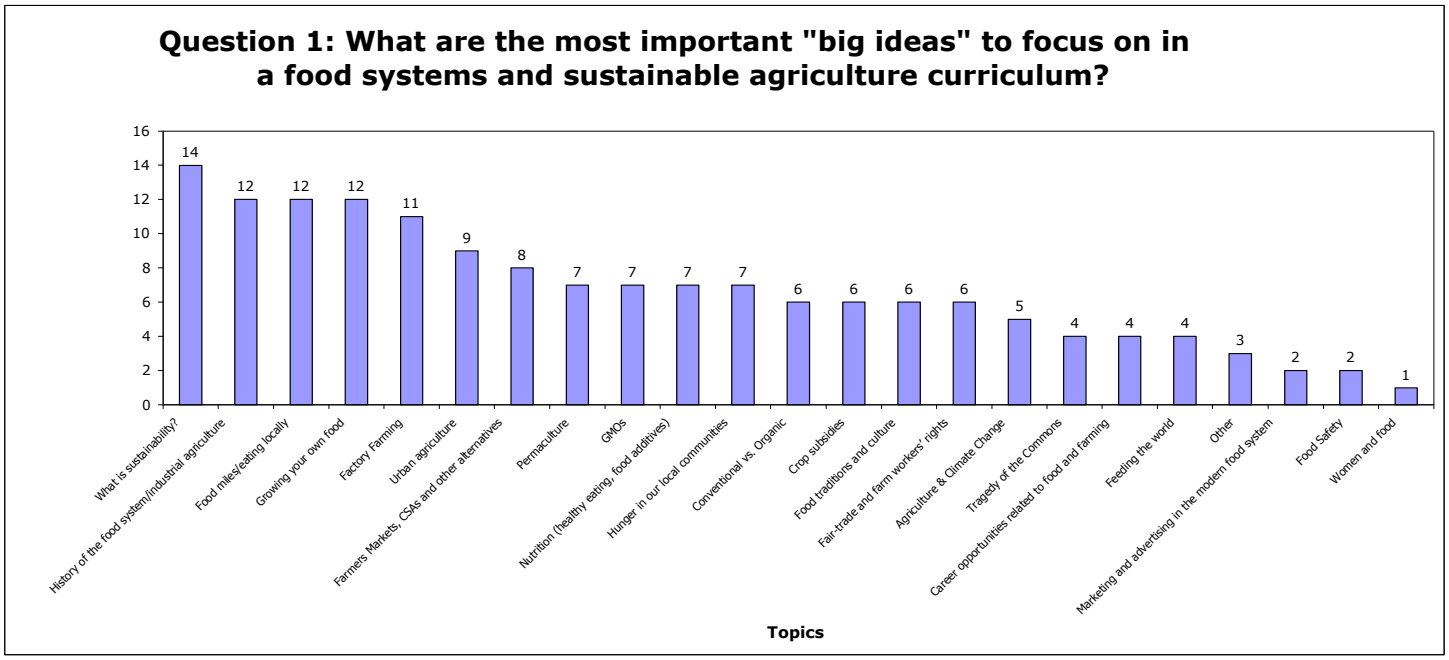
Appendix B

Survey to Develop Core Ideas

I used an online survey to query members of the sustainable agriculture community to get input on the "big ideas" on which a sustainable agriculture and food systems curriculum for high school students should focus. I sent the survey to people I know and with whom I have worked, selecting those who have experience with both education and sustainable agriculture. The respondents include professors, farmers, environmental educators, university students and professionals working on agriculture and food systems issues. The questions and responses are as follows:

1) If you were designing a program to educate high school students about sustainable agriculture and food systems, which of the following topics do you feel are the "big ideas" that you would most want students to understand? Obviously many of them overlap, but which are the most important to focus on? Please choose your top 10. There is space below to add other ideas.

Figure B1: Raw Data, Question 1



The top responses to Question 1 were "What is sustainability?", "History of the food system/industrial agriculture", "Food miles/eating locally", "Growing your own food", "Factory Farming", "Urban agriculture", "Permaculture", "GMOs", "Nutrition (healthy eating, food additives)", and "Hunger in our local communities". Other suggestions made by respondents were:

- What is "food security"? What are "food deserts"?
- Seed-saving and indigenous people's rights!
- Systems! The ability to conceptualize, analyze and act in a systems manner is foundational to all the rest.

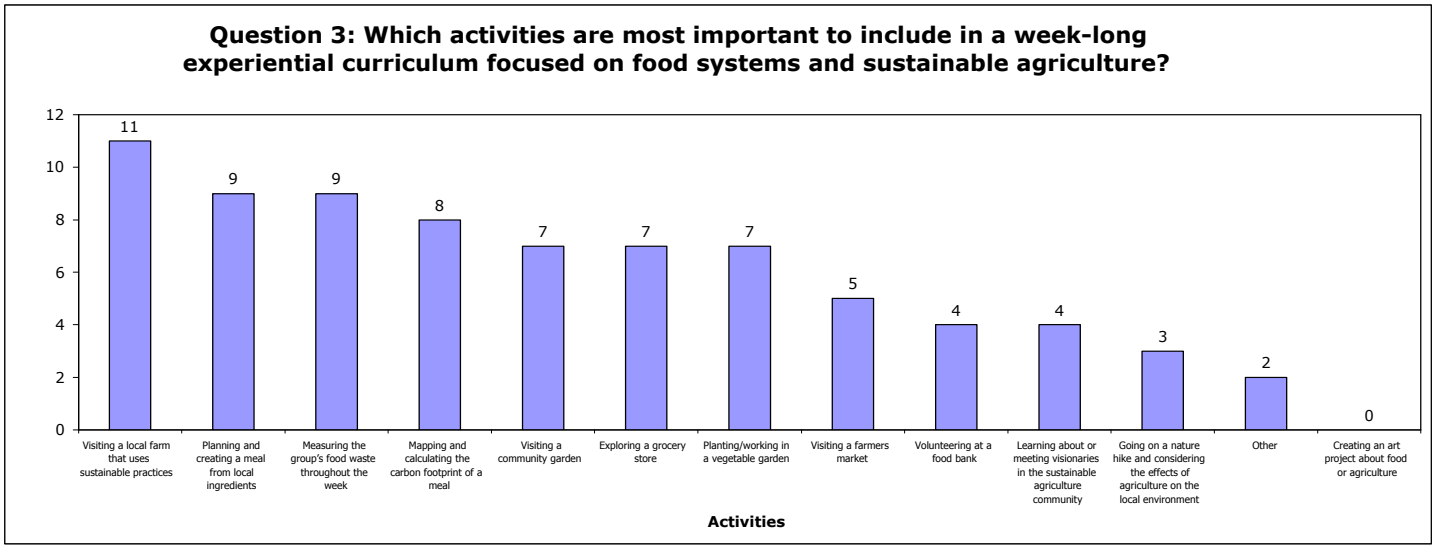
2) Do you have any other comments to share about your choices above?

The following comments were made:

- Looks like a great list. A key (I think) to designing a good syllabus is to have one or two major lessons or themes that will run throughout the course. You seem to have that in "sustainability" and "expressions of hunger." From there, your different subunits cover why this stuff is important, how we might think about it, and where avenues exist for effective action. Nicely done.
- I think it's essential to dispel the myth that organic agriculture cannot feed the world, and to unearth the terrifying amount of control that big agribusiness has on our food systems and, therefore, our lives.
- I tried to choose options that seemed like they would really connect with students. I think that anytime students are given the opportunity to learn about things in a hands-on fashion that it tends to lead to a really positive and memorable outcome. As illustrated by the work of Vandana Shiva, indigenous people's traditional agricultural rights, which definitely include seed-saving, are very important causes that deserve attention.
- You would want to start with unbiased ideas and let the kids gather their own opinions, I had a wonderful professor who did this when I took a food issues class. It was very discussion based, read some from a book and now why don't we look at why this may have happened, how did we get there etc. it got everyone thinking, then the other buzz words and hot buttons came up from student not the professor, when someone would say those words she'd say what can you tell me about this or how it relates, it helped learning from peers and we didn't get an opinion from our professor allowing us to always listen to her. Excellent. :)
- I picked the most hands on topics that speak to people's current reality so that highschoolers can relate and feel like they are being given tools and practical options to do something with the information they are given.
- Tough decisions. For the record I think it is difficult to focus on one without the others.
- Permaculture is listed above as a topic but it is more of a process. As a method of approach and decision-making, permaculture is powerful and can be paradigm-shifting, but if you think of it as a collection of techniques, it's just another name for sustainable agriculture - and how does that create change? If your goal is to generate action (eventually), then the more tools you can give the students the better (rather than just info). Good luck!
- They all seem important - You really have a good diversity of topics. It was hard to leave some of them un-checked!
- The fact that only a few corporations control most of our food choices would be a good point to include.

3) If you were to choose 5 experiences to integrate into a week-long sustainable agriculture and food systems education program, which would you choose?

Figure B2: Raw Data, Question 3



The top responses to Question 2 were "Visiting a local farm that uses sustainable practices", "Planning and creating a meal from local ingredients", "Measuring the group's food waste throughout the week", "Mapping and calculating the carbon footprint of a meal", "Visiting a community garden", "Exploring a grocery store", and "Planting/working in a vegetable garden". In the space for "Other", respondents said the following:

- I only didn't check "visiting a local sustainable farm" because I think that's the vision most people have in their head about what farms look like (rather than factory farms).
- I'd love to have all topics covered!

4) What other suggestions, if any, do you have for experiential education opportunities that could be used to teach the "big ideas" of sustainable agriculture?

The following comments were made:

- Meeting with small farmers who have suffered from the practices of big agribusiness, or who have suffered health effects of conventional chemicals (pesticides, herbicides, etc.) could make a big impact. The Institute for Agriculture and Trade Policy might be another place to look for ideas. Dr. Allen Greene gave an amazing presentation at the Midwest Organic and Sustainable Education Services (MOSES) conference last year. It's entitled "Why Farmer's Are My Heroes," and focuses largely on the health benefits of sustainable ag. I highly recommend it! If you can't find a copy online, let me know and I'll try to burn the CD I have.
- Aquarium vermicompost set-ups are very easy to put together, fun to look at, and extremely educational tools to show how easily food returns to the soil. It would really be something that would be best done for longer than one week, but even so it is still a really great experience to watch your food waste turn into "black gold."
- I also took this other course were we went to different farms and looked at the agroecology and analyzed which system was best rating it on social, environmental and economic implications. Totally unbiased, which is needed in this kind of topic, steer clear of hot buttons. I picked things that would stimulate ideas and get people talking, asking the why? What they saw? Experienced? How this happen? etc.

- Build a compost pile from someone's kitchen waste a week or so before the class. stick a thermometer in it so that people can witness it heating up and then pass around a bucket of finished compost so that people can feel its sponginess and smell it. It's always fun to watch how surprised people to witness the transition of kitchen waste to soil. Also, get kids to eat tomatoes fresh from the plant and carrots straight from the ground. Involve the taste buds as much as possible, people will remember and love it!
- This might be lame, but "the garden" is one of the best films I've seen about this. Also, maybe you could talk about different diets (vegan, locavore, carnivore, etc) and how they may or may not be sustainable.
- Two thoughts: One - people (even high school students) hold lots of knowledge, so the fewer lectures and the more discussions that can happen (with expert knowledge and facilitation ready at hand), the better! Second - a great addition to a permaculture course I was recently involved with was facilitation skills. The idea was that over the week, learning would happen both through facilitation by the teacher and through application of facilitation skills in the class. In theory, the students were them better equipped to go out and teach others what they had learned. Might not fully apply here, but could spark some other ideas.
- I personally feel that hands-on experiences are the best. Don't just visit a farm - go there for several hours and help in a variety of projects planting, transplanting, weeding, harvesting, feeding animals, etc.
- I think I remember an exercise that showed how small an amount the farmer who grew the food actually got out of the price the consumer paid. An activity that shows why it's not a good idea to use corn for biofuel or to feed livestock used for food, especially when it's a main food source for some under developed countries.
- In our local community garden this past year, we had K-6 students (300 of them) start the seeds and planted the seedlings on planting day with the Governor's executive chef speaking to them about the importance of what they were doing. The kick-off to the seed planting played into the character ed of the elementary school with that month's theme being "consideration" -- consideration for the earth, community, neighbors. Much of the food harvested (we employed youth/teens through a county program throughout the summer) went weekly to the local food pantry, and the rest was sold at a local farmers' market on Saturdays -- teaching sustainability of the program. Youth (12 and under) used the food in a daily summer program -- lunch 'n' learn at our Courthouse Community Center. Food grown throughout the summer months was also used at our annual Al Fresco Dinner (a meal for 400, locally sourced, to benefit our Courthouse Community Center.) Also, classes were conducted at the Battenkill Kitchen (a shared-use facility for processing food items, offering value-added opportunities to local farmers and producers, those processing/baking, too, for farmers' markets) for preserving the harvest -- canning, freezing, drying, and also classes on using local/seasonal food in everyday cooking. Youth and adults attended these classes. From youth to seniors, we had many parts of our community participating in the community garden -- towards the end of the season, we also had senior citizens invited to glean and take product home. The land we used was provided by a local farm.

5) Would you be willing to read and comment on a draft of the curriculum and report I put together for this project? If so, please leave enter your e-mail address below. I will send you a copy of the draft for review in late March or early April.

Twelve respondents offered to review the curriculum.

Appendix C

Program Set-Up

Figure C1: Curriculum Concept Map

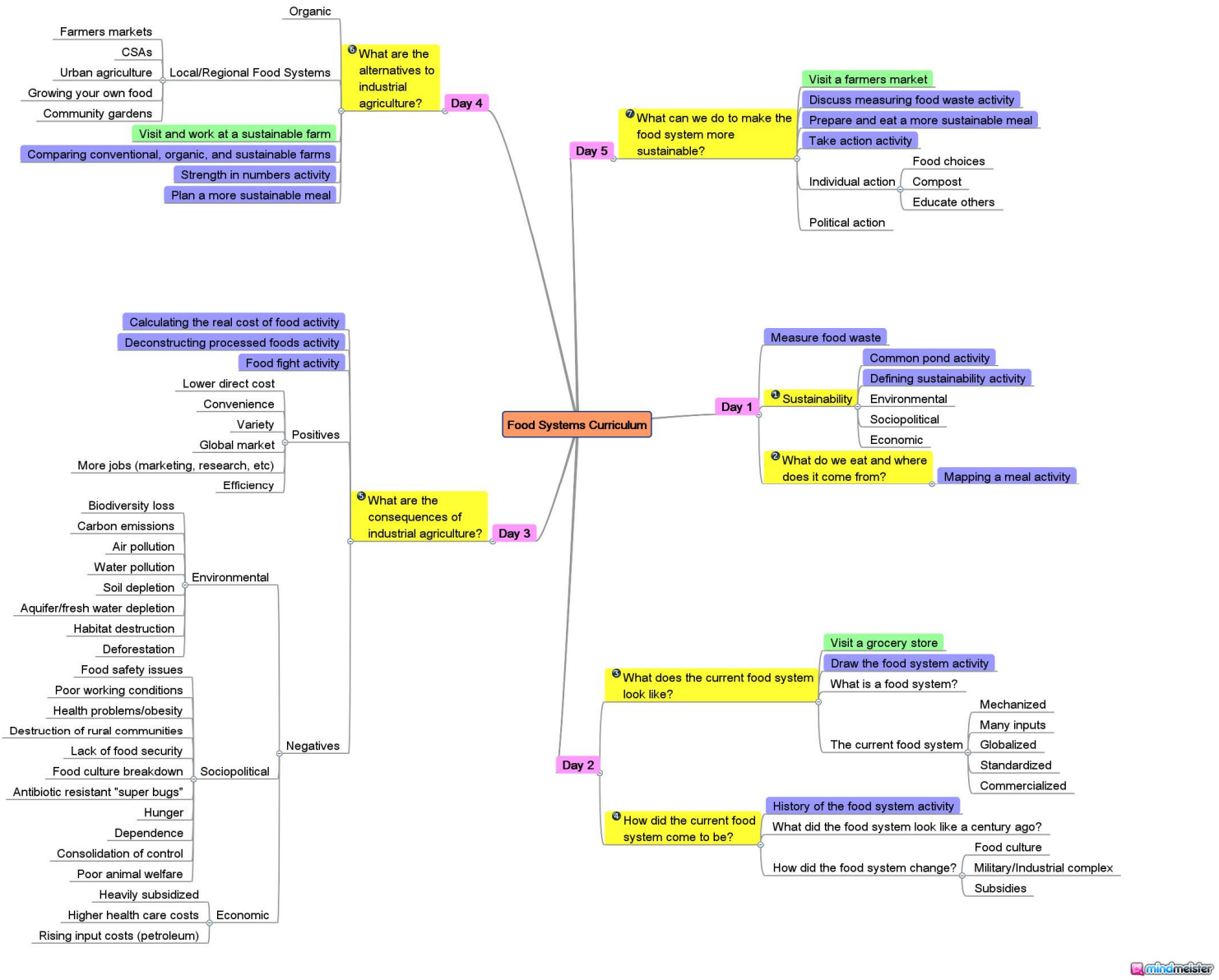


Figure C2: Schedule for Program Week

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
CORE FOCUS	**What is sustainability?; What do we eat and where does it come from?**	**What does the current food system look like?; How did the current system come to be?**	**What are the consequences of industrial agriculture?**	**What are the alternatives to industrial agriculture?**	**What can we do to make the food system more sustainable?**
7:30					
8:00	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
8:30					
9:00	Introductions, Icebreakers	Measure Food Waste	Measuring Food Waste	Measuring Food Waste	Measuring Food Waste
9:30		Grocery Store Visit	Warm-ups	Visit and Work at a Sustainable Farm	Farmers Market Trip
10:00	Framing the Experience				
10:30			Deconstructing Processed Foods		
11:00					
11:30	The Common Pond				
12:00					
12:30	Lunch	Lunch	Lunch	Lunch	Lunch
1:00					
1:30	Begin Measuring Food Waste	Measuring Food Waste	Measuring Food Waste	Measuring Food Waste	Measuring Food Waste
2:00		Grocery Store Discussion	Calculating the Real Cost of Food	Farm Discussion	Measuring Food Waste Discussion
2:30	Defining Sustainability			Strength In Numbers	
3:00					Dinner Prep
3:30		Draw a Food System			
4:00			Food Fight		
4:30	Mapping a Meal			Comparing Conventional, Organic, and Sustainable Farms	
5:00					
5:30					
6:00	Dinner	Dinner	Hunger Banquet	Dinner	Student-Planned Dinner
6:30					
7:00	Measuring Food Waste	Measuring Food Waste	Hunger Banquet Discussion	Measuring Food Waste	
7:30	Watch *Food, Inc*	History of the Food System		Plan a More Sustainable Meal	Take Action Activity
8:00					
8:30					
9:00					
9:30					

Appendix D

Sample Lesson Plans

Before composing the full curriculum with lesson plans for every activity and excursion, I completed sample lesson plans for two of the activities. I will send these lesson plans, along with the curriculum outline, to sustainable agriculture and food systems education experts for review. I hope to receive feedback on the curriculum content and progression, based on the curriculum outline, and on the clarity of the experiential approach that is woven into the lesson plans. Based on this feedback I intend to revise the existing materials and compose lesson plans for the rest of the activities.

The first sample lesson plan is for the first experiential, content-focused activity, which students will engage in following personal introductions and a brief orientation to the program. *The Common Pond* consists of a game and a discussion that help students begin to think about sustainability, providing a basis for the afternoon activity, in which students define sustainability for use as the program's overarching theme. The second sample lesson plan is for an activity on Day Four, which focuses on alternatives to industrial agriculture. The activity, *Strength In Numbers*, consists of a game that illustrates the importance of crop biodiversity in protecting against pests and disease, as well as a group activity in which students make plans for a community garden based on principles of companion planting and biodiversity.

Each lesson plan lays out the groundwork and objectives for the activity, explains the procedure for the activity, provides a guide for discussion, and includes any requisite handouts. Additionally, the lesson plans include marginal notes that help facilitators anticipate the directions in which an activity or discussion might progress, supporting the experiential approach.

The Common Pond

An Introduction to Sustainability via the Tragedy of the Commons

Facilitator Guide

Introduction

This activity is intended to serve as an introduction to the concept of sustainability, which students will define and discuss thoroughly as a group in the next activity. The activity is based on the concept of the Tragedy of the Commons – that individuals acting rationally in their own self-interest will ultimately deplete a limited common resource even if it is clear that it is not in anyone's long-term interest for this to happen. In this case, the common resource is fish in a common pond. Because individuals in such a scenario usually cannot or do not communicate with other users about their use of the resource, they cannot be sure about what other users will do. The activity attempts to mirror this by requiring students to refrain from communicating with each other in any way during the activity. This ensures that students make decisions based on their own self-interest, without certainty about how others will behave. A group discussion after the activity gives students the opportunity to reflect on it and justify their actions while allowing the facilitator to ensure that the students grasped the intended concepts.

Objectives

Upon completion of the activity, participants should:

1. Be able to discuss what it means for something to be "sustainable"; and
2. Understand how individual actions contribute to a collective result.

Activity

Materials Needed (Group of 30)

- 240 small plastic fish or other small items
- 240 pennies
- 6 large, shallow bowls

Note

This activity can be done with as few as 4 students. For larger groups (more than 10) it is helpful to have more than one person facilitating this activity to speed up the transitions between each round and manage the different outcomes that may arise within different pond groups.

Procedure

1. Divide students into pond groups of 5. Each pond group gets a Student Guide and a bowl with 20 fish. If the number of students in the whole group is not divisible by 5, you can use

smaller or larger pond groups, but make sure each group's bowl contains 4 fish per group member (i.e. 16 fish for a group of 4, 20 fish for a group of 5, 24 fish for a group of 6).

2. Each pond group should sit in a small circle around their bowl, as instructed in the Student Guide.
3. Tell students to read aloud the scenario for the activity from their Student Guide: *Imagine that each of you is the head of a starving family in a rural village. The only way you are able to support your family is through fishing in the pond in the center of your village. Your goal as the head of the family is to make sure your family survives for as long as possible.*
4. Then have one student from each group read aloud to his/her group the instructions for the activity from the Student Guide. Reiterate that as soon as the instructions are read, they may not communicate with each other in any way, including mouthing, making noises, pointing, gesturing, etc. They may ask you questions about how to execute the game, but you should avoid giving more information and simply refer them to the instructions on their Student Guide so that you don't give away any hints to what they are supposed to discover over the course of the activity. They should figure things out for themselves and will have the opportunity to discuss what happened when the activity is over.

Note

It is critical that students do not communicate with each other at any time after the initial instructions are read aloud from the Student Guide. This includes in between rounds and in between games if you restart the game. Many students will find this frustrating, but maintaining this condition ensures a more realistic and impactful experience.

Over the course of the activity each student should begin to realize that the only way for their own family to survive from round to round is for each member to remove a small number of fish per round while the group collectively maintains a sustainable number in the pond.

5. Before beginning each round, remind students that they may not communicate in any way, either during or in between rounds.
6. Announce the start of the round, count to ten, and then tell participants to stop.
7. Go around to each pond group and collect 2 fish from each student, symbolizing the fish their family consumes to survive to the next round. Any student who does not have 2 fish "dies" and is out of the game.
8. Then, double the number of fish in the group's bowl (not to exceed 4 x the # of participants in the group, i.e. 20 fish for a group of 5 students). If all of the fish are gone, that group cannot continue playing and should sit quietly while the other groups continue with the next round.

9. Start the second round. Continue playing until every pond group has either run out of fish in their bowl or reached a system of sustainable harvest, in which group members are able to survive round after round by taking 2 fish each and allowing the rest to reproduce and replenish the stock in the pond. One of the following scenarios will likely occur in each of the pond groups:
    A. The students will get caught up in harvesting as many fish at one time as possible, they will not consider the long-term consequences of their actions, and/or they will worry about the fact that they cannot control anyone else's actions (If they take only the 2 fish they need for their family to survive and someone else takes more than 2 fish, the pond will no longer sustain everyone in future rounds). One or more students will scramble to get as many fish as they can, removing all of the fish from the pond in a single (perhaps the first) round. Since they no longer have any fish in the pond, nothing reproduces and their pond remains empty.

    If this happens to all or most of the groups in the first couple rounds, have them return all of their fish to the ponds and start the game over. Give them another chance to play the game and see if the same thing happens. For some groups, this will happen repeatedly, whereas others will figure out how to sustain their families and will reach a system of sustainable harvest (see scenario B and introduce it if time allows). If the groups cannot seem to make it through more than a few rounds before depleting their fish stock, even after restarting the game several times, take a few minutes to remind the students of their goal – to make sure their families survive for as long as possible. You want them to come up with the sustainable solution on their own, so ask them to think about (but not say aloud) how their families could survive in the long-term, given the parameters of the game. Give them a minute or two to think about it and then start the game one more time. If they continue to struggle, give them a new scenario that allows them to work through the difficulty. Tell them:

    After watching the villagers struggle to stay alive as the fish stock in the pond continued to diminish year after year, some of the village elders decided to call a meeting to see if all of the fishermen might be able to work together to solve their problem. Use the next few minutes to discuss the situation with your fellow villagers and come up with a plan to keep your families alive.

Once they have talked for a few minutes, start a new game. The students should now be able to reach a system of sustainable harvest.

B. Either right away or after a couple failed attempts to sustain themselves, the students will realize, independently, that sustaining their families for as long as possible means that the fish will need to reproduce each round and so they must leave enough fish in the pond at the end of each round so that they will have fish to harvest during the next round. This is the goal This will look something like (or will likely evolve into) each student taking 2 fish from the pond during each round. With 5 students in a group, that will leave 10 fish in the pond at the end of the round, which will double to the original number of 20 fish during reproduction. This way, students provide for their families each round and the pond never gets depleted. In other words, they have reached a system of sustainable harvest.

   If this scenario happens in several of the groups the first time the students play the game, use the opportunity to make the game a bit more complicated by tempting students to take more fish than is sustainable. Tell everyone:

   A company has come to your village and wants to buy fish from you. After your family consumes its 2 fish at the end of each round, you may choose sell any of your remaining fish to the company for one penny each. With the pennies, your family can pay for school tuition, new clothes, other kinds of food, luxury goods, etc. The more money you have, the more your family will be able to afford.

   Once you institute this opportunity, go around to each group at the end of each round and after collecting a student's 2 fish to eat, offer to buy any extra fish. They do not have to sell their fish. Then double the fish in the group's pond and start the next round.

   Since students will want to provide more for their families, they will likely take more than 2 fish so that they will have something to sell. This will, either immediately or gradually, reduce the number of fish in the pond, eventually causing some or all of the villagers to die.

Note

The activity is a symbolic exercise intended to show students the consequences of individual actions in situations where shared resources are at stake and to foster discussion about this matter. Obviously, circumstances vary and real-life situations are much more complicated than this one. This is something students should reflect on as a group during the post-activity discussion. In this case, because of the number of fish set out in the activity, it is impossible for every villager to feed his/her family infinitely and sell fish to buy other goods to improve their standard of living.

Discussion

Bring the whole group back together to share their experiences with each other. Base the discussion on whichever scenario(s) the groups participated in. The discussion should help students think about what factors influenced their decisions during the game, how much control they had over their families' future, and how the simulation might apply to real life situations. Questions that might help guide the discussion include:

- Did your pond run out of fish? Why or why not?
- Why did you take the number of fish you took?
- Why couldn't you ensure your family's survival forever even if you were taking only your share of the fish?
- What happened when the pond ran out of fish? Were some people able to survive still? For how long?
- Was it possible to survive indefinitely? How?
- How did not being able to communicate with the other people around your pond affect your choices? The outcome?
- What about this simulation is realistic? Do situations like this occur in the real world? When?

If you modified the rules based on Scenario A:

- How did the meeting called by the elders change the game?
- Think about situations like this activity that happen in the real world. How does communication change those situations?

If you modified the rules based on Scenario B:

- How did people's behavior change when the company offered to buy fish? Why?
- What happened to the community as a whole because of this?
- Think about situations like this that happen in the real world. What is or is not realistic about this scenario?

Managing Content

If students do not use the term "sustainable" on their own, introduce it during this discussion, as it will form the foundation for the next activity and the rest of the week.

If it seems appropriate, you can also introduce students to the Tragedy of the Commons: Garrett Hardin coined the term in 1968. He used the example of the traditional 'commons' in New England towns to signify a public resource available for private gain. In that case, the commons was used for grazing the townspeople's livestock. He demonstrated the idea that a small increase in use of the resource (e.g. one extra cow) provides a great benefit to an individual, while the cost of that additional use (decreased grass supply) is shared by all. Therefore, each user has an incentive to use (and exploit) the resource to the greatest of his or her ability. Ultimately, there is a decrease in yield for both the group and the individual.

As discussed above, the simulation is a simplification of reality and is intended to spur thought and discussion. After debriefing what occurred in the activity itself, encourage students to reflect on the real-life situations to which the activity alludes, allowing the discussion to flow from the connections they make.

The Common Pond

Student Guide

Materials

Your group of 5 students should have:

- 1 bowl
- 20 plastic fish

Directions

1. Sit in a circle with the bowl in the center and all of the fish in the bowl.
2. Read the following scenario aloud:
   "Imagine that each of you is the head of a starving family in a rural village. The only way you are able to support your family is through fishing in the pond in the center of your village. Your goal as the head of the family is to make sure your family survives for as long as possible."
3. Now read the directions for the activity aloud:

   - You will be participating in several 10-second rounds. The facilitator will announce the start and end of each round.
   - During each round, you may take as many fish from the pond (bowl) as you want.
   - Once a fish is removed from the pond, it belongs only to the person who harvested it and may not be returned to the pond.
   - At the end of each round, each fisherman/woman needs at least 2 fish for his/her family to survive. The facilitator will collect 2 fish from each person to symbolize your consuming the fish. Anyone who does not have 2 fish "dies" and is out of the game.
   - Also at the end of each round, the fish remaining in the pond will reproduce. The number of fish in the pond will double, but the pond cannot hold more than the number it contains at the beginning of the game because there is only enough space and food for that many fish to survive.
   - You are not allowed to communicate with each other *in any way, at any time* from now on. This includes mouthing, making noise, pointing, gesturing, etc.

4. Listen for the facilitator to announce the start of the first round and follow his/her directions.

Strength in Numbers

The Role of Biodiversity in Agriculture

Introduction

This activity provides a vehicle for comparing industrial agriculture and sustainable agriculture by highlighting one of the major differences between industrial and sustainable agriculture. Exploring why crop biodiversity can be beneficial, students put their evolving knowledge into practice in planning their own gardens. Students may also note, however, that monocropping has advantages as well, and there is a reason it is used to such a great extent in our modern food system.

Connecting to the Big Ideas

- Sustainability
- Conventional vs. Sustainable Agriculture

Objectives

Upon completion of the activity, participants should:

3. Be able to discuss some of the advantages and disadvantages of monoculture;
4. Be able to discuss some of the advantages and disadvantages of polyculture;
5. Understand the importance of crop biodiversity to sustainability; and
6. Be able to use this understanding to inform a plan for a hypothetical garden.

The Experiential Approach

- Set out the rules for the games then allow students to work through them on their own.
- Give students the opportunity to reflect on the activities and information by challenging them to justify their choices or answers.

Part One: Monoculture vs. Polyculture

This activity should show students what happens when a disease enters a homogenous population (i.e. monocropping) where all members are susceptible to it versus a heterogeneous population (i.e. polyculture) where only one category of the population is susceptible to the disease. In the activity's first scenario, all of the students represent a single category and all are susceptible to the disease. As the disease moves through the population, all members will become infected and die. In the second scenario, each student is a member of one of five categories. Only one of the categories is susceptible to the disease, so as it moves through the population only the members of that category die. During the post-activity discussion, students will have a chance to reflect on what happened during the activities themselves. Then they will be asked to apply the understanding they gained

from the activity to planting a garden. Here students should realize that planting several different kinds of crops provides natural protection against pests and disease, so it is safer for a farmer than planting only one crop. However, natural insurance against such sources of crop failure is only one factor that farmers consider in choosing what to plant. Students may bring up other considerations, such as labor requirements, personal taste, heartiness, nutrient requirements, costs, etc. These can be used to inform students' decisions in the next activity, so discussing them briefly could be a good segue. If the students do not bring up these factors, move on to the second activity and consider discussing them after it.

Materials Needed (Group of 30)

- Thirty cards on strings, to wear around the neck, with identical symbols (i.e. circles) on them
- Six of each of four other symbol cards on strings (i.e. squares, triangles, stars, half-moons)

Procedure

Scenario One – Monoculture

5. Have each participant put on a circle card.
6. Ask everyone to close their eyes while you choose one person to act as the "disease", indicated by a tap on the shoulder. When the game begins, the "disease" should scratch the palm of each person with whom he or she shakes hands. Explain that when one feels one's palm get scratched, one is infected with the disease. Once infected, one should shake the hand of one more person, scratching his or her hand, before dying from the disease (falling on the floor).
7. Once you choose a "disease" have everyone open their eyes and begin shaking hands.
8. When everyone has been infected and died, have the group gather to try a second scenario.

Scenario Two –Polyculture

1. Have each participant put on a symbol card so that there are six students representing each of the symbols (circle, square, triangle, star, and half-moon).
2. Ask everyone to close their eyes while you choose one person to act as the "disease", indicated by a tap on the shoulder. This time, the "disease" should shake hands with everyone, but should only scratch the palm of the people representing his or her symbol. Explain that when one feels one's palm get scratched, one is infected with the disease. Once

infected, one should shake the hand of one more person, scratching his or her hand only if he or she is of one's own symbol, before dying from the disease (falling on the floor).

3. Once you choose a "disease" have everyone open their eyes and begin shaking hands.
4. When all of the infected symbol have died, have the group gather to discuss the scenarios.

Discussion

- What happened in the first scenario? Why?
- What happened in the second scenario? Why?
- Imagine that you are a farmer deciding what crops to plant in your field. You have five different types of seeds, and each produce crops that are worth different amounts of money. Reflecting on the activity you just did, how would you decide which seeds to plant?

Managing Content

When discussing how the activity applies to growing crops, students may describe the concepts of "monoculture," "polyculture," and "biodiversity" without using the terms. This is a good time to share the terms, commonly used in sustainable agriculture, so that students can use them to communicate with each other and people who have not participated in the activity.

Students will likely bring up a number of factors that would influence their decision about what to plant, in addition to what they learned from the activity. These may include heartiness, input costs, labor requirements, profitability, personal taste, etc. Make sure they recognize that planting more than one type of crop provides insurance against pests and disease.

Part Two: Using Biodiversity in the Garden

Materials Needed (Group of 30)

- Three grids of squares, 3-by-4, taped out on a floor, table, wall, or blackboard
- Three sets of vegetable cards containing twelve cards of each vegetable (corn, beans, squash, radish, spinach, carrots, onions, leeks, onions, oregano)
- Three copies of the Vegetable Crop Information Guide (see attached)

Procedure

1. Divide the students into three groups.
2. Give each group a set of vegetable cards, a grid, and a vegetable information guide.
3. Ask each group to look at the list of vegetable information. The list provides information about the plants' needs and potential services, as well as the months in which they can be harvested and whether they can be preserved.
4. Explain that their goal is to create a garden layout for their community garden using what they learned

Managing Content

The activity is intended to show students the value of using biodiversity and companion planting in a garden.

This is a good time to share the terms "biodiversity" and "companion planting" if students are not already familiar with them.

When the students present their layouts and explain their reasoning, they may touch on the following topics:

- Insurance against disease
- Keeping pests away
- Providing nutrients (i.e. nitrogen) naturally
- Maintaining soil moisture
- Reducing labor requirements
- Reducing costs
- Having food throughout the year
- Having a diverse diet
- Personal tastes

from the last activity and the information on the list of vegetable traits. They should think about how they can arrange the plants to make the best use of the space while also considering what they can do with the crops once they're harvested. Tell the students that they may place up to three cards in each square of the grid. When all of the groups finish their plans (set a time limit if you would like), they will present them to a panel of (imaginary) judges, explaining their justifications for the layout they chose.

Post-Activity Discussion

Now that the students have presented their ideas and explained the reasons for their choices, the activity can transition into a discussion among the group as a whole, especially if the students seem to need more time to reflect and make connections. If students had different ideas about how to organize the garden, encourage them to ask each other questions about the different plans. See if the whole group can come to a consensus on the best plan.

Some additional questions that might help guide further discussion, along with possible aspects to students may bring up, are below.

- How many different types of corn or potatoes do you see in the grocery store? What does this say about our food system?
- What are some advantages and disadvantages of monoculture?
  - Advantages: efficient to plant, care for and harvest because everything in the field needs the same things; farmer only has to be an expert in one type of crop
  - Disadvantages: easy for diseases and pests to spread so yields are not secure and farmer needs chemical pesticides; depletes the soil quickly so farmer needs external inputs (fertilizer); only produce one type of crop so farmer isn't self-sufficient; entire crop is harvested at the same time so yield is not spread out over the whole season
- What are some advantages and disadvantages of polyculture?
  - Advantages: different crops and varieties grow well in different conditions so the growing season is extended and the entire year's crop is not lost in the event of mild drought, etc; different crops are resistant to different pests and diseases so entire year's crop is not lost due to a pest or disease; farmer's diet is well-balanced because he or she has lots of different foods to eat; different crops use and replenish different nutrients in the soil so soil health is maintained without needing much added fertilizer

- Disadvantages: labor-intensive to plant, care for and harvest because different crops need different things; farmer needs lots of knowledge of different crops and varieties

- Can you think of ways that polyculture might be good for the environment? (Reducing soil erosion, preventing chemical runoff, supporting wild biodiversity)
- How is crop biodiversity relevant to each of the three pillars of sustainability? (Environmental: reduces need for chemical inputs, encourages natural biodiversity around fields, helps keep soil healthy; Sociopolitical: helps maintain traditional crop varieties/food culture, reduces use of chemicals that harm farm workers, consumers, and farm neighbors, doesn't create super bugs; Economic: reduces input costs, reduces likelihood of total crop failure, increases land use efficiency)

Vegetable Crop Information Guide

Crop	Traits	Harvest Season	Usage
Beans	Need support to grow upwards; need moisture; fix nitrogen	July-September	Immediate or dried for year-round use
Cabbage	Needs protection from cabbage butterfly	June-November	Immediate or pickled for year-round use
Carrots	Needs protection from carrot flies; confuse onion flies	July-November	Immediate or canned for year-round use
Corn	Needs nitrogen, needs moisture; has a tall, sturdy stalk	July-October	Immediate or canned or dried for year-round use
Leeks	Improve growth of onions and carrots, repel carrot flies	August-November	Immediate
Onions	Need protection from onion flies	July-November	Immediate or can last through winter in root cellar
Oregano	Repels white cabbage butterfly	July-October	Immediate or dried for year-round use
Radishes	Attract leaf minor (pest) away from leafy greens	June-October	Immediate
Spinach	Needs protection from pests	May-October	Immediate
Squash	Needs nitrogen; leaves prevent weed growth and evaporation of soil moisture	July-November	Immediate or can last through winter or canned for year-round use