

## **Cultivating Sustainability Pedagogy through Participatory Action Research in Interior Alaska**

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### **Abstract**

As the environmental movement grows into a broader sustainability revolution, we must move beyond the traditional scope of environmental education to address social-ecological challenges through integrated education for sustainability. This paper proposes that the purpose of sustainability education is to foster a community culture that will promote the emergence of sustainability in complex adaptive systems with social and ecological components. This research explores how place-based education can promote sustainability of a particular community food system. Through participatory action research, the paper develops and demonstrates pedagogical components of sustainability that are applicable to formal and non-formal educational contexts. This work is based at the Effie Kokrine Charter School (EKCS), a junior-senior high school in Fairbanks, Alaska that teaches with an Alaska Native approach, emphasizing place-based, experiential, and holistic education by utilizing students' natural and human communities to facilitate learning. The collaborative design of an Interior Alaska gardening curriculum serves as both an organizing framework for the project's fieldwork as well as an outcome of the research. The resultant gardening curriculum and the rationale behind its design demonstrate components of pedagogy for sustainability, including systems thinking, place-based and problem-based learning, eco-cultural literacy, eco-justice values, and appropriate assessment. This pedagogical framework has theoretical and practical implications in multiple educational settings and indicates ways for our educational institutions to participate in the global sustainability revolution.

**Keywords:** sustainability education, place-based education, participatory action research, indigenous knowledge, pedagogy

The theory and practice of sustainability has burgeoned in the last decade, and the field of sustainability education is emerging in tandem with sustainability research (Edwards, 2005). The best-known definition of sustainability arose in 1987 with the World Commission on Environment and Development's (WCED) Brundtland Report on sustainable development, defined as "development that meets the needs of current generations without compromising the ability of future generations to meet their needs and aspirations" (WCED, 1987). Over twenty years later, literature abounds which examines the theory and practice of sustainable development and sustainability. The practice of education has the potential to synthesize the plethora of sustainability definitions on particular goals and practices associated with educating youth. What we pass on to the next generations through formal and informal education indicates much about what we as communities value. In addition, practitioners and theorists need to articulate pedagogical approaches best suited for sustainability education at multiple levels and

in diverse regions. The research herein contributes to this pursuit by exploring the practical and theoretical implications of a participatory action research project based in Alaska.

During 2005 and 2006, as a doctoral student at the University of Alaska Fairbanks (UAF), I collaborated with Alaska Native middle school teachers and their students at the Effie Kokrine Charter School (EKCS), a public charter school in Fairbanks, Alaska. Through this participatory approach, I explored the question of what Alaska Native pedagogies can teach Western educators like myself about educating for sustainability. My collaborators and I designed place-based gardening curriculum that reflected an Alaska Native approach to education, attempting to merge the goals of Alaska Native education with those of formal Western education through pedagogy. (For a more in-depth report of this research, see my dissertation, available at [http://www.ankn.uaf.edu/Curriculum/PhD\\_Projects/LauraHenryStone.html](http://www.ankn.uaf.edu/Curriculum/PhD_Projects/LauraHenryStone.html).) Pedagogy is traditionally regarded as the methods an educator employs in the process of education, but I mean the term in a broader sense. Pedagogy should include the goals and content of education as well as teaching strategies. It provides the unifying philosophical framework that underlies any particular curriculum. In sustainability education, the goal should be to foster sustainability of human communities.

Sustainability tends to be a meaningless theoretical concept when disconnected from a specific context in which to apply it. Based on my own interests and on the practical and research needs that I perceived in Interior Alaska, I chose to focus my research on the relationship between education and food system sustainability by exploring how place-based education can promote the emergence of sustainability within the social-ecological systems of a particular region. Through this participatory approach, I concurrently investigated broader research questions, including: What kinds of educational approaches can foster sustainability within regional social-ecological systems? Specifically, how can place-based education promote the emergence of sustainability in a community food system? These questions resolved themselves around the focus of *sustainability pedagogy*. What does such pedagogy look like? While my work has involved formal middle school education within the context of community food systems (e.g. Feenstra, 2002), this framework is intended to be applicable to any K-12 educational initiative with a goal of promoting sustainability. However, being very qualitative in nature, this research is limited in its generalizability. The objective is to elucidate principles of sustainability pedagogy that can contribute to an international conversation about educating for sustainability.

I propose that sustainability pedagogy include the following five components:

1. Systems thinking
2. Place-based and problem-based learning
3. Eco-cultural literacy
4. Eco-justice values
5. Appropriate assessment

The first two of these components served as guiding concepts from the early stages of my research and became more refined throughout the research process. The remaining components were less well-developed to begin with and emerged more from the research process as ways to describe the themes regarding sustainability education that begged for definition.

Figure 1 portrays a conceptual diagram of the integrative nature of this research as well as a general outline of this paper. In the orientation of action research, holism is a key theme in this pursuit through integration of theory and practice, Western and Alaska Native ways of knowing,

and ecology and culture. The literature review of sustainability education and participatory action research explores the theoretical knowledge relevant to this project, although it does not deal with the level of knowledge systems but rather starts with the second level. The research context is addressed in the section on research setting. The bulk of the methodology and discussion concerns the development of the gardening curriculum as an integrating lens for the exploration of sustainability pedagogy. The conclusion takes up the dashed arrows in the diagram, which reflect the contributions made by the research to both theory and the research setting.

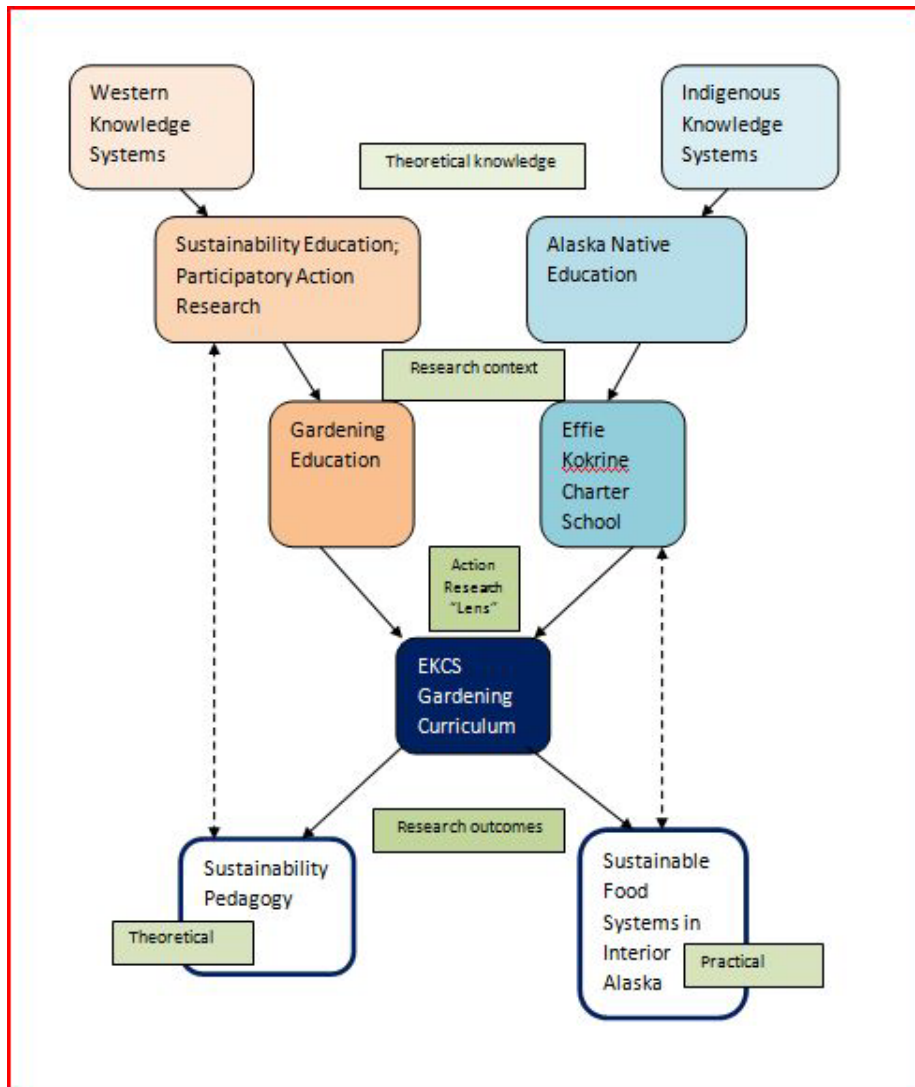


Figure 1: Conceptual diagram of this research

### Review of Literature Relevant to Sustainability Education

First, I offer my own definition and explanation of sustainability to guide this investigation of sustainability pedagogy. This research is most influenced by concepts of sustainability that transcend a focus on development or on disciplinary approaches and draw from a systems thinking perspective (Capra 1996, 2002; Meadows, 2005). Sustainability is the capacity of a complex adaptive system to maintain and nourish its primary functional characteristics over a long period of time. I suggest that sustainability can be considered an

emergent property of complex systems. “Throughout the living world, the creativity of life expresses itself through the process of emergence” (Capra, 2002, p. 119). Structures or properties that emerge from this process cannot be planned into being through a linear design process, but rather emerge from a self-organizing complex of factors. In contrast to designed structures, emergent structures “provide novelty, creativity, and flexibility. They are adaptive, capable of changing and evolving” (p.121). Capra explains that all human systems are a combination of emergent structures and designed structures.

In the context of social-ecological systems, sustainability is a property that emerges when human activities occur within the appropriate spatial and temporal scales delineated by the context of their natural and cultural support systems. This definition is quite different from viewing sustainability as a static condition and relies on an understanding of complex systems. Perhaps sustainable communities are not something that can be designed through linear or directional models, but are rather a combination of planned and emergent properties of non-linear systems. The role of sustainability education is to facilitate the creation, maintenance, and exchange of knowledge and skills necessary for human communities to adapt to their social-ecological contexts and hence maintain the conditions needed for sustainability of particular systems. This question then follows: How does one design an educational system that allows sustainability to emerge?

The field of sustainability education is as varied as the multiple definitions of sustainability as applied in other fields. While the UN uses the phrase *education for sustainable development*, there are myriad other labels addressing overlapping sets of goals, including *sustainability education* (e.g., Dawson, 1995), *sustainable education* (e.g., Sterling, 2001), *education for sustainability* (e.g., Cloud, 2005, [www.naaee.org/news-and-events/communicator\\_fall2005.pdf](http://www.naaee.org/news-and-events/communicator_fall2005.pdf)), *education for sustainable living* (e.g., [www.ecoliteracy.org/education](http://www.ecoliteracy.org/education)), and *education for a sustainable future* (e.g. Blockstein & Green, 2003), all of which have slightly different connotations and backgrounds. However, they all have the goal of integrating environmental, social, and economic concerns, or what are often depicted as the “three E’s” (with *society* being replaced by *equity*). Edwards (2005) suggests that a fourth “E” should be education. Indeed, education cross-cuts these three realms of sustainability by addressing what knowledge and skills we pass on to future generations.

Several alternative and progressive Western educational models have much to offer to the field of sustainability education. Sustainability education reflects an attitude of progressive education reform espoused by many education philosophers and researchers over the last century (Dewey, 1916; Freire, 1970, 1995; Gardner, 1999; Montessori, 1976; Sizer, 1992). As one of the founders of this progressive and pragmatic approach in American education a century ago, Dewey advocated for education that connects learners to their everyday environments in practical ways that enhance the learning process (Dewey, 1915, 1916). Dewey’s work helped lay the philosophical foundations for today’s interest in *problem-based*, *inquiry-based*, and *experiential* learning (Askill-Williams, Murray-Harvey, & Lawson, 2007; Barrell, 2007). The curriculum planning process known as *understanding by design* offers a framework for putting these philosophical concepts into practice through creating teaching units and assessing learning outcomes using performance-based assessment (Wiggins & McTighe, 1998; Wiske, 1998).

The relatively young field of *place-based education* also builds on Dewey and encourages educators to link students to their local places—both natural environments and human communities—in order to learn fundamental concepts as well as to facilitate student and community well-being (Elder, 1998; Gruenewald, 2003, 2006; Gruenewald & Smith, 2008;

Sobel, 2004; Williams, 2003; Woodhouse & Knapp, 2000). Place-based education also draws from *environmental* and *outdoor* education (Adkins & Simmons, 2002; Palmer, 1998), but its objectives are broader than teaching students about ecological concepts, environmental policy or outdoor skills. The concept of *ecological literacy* also offers a way to broaden the concept of issues-based environmental education to a more holistic approach to fostering sustainability (Orr, 1992, 1994; Smith & Williams, 1999; Stone & Barlow, 2005; Uhl, 2003).

While traditional environmental education has focused on “natural” ecosystems, the popular movement of school gardening in the U.S. perhaps offers more relevant models for sustainability education and this research in particular. Youth gardening has been proliferating in schools and communities throughout the U. S. for the last couple of decades. (A more thorough review, including a typology of contemporary school and youth gardening programs, can be found in my dissertation.) Many excellent gardening curricular resources are available, such as *The Growing Classroom* (Jaffe & Appel, 2007). While teachers have been growing things with their students for a long time, the organization often credited with shining the spotlight on school gardening most recently is The Edible Schoolyard, started by chef Alice Waters in Berkeley in 1995 (Waters, 2008). The concept of sustainability is referenced several times in the descriptive literature on the program website; they summarize, “Students’ hands-on experience in the kitchen and garden fosters a deeper appreciation of how the natural world sustains us and promotes the environmental and social well-being of our school community” ([www.edibleschoolyard.org](http://www.edibleschoolyard.org), Accessed Feb 10, 2010). Gardening education has the potential to contribute greatly to the field of sustainability education.

Finally, perhaps the most fertile ground for cultivating a framework for sustainability education can be found in Native American and Alaska Native educational models, in which youth learn through holistic and practical experiences (Barnhardt, 2006, 2008; Barnhardt & Kawagley, 2004, 2005; Cajete, 1994, 1999; Kawagley & Barnhardt, 1999; McCarty, 2002). Many Indigenous cultures offer models for the integration of ecological and cultural education because such cultures throughout the world often lived—and in some cases continue to live—in long-term balanced relationships with bioregional environments (Berkes & Folke, 1998; Kroeber, 1953; Redman, 1999). These cultures offer many lessons about living well in natural places that should be included in education for sustainability (Armstrong, 2005; Bowers, 2001; Cajete, 1994). Such lessons involve sustainable ways to extract food and other resources from the environment, such as through intricate common property arrangements (Feit, 2001), detailed knowledge of local landscapes (Basso, 1996), and educational practices tightly wedded to these social-ecological relationships (Kawagley, 1995; Kawagley & Barnhardt, 1999).

It may be impossible to integrate all of these various components into one overarching framework for sustainability education, especially regarding the integration of Western and Indigenous ways of knowing and educating. For instance, Bowers (2001) writes of several discrepancies between Western progressive education, such as that articulated by Dewey, and Indigenous education, one of the primary ones being the difference in the fundamental social unit. In Western societies, the individual is emphasized. In many other cultures, the individual may be superseded in importance by social units such as family and community. This difference may be irreconcilable within a framework of sustainability education that is still largely grounded in Western approaches. This study does not seek to resolve all of these possible frameworks but does attempt to explore them more deeply in the context of a real-world educational project.

### Research Setting: Interior Alaska

*Place* serves as a primary organizing concept throughout this project. The place under consideration is the bioregion of Interior Alaska. Ecologically, the interior of Alaska is composed primarily of boreal forest, bordered on the north by the Brooks Range and on the south by the Alaska Range, and cut through by the extensive network of glacially-fed streams and rivers that flow into the Yukon River (Thorson, 1986). Interior Alaska was traditionally occupied by multiple groups speaking different dialects of the Athabascan language family (Mishler & Simeone, 2004, 2006; Nelson, 1983, 1986a, 1986b; Peter, 2001; Schneider, 1986). They were and are distinct from the coastal cultures of Alaska, such as the Yup'ik of the west and the Inupiaq of the north. The contemporary economic center of Interior Alaska and one of the state's three urban areas, Fairbanks was founded by Euro-Americans in 1903 on the banks of the Chena River as a fur and gold trading post (Cole, 1999). Today, Fairbanks has a population of about 30,000 in the city proper and a regional population of about 80,000, the majority being non-Native. The town's economy is still largely dependent on mining and oil industries, but it has other large employers such as the military and the University of Alaska.

My research is influenced by the assumption that Alaska Native peoples prior to the incursion of non-Native cultures in the region were well-integrated with their environments (Nelson, 1983, 1986a, 1986b). The depth of knowledge that Athabascans prior to modern times had regarding their environment was of an intimacy far beyond that of contemporary American cultures. Their ecological knowledge and attention to detail came from being entirely dependent on the local environment for livelihood. Because of the erosion of relationships between contemporary Athabascans and their immediate environments, much of this knowledge is being lost. In addition, some researchers suggest that the imposition of a Western education system upon Athabascan peoples contributed to the disintegration of healthy food systems in Interior Alaska (Kawagley, 1995). However, much of life in the close to 50 rural villages in Interior Alaska still revolves around obtaining natural resources from the surrounding environment for local and personal use, a system commonly referred to as *subsistence*.

In the fall of 2005, the Effie Kokrine Charter School opened its doors to its first students. The charter for the school had been approved by the Alaska State Board of Education the previous spring. The school was designed as a middle and senior high school serving grades 7-12 with a minimum of 150 students. The EKCS mission was "to provide educational opportunities for students to succeed in the world by developing a strong sense of purpose, identity, place and community through cultural and academic empowerment" (EKCS proposal, 2005, <http://www.ankn.uaf.edu/NPE/EKCS/FinalProposal.html>). The proposal also included the following components that provided the basis for meeting the mission:

- "Teaching methods based in Native ways of instruction and learning
- Active, project-based learning
- Curriculum based in Native knowledge of the world
- Presence and involvement of Native elders
- Use of broad community as a learning context
- Building students' pride in Native culture as an element in success
- Academic success" (ibid.)

Named after a Native Elder, the school intended to teach with an Alaska Native approach and hence appeal to the many Alaska Native students and families in Fairbanks with ancestral roots from all over the state, but primarily Interior Alaska. The development of the school had been heavily influenced by organizations such as the Alaska Native Knowledge Network

([www.ankn.uaf.edu](http://www.ankn.uaf.edu)), which exists in part to advocate for ways that the Western educational system in Alaska can improve their efforts to help Alaska Natives succeed their educational endeavors. When the school opened, at least 95% of the students, half of the eight teachers, and the principal were Native. This composition began fluctuating almost immediately, but Alaska Natives students remained in the vast majority during my two years of work there.

One of the most unique aspects of the school is a spiral curricular framework developed by a collaborative of Native educators and adopted by the school (Fig. 2 and e.g. <http://www.ankn.uaf.edu/NPE/EKCS/>). The spiral is organized around several key cultural themes, such as subsistence, tribe and community, and living in place, and the curriculum cycles through these themes. At any one time, the entire school is focused around that theme, but students in ascending grades deal with more complex concepts and work on higher-level Alaska Standards for education within the cultural theme. I saw the school as an exciting experiment that was putting into practice what many educators had been discussing—integrating Western educational standards with Alaska Native teaching approaches on a whole-school level. As such, the school offered an ideal setting to explore my interests in sustainability pedagogy. I proposed to the school advisory board that I help them meet one of their tangible needs—developing curriculum—while at the same time exploring the practice of place-based education in relation to local food systems. Given my experience and interest in gardening and environmental education as well as my prior education and participation in Alaska Native communities, the board approved my proposal to integrate the existing garden at the school site into the curriculum of the new school.

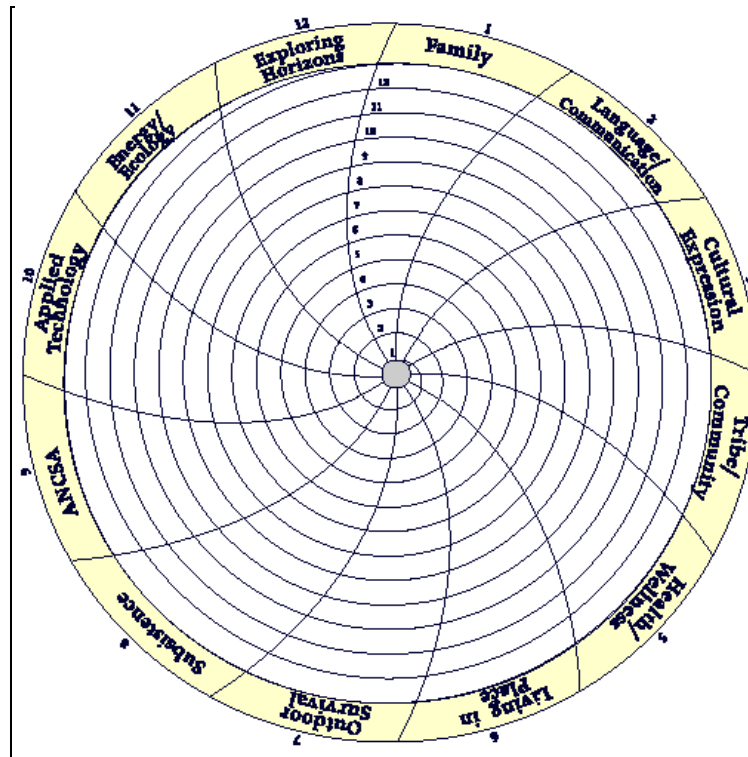


Figure 2: General format of the Spiral curriculum used by EKCS.

Outer ring shows themes. Inner rings refer to grade levels.

Source: Alaska Native Knowledge Network ([www.ankn.uaf.edu](http://www.ankn.uaf.edu))

### Methodology: Participatory Action Research

Participatory Action Research, or PAR, is a multifaceted research tradition with roots in a variety of social sciences. It offered an appropriate framework for this study for several reasons. First, the participatory nature of PAR honors the expectation among many Native and Indigenous communities that they be included in the design and conduct of research that involves them (Smith, 1999; Alaska Native Science Commission, [www.nativescience.org/communities/code.htm](http://www.nativescience.org/communities/code.htm)). Second, the action orientation is a good fit with sustainability research more generally, in which the goal is to design, implement, monitor, and/or maintain sustainable systems. This applied goal presupposes a value orientation and potential bias on the part of the researcher: I desire that my research contribute directly to ecological and cultural sustainability within the context in which I work.

While PAR does not delineate an explicit methodology, there is a core set of principles or characteristics shared among PAR theorists and practitioners (Atweh, Kemmis & Weeks, 1998; Berg & Schensul, 2004; Gray, 2004; Greenwood & Levin, 1998; Herr & Anderson, 2005; Kemmis & McTaggart, 2000; Reason & Bradbury, 2002; Whyte, 1991). These include the following:

- Researchers and practitioners/stakeholders *collaborate* in the design, conduct, and/or analysis of the project.
- The creation of *locally-relevant knowledge* is a primary goal and the standard for evaluating quality and rigor of the research.
- The primary researcher has an *active and critical role* in designing and conducting the “action” rather than “objectively” documenting the process as in, for instance, a case study.
- Data are generated through the *experiences* of the participants.
- *Theory and practice* are united with the end result of *action* within the context of the research.
- The research design reflects a *cyclical nature* through which data generation and analysis are continuously built back into the research design.

While guided by PAR, my fieldwork was grounded in the qualitative approaches typically associated with ethnography; in a sense, my study was an “actionography.”

This research was also cyclical in nature; it did not proceed in the linear format expected of more traditional research, in which the steps of the research process follow one another sequentially. For instance, because of the participatory nature of this work, I often had to readjust my research plans based on changing circumstances. I quickly learned that the collaborative and real-world nature of action research requires flexibility, patience, and a willingness to adapt one’s own goals to those of others. My final project did not turn out as I had envisioned, but my work remained guided by the overarching goal of the research to explore sustainability education in the context of this real-world setting. I was able to sketch the rough outlines of a gardening curriculum that captured the ecological and cultural principles that I wanted to explore. In the following description of my fieldwork, I employ a chronological story-telling format to capture this participatory and non-linear character of my research. My research proceeded in several stages, starting with a “pilot” study during my gardening internship with Boreal Farm in the summer of 2005. I begin the narrative below just after the conclusion of this internship and the inception of my formal work with the Effie Kokrine Charter School.



## Research Methods

When the EKCS opened in fall of 2005, one of the most innovative components of the new school was its seasonally-based spiral curriculum, which included several weeks of classes in the summer. The EKCS opened at the site of a former school, which already had a school garden operated by Boreal Farm, for whom I had interned as a youth gardening coordinator during the previous summer. I saw the presence of the garden and the summer classes as a perfect opportunity to incorporate gardening into the new culturally-grounded curriculum. My objective was to design gardening curriculum that teachers could integrate into the innovative and still-emerging curriculum. For such a curriculum to be successful, I would have to master the underlying principles of the pedagogical approaches of this new school. For this reason, I saw this as an ideal action research project, in which I would be contributing to the creation and application of local knowledge and would be testing the quality of my work within the research setting itself.

I officially began working with the school in October of 2005. I identified one eighth grade teacher who was particularly interested in my initial proposal regarding gardening curriculum (referred to as “Cindy” herein). In order to get to know the school and its students better and develop trust among my collaborators, I began by volunteering in Cindy’s classroom. Over the course of the school year, I became more and more involved in various school activities and staff meetings, witnessing first-hand the challenges and successes of the new school. The school contracted a curriculum consultant to help teachers with the curriculum for their individual classes. I learned much from this consultant concerning her approach to designing culturally-relevant curriculum that integrated Alaska’s standards for public education. I eventually modeled my own gardening curriculum on her templates. However, one of the disjunctions between my vision of a whole-season gardening curriculum and the school’s overall curriculum became apparent; most of the teachers’ units were based on six-week modules, and the whole gardening season does not fit within six weeks. As the seed-starting months of February and March approached, another challenge had to be reconciled. Boreal Farm’s directors intended to manage the school garden as a youth employment program in the same way as they had the previous summer when I worked for them and were not as interested in focusing on curricular integration if it resulted in a diminished garden product for sale to the local community. I had to come up with another alternative.

Faced with these challenges, Cindy and I decided to design and pilot a three-week garden module partially based at the traditional family camp of local Athabascan Elder Howard Luke (his real name), who had been actively engaged in the education of Alaska Native youth for many years (Luke, 1998). While the logistics of visiting his camp were challenging, the advantage over using the school garden was the cultural connection to Athabascan gardening practices. I began visiting Howard at his camp, usually with mutual friends along to help with camp chores and listen to Howard tell stories. I paid special attention to his stories about gardening. His mother had always had a garden at their camp, and Howard also worked in the garden at the boarding school he attended in the village of Nenana as a boy. Cindy and I hoped to take her students to Howard’s camp for an extended period of time, but in the end, we were only able to work out a one-night stay in the midst of our three-week module on gardening. This three-week module and the trip to Howard’s camp became the heart of the action part of my dissertation research. Table 1 presents a vignette of our experience at Howard’s camp based on a synthesis of my field notes on that day.

Table 1  
Vignette: An Afternoon at Howard's Camp

On May 31, we arrive at Howard Luke's camp on the Tanana River in two boatloads of ten Alaska Native eighth graders, their two Native teachers, and me, a non-Native doctoral candidate researching place-based education. The objective for this sunny day is to plant Howard's garden for him. An Athabascan Elder, Howard lives alone at the camp where his mother raised him, near the site of the old Athabascan village of Chena. Despite being just a few miles from Fairbanks, his camp is only accessible by boat because of its location on a large island in the Tanana. Howard's only source of occasional electricity is a gas-powered generator, yet he has turned his camp into a cultural and educational resource for the community. There are multiple old and new cabins for housing guests and a large gathering hall that Howard constructed with the support of a non-profit foundation several years ago. We are planning on spending one night here with the students. It is less than the week or whole summer we would have preferred, but it is still a treat.

Howard greets us from shore as the skiff pulls up next to the silty embankment of this braided, glacial river. Howard is over 80 years old, a small, competent man who loves to tell stories and share his vast knowledge and wisdom with students of all ages. We unload supplies from the boat—food, fuel, and gardening materials—then follow Howard down a faint path along the bank. We pass a couple of older outbuildings before arriving at the heart of the camp, marked by an open-air dance platform a few yards back from the bank. Several cabins, including Howard's, stand in a row behind the dance platform. The garden we've come to tend is nestled next to the oldest cabin in the group—the one-room, dirt-floor dwelling where Howard's mother lived as a young woman. We head past Howard's cabin and the dance floor to the outdoor kitchen, a fire pit, small shed, and several picnic tables, all covered by the large blue tarp common to fish camps all over Alaska. Here, we unload our supplies. Cindy, one of the teachers, takes charge and divides the students into groups and assigns each of them chores. She stays in the kitchen with several girls to start preparing lunch, while I take another group of girls to the garden. The second teacher and most of the boys in the group work on whatever chores Howard has for them. Some of them start stripping spruce poles to use as new fence posts around the garden. Others mow the lawn and gather firewood.

Over the rest of the day, each student plays some role in preparing and planting the garden. Before our trip, I assigned each of them a particular vegetable to plant. Some of the boys show up at the garden only long enough to deposit their requisite seeds in the ground; many of the girls stay with me through the whole process of preparing the beds and then watering everything in using river water pumped into large barrels next to the garden. In the late afternoon, we give the students free time to play games or visit. I chaperone a walk with several boys down a path past an old graveyard and into the boreal forest Howard knows intimately. As evening descends, I hope that the students will gather around Howard for visiting and storytelling, but the gathering never quite happens. This is my one regret for the day, and I promise myself to work on ways to foster this kind of interaction in the future.



Figure 3: Howard working with students at his camp on the Tanana River. Photo by Laura Henry-Stone, 2006.

The gardening season in Fairbanks ends in mid-September, just a few weeks into the conventional school year. The EKCS started its new 2006 school year with summer classes for six weeks starting in July, then resumed again in mid-September after a month-long break. Cindy's students from the prior year moved on and a new group of eighth graders started in July. I continued to interact with the school and Cindy's new students throughout the summer, but in September, my research entered a new stage. At this point, I took a step back from my active engagement with students and instead focused on interviewing teachers about their interests in a gardening curriculum. I also participated in several planning meetings that also served as focus group sessions. Both the interviews and the group meetings were open-ended in nature and did not follow a strict interview protocol. General guiding questions included the following: What are your hopes for a gardening curriculum at the school? What is your understanding of the Fairbanks' food system? How can schoolyard gardening play a part in Fairbanks' food system? In the nature of action research, I began analyzing the interviews immediately, within the context of the research setting, as I applied their results to the next stage of the research process.

### **Action Research Lens: Designing Gardening Curriculum**

During the course of the school's second year of operation, the EKCS board decided to eliminate the summer portion of the school calendar, mostly due to the many administrative problems that had resulted from the lack of alignment between this school's calendar and the rest of the district. Meanwhile, Boreal Farm continued to plan for another summer operating the EKCS school garden as a youth employment program, despite my efforts to integrate the school garden with what I saw as the school's educational goals. For instance, several teachers and I agreed that if this garden was to be a model of Alaska Native subsistence practices, selling produce should not be a part of it. For these reasons, I decided that the best way for me to create a useful product for the school and the broader educational community was to design an actual stand-alone gardening curriculum rather than to continue to look for ways to integrate gardening into the existing school curriculum. Many good curricular resources on gardening exist, but most are for elementary level students and consist of collections of activities rather than an integrated

curriculum (e.g. Jaffe & Appel, 2007). My vision was to provide a framework for these types of activities that reflected the principles of Alaska Native pedagogy as they were practiced at EKCS.

Once I had made this decision, one of the most interesting developments from the participatory action orientation of my research emerged. The goal of creating a structure and philosophy for the gardening curriculum provided a framework for the analysis of the data I gathered through interviews and observations. The categories I used to analyze interview data were directly tied to practical concerns of developing curriculum, but also reflected some of the deeper philosophical components of the school's pedagogy. These categories and their descriptions are presented in Table 2.

Table 2  
Categories of Data Analysis Relevant to Curriculum Design

<b>Category</b>	<b>Description</b>	<b>Example Interview Quote</b>
<b>Module content themes</b>	This is the level at which I focused many of my interview questions. I asked teachers specifically what kinds of themes they would prioritize in a gardening curriculum and what they would recommend I include as components of the curriculum. However, their thematic answers still helped me identify the types of units I would later create as the backbone of the curriculum.	"I think one important part we could add is the nutritional value. You know, natural foods versus, um, the more commercial food package stuff. Teaching them that it has many more nutrients and that it's healthier and, you know, teaching them, finding ways to get veggies for snacks or something, finger food type vegetables... And then if we could do some preserving where we dried stuff and have little things where they take packaged dried vegetables home to add to their soup or something so they get something... they share it with their family. That would be neat. Or potlucks here or something."
<b>Teacher Understandings of Sustainable Agriculture and Community Food Systems</b>	In my interviews, I included a question about either the concept of sustainable agriculture or community food systems in order to gauge teachers' understandings or opinions of these concepts. Their responses were all over the board. This divergence is relevant to the curriculum in terms of what background information I chose to include and how to present it in each unit. However, their responses are also potentially more relevant to my concluding discussions about sustainability pedagogy than any of the other categories.	"A sustainable food system would be ... it's just... I just see a big garden. Cause it's not like hunting, because eventually, I mean, right now we see it in my cultural group in my home, people aren't getting their moose anymore that they grew up with because they're competing with people from Anchorage, from Montana. You know. They have these cheap rinky-dink outboard motors and they're competing with people that have air boats that can get to places they can't get. And they're just stripping apart the land. Therefore, it's no longer a sustainable food thing, and it's being regulated to where, you know, before they could just go out and get the meat when they needed it. Now, you have one week or two weeks or three weeks, if you're

		<p>lucky, that you can go out and get it. But you're competing with all of these other things. So that's no longer sustainable... And nowadays we have to have jobs, and you can't just leave your job and go out there and do that, so it's not sustainable that way anymore, for a cultural person."</p>
<p><b>Appropriateness of curriculum to meeting broader school goals</b></p>	<p>Some of these broader school goals are articulated by official EKCS documents, but some are implicit among the staff. In part, this category teases out some of those goals, specifically those that can be addressed by the gardening curriculum. It also includes more explicit comments on how a gardening curriculum is appropriate to help meet those goals.</p>	<p>"Oh, I think [gardening curriculum is] a wonderful idea, just because a lot of the students that we're trying to meet the needs are Native kids who live in the city who don't necessarily have that tie to their culture or have the village sort of life, so it would be great if they don't have a garden at home, which a lot of kids live in apartments and can't have a garden, and we have space here, then I think we should incorporate it, because why not? Space for a garden, kids need to know how to garden. You know... Well, I think it's part of their tie-in to their culture, you know, sort of the getting back to the nature, and having some sort of a tie to the land rather than just living in a concrete area. They have to realize that as part of the respect for nature value, some...one of that comes from learning how to, um, use the resources wisely. Gardening is a big element."</p>
<p><b>Teaching philosophies and approaches</b></p>	<p>This category is a thematic category that cross-cuts all the categories above. Many times, teachers made comments that related to their own teaching philosophies or approaches.</p>	<p>"What I'd like to see happen here is the idea that we all arrive at, first, a philosophy of methods, and then, kind of a menu of methods that we that we keep using over and over again because we know they work. Because the literature says they work and we've experienced them working. Learning styles being one of them. Let's add to it, though. Journal writing, portfolios, Socratic seminars....So when you look at putting together a module on gardening, I think it's really important that you balance, "Okay, here's the content that I want to get across, and here's the method that I'm doing it, and the different skills I'm teaching..."</p>
<p><b>Curriculum goals</b></p>	<p>This category is similar to outcomes but is both qualitatively distinct and a bit more explicit about the types of objectives that the curriculum sets out to meet. In my use of the</p>	<p>"Yeah, you know, from a curriculum planning perspective, I guess what I would say is, I think you'd plan a very different curriculum for these guys, if you wanted it to be... if your ultimate</p>

	words, outcomes can be tangible, school-wide products, whereas goals explicitly relate to student learning.	goal was to teach these kids the value of sustainability, you had these kind of overarching goals, and you wanted to teach them that in the context of their... their daily lives and their choices, then I think it would look different than how you would plan a curriculum for inner city Detroit.”
<b>Learning activities</b>	Many teachers shared input about specific activities they would include in a gardening curriculum. I asked for feedback from the teachers with whom I had worked on various classroom activities during the summer of 2006, and other teachers often offered examples from their own experiences as well.	“Work in the garden in the morning to see what’s ready to harvest and then plan a lunch menu around that.”  “Plan a balanced meal using Native foods.”
<b>Standards</b>	I usually asked my interviewees how they would recommend incorporating standards into the gardening curriculum. I realize now that I assumed that they would want to see a curriculum that made explicit links to standards. Because I asked the question, many of them answered it, so I include their comments here. However, I discovered later, when gathering feedback on my first curriculum draft, that the teachers who looked over the curriculum were perfectly content that I had not included explicit links to standards in each unit.	“[O]ne of the science...standards is understanding how organisms work together in an environment. Just the simple things where you taught us about how there are some plants you would naturally plant next to others because they repel bugs. I had no idea about that. And just, things, ideas on how to make things work together naturally. That would be a good science thing.”
<b>Projected outcomes</b>	I began this project with my own vague sense of the goals and outcomes I wanted to pursue with the curriculum, but my conversations with teachers helped me think about how to express these. This category includes the comments from teachers most relevant to the outcome level of curriculum.	“I think if these kids are going to grow up and be healthy productive people with all of the different constraints in the world placed on them, um, part of what we have to be in the process of doing is defining what it means to be a modern-day Native person. They have to. I can’t define that. But really, ultimately, like, being Native... it can’t be what Howard thinks it is. That has to be a part of it. But their lives are too different now than his.”

Using the input from these various categories and from theoretical literature and the review of other school gardening curriculum I had done, I generated a draft of a gardening curriculum appropriate for Interior Alaska. Table 3 portrays the resulting structure for each of the

nine modules of the final gardening curriculum, to be implemented during the course of the gardening season. The structure was also loosely based on the understanding by design framework used by the EKCS curriculum consultant (Wiggins & McTighe, 1998).

Table 3  
Gardening Curriculum Unit Components

Component	Description	Example from Curriculum
<b>Title</b>	Each unit is named based upon its unifying goal and content. There are ten total units.	Unit 1: Sustainable Agriculture
<b>Understanding Goal</b>	Articulating an understanding goal at the beginning of each unit is a technique drawn from an educational design framework known as Teaching for Understanding, which has been employed in the design of other modules in the EKCS Spiral curriculum.	Students will understand that there are different kinds of agriculture, and that sustainable agriculture takes into account cultural, ecological, and economic characteristics of the specific place where it occurs, in this case Interior Alaska.
<b>Performance Task</b>	The performance task is the suggested culminating task required of each student to demonstrate that he or she has met the understanding goal. This is a good place to incorporate different learning styles of individual students.	Students will work together to create a model of a small-scale farm or garden appropriate to Interior Alaska and describe how it is different from a large-scale corn field or cow farm in the US Midwest.
<b>Background Information</b>	This section provides background information for the teachers, consisting of the content knowledge I suggest that they need to know in order to help students meet the understanding goal.	<i>Sustainable agriculture</i> is an approach to growing and producing food and fiber that has emerged as a movement in the last several decades. It provides an alternative to the model of <i>conventional agriculture</i> pursued by large <i>agribusiness</i> ventures...
<b>Terms</b>	These are suggested vocabulary that students should know at the end of their unit. Most of them are defined for the teacher in the background information.	agriculture, sustainability, sustainable agriculture, organic agriculture, permaculture, industrial or conventional agriculture, fertilizer, pesticide, herbicide
<b>Activities</b>	These are suggested activities for teachers to use to deliver the content knowledge and skills necessary for students to accomplish their performance task and meet the understanding goal.	Visit Boreal Farm for a tour of the farm or arrange to have someone from the farm visit the classroom and guide students on a tour of the EKCS garden. Students should come prepared with questions about why Boreal grows food the way it does. One idea could be to assign each student or pair of students a specific vegetable to investigate and

		then report findings back to the rest of the class upon return to the classroom.
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Table 4 includes an outline of the nine units according to theme and season. The organization of these units is in part inspired by the spiral curriculum framework employed at the EKCS. The spiral approach employs a place-based and holistic philosophy in that the types of topics being explored during any one unit are in part inspired by what is appropriate for that season, rather than by what standards need to be addressed for the next test. Teachers incorporate discrete standards of learning into the themes of the current unit. Initially, I had hoped to integrate gardening throughout the original spiral curriculum; however, in part because of the cessation of summer classes, this was not possible. We chose to design a stand-alone curriculum that captured the spirit of the spiral instead.

Table 4  
Gardening Curriculum Outline

<b>Theme</b>	<b>Curricular Units</b>	<b>Time of year</b>	<b>Approx. length of time needed</b>
<i><b>Intro to Gardening</b></i>	<b>Unit 1:</b> Sustainable agriculture <b>Unit 2:</b> Gardening in Interior Alaska <b>Unit 3:</b> Garden planning and seed starting	April-May	2-3 weeks
<i><b>Garden Planting</b></i>	<b>Unit 4:</b> Soil preparation <b>Unit 5:</b> Transplanting, seeding, and cultivating the garden <b>Unit 6:</b> Pest management	June-July	2-3 weeks
<i><b>Garden Harvest</b></i>	<b>Unit 7:</b> Food systems <b>Unit 8:</b> Nutrition, cooking, and preserving <b>Unit 9:</b> Composting	August-September	3-4 weeks

I shared this draft of the gardening curriculum with several of the teachers with whom I had collaborated and interviewed. In this way, the curriculum served as a way to verify my interview data with my interviewees rather than simply showing them transcripts or my data analysis categories as is more typical in qualitative research. However, by the time I shared the draft of the curriculum, there were only three teachers still at the school who had started when the school opened and whom I considered true collaborators. Of the three who reviewed the curriculum, none had significant feedback on the curriculum. Was this because they thought it was good as it was, or because they did not have the time to devote to exploring it deeply? I was never sure.

I foresaw that our gardening curriculum, which I had hoped would be used by the EKCS during the summer in their own school garden, would probably not be used as such. I found this exceptionally frustrating, as I saw it as a question of validity—my action research would be validated if the product I collaboratively created were used by the audience for whom it was intended. I acknowledge that there were many factors outside of my control, but I do not know of any instances in which the draft gardening curriculum we created was further developed or used



by any organizations, though it is posted on the website of the Alaska Native Knowledge Network ([http://www.ankn.uaf.edu/Curriculum/PhD\\_Projects/LauraHenryStone.html](http://www.ankn.uaf.edu/Curriculum/PhD_Projects/LauraHenryStone.html)). One of the most challenging aspects of action research, especially for a graduate student who must write a thesis, is that the author(s) at some point must step back from the participatory action and focus on analyzing the results. This transition marks a new stage in the research; I made very few edits to the gardening curriculum before giving my final draft to the EKCS and moving on. The final stage of my research involved analyzing the gardening curriculum itself to draw more theoretical conclusions about sustainability education. These will be discussed in the following section.

### **Discussion: Sustainability Pedagogy as Demonstrated by EKCS Gardening Curriculum**

The process and product of the gardening curriculum serves as a “lens” to focus and integrate theory and action (see Fig. 1). The primary outcome of this focusing process is a clearer articulation of the suggested components of sustainability pedagogy introduced at the beginning of this paper. This discussion section returns to this topic with a deeper explanation of the components and then uses the EKCS gardening curriculum to illustrate them.

1. *Systems thinking* describes the philosophical framework of sustainability pedagogy. Because sustainability is a property of complex systems, it is imperative that students and teachers alike learn how to think systemically. Curriculum should be organized around this philosophy
2. Teaching methods utilize *place-based* and *problem-based learning*. Regarding teaching methods, place-based and problem-based learning have much to offer sustainability educators. Because sustainability is most useful when applied to particular systems, students should be encouraged to investigate particular components of systems with which they are familiar.
3. *Eco-cultural literacy* defines the core content. Regarding content of sustainability education, learning goals could focus on eco-cultural literacy. What knowledge about ecology and culture (including economics, politics, and social institutions as well as cultural practices) do students need to have to understand how to sustain the important components of such systems?
4. Educational values are tied to *eco-justice values*. Sustainability education cannot ignore the role of values. I suggest that sustainability pedagogy incorporate what Bowers (2001) refers to as eco-justice values, or a set of principles that honors and respects both human and non-human members of the Earth community.
5. Assessment must be *appropriate* to these above components. How do educators properly assess whether the preceding philosophy, methods, content, and values are in fact creating in students the ability to foster sustainability in the systems to which they belong?

*Systems thinking* is reflected in multiple ways in the gardening curriculum, just as it is in the spiral curricular framework for the EKCS as a whole. My dual objectives regarding systems thinking are to both integrate students within the system under consideration—the socio-ecological food system of Interior Alaska—and teach students how to think systemically. The curriculum attempts to meet both of these goals simultaneously by including activities to teach students about their own role in their food system, such as by asking students to characterize this system from their perspectives. In addition to learning about their food systems, students undertaking this Interior Alaska gardening curriculum also learn to be agents of a complex community food system, in which they work together as a learning community to plan, plant, and

harvest a garden. Not each student has the same job and learns the same content knowledge; rather, they learn together.

The EKCS gardening curriculum also draws from both *place-based education* and *problem-based learning* as components of sustainability pedagogy. The curriculum offers a way to connect students with their places through food that they grow themselves and then prepare and eat together. What we eat is one of the most fundamental interactions humans undertake with the natural world. There are several examples in the EKCS gardening curriculum of how place is used, such as taking students to Howard Luke's camp or a similar community site to conduct gardening activities and asking students to conduct research on their local food systems and growing conditions. Similarly, gardening education is problem-based education. How do we feed ourselves, our families, and our communities without taxing the limits of our local food systems? These are sustainability challenges that students learning through a place-based gardening curriculum can take on as part of their learning process.

In this Interior Alaska gardening curriculum, *eco-cultural literacy* is a key learning objective. Gardening provides an excellent way to learn ecological principles generally and those of specific areas particularly, as students must become familiar with local climate and ecosystems, especially characteristics concerning soils and potential pests. Organic gardening and sustainable agriculture are especially apropos for learning about local ecology because a gardener using principles of sustainable agriculture must have a deep understanding of how to reliably produce quality crops with minimal damage to the local environment. In Interior Alaska, the primary Indigenous culture is Athabascan, though many others are also represented at the EKCS, as is Euro-American. But because this curriculum is intended to be culturally appropriate in addition to creating sustainable food systems, special attention is given to local Athabascan culture. My fieldwork involved working with and learning about the gardening experiences of local elder Howard Luke, which I incorporated into the design of the gardening curriculum. There could be many other ways to incorporate Native knowledge of gardening and food systems into this curriculum as well. However, beyond just including the content about Howard's experiences, the curriculum also attempts to teach using an Athabascan approach to education, which emphasizes practical skills and an intimate knowledge of local environments.

*Eco-justice values* are expressed multiple ways in the EKCS gardening curriculum. First of all, one of the objectives of the curriculum to improve community food systems in a way that pursues greater food security for students and their families while simultaneously respecting and maintaining the needs of local ecological support systems, a fundamental goal of sustainable agriculture. Food insecurity is linked to poor management of food systems and is often most prevalent among underprivileged communities, such as many rural Alaska communities with high percentages of Alaska Natives. Second, this gardening curriculum provides a way to address cultural values associated with Indigenous Alaskan cultures. One of the goals of the EKCS as a whole is to teach through a culturally-appropriate curriculum, which includes students learning and implementing cultural values. The school is supporting the process recommended by Bowers (2001) in which the EKCS community is evaluating which Alaska Native cultural values are still relevant in today's world. Elders play a primary role in this process, as the cultural standards adopted by the Alaska State Department of Education and Early Development were developed by a team of Alaska Native Elders and educators from around the state (Boyer, 2006). This incorporation of cultural values is reflected in the EKCS gardening curriculum through the involvement of Athabascan Elder Howard Luke in the curriculum as well as through the correlation of various units and activities to cultural standards.

This draft of an EKCS gardening curriculum does not fully address *appropriate assessment*. In the understanding by design framework (Wiggins & McTighe, 1998) used to develop the units in the curriculum, students are asked to perform authentic performance tasks to demonstrate their understanding of the learning goal for the unit. I also had the original goal of incorporating Alaska State Standards for education within the gardening curriculum in order to attempt integration of Western and Indigenous pedagogies. However, because I designed the units based upon broader goals for the entire curriculum, standards were difficult to incorporate in the appropriate places and at appropriate scales. Some of the standards, such as those in the content area of science, are extremely specific, while others, such as cultural or technology standards, are broader and therefore easier to apply to a wider range of learning activities. The draft curriculum includes incomplete, preliminary attempts to incorporate standards, with the expectation that classroom teachers are the best judge of which standards to address with which units. Besides more fully incorporating standards, the next step for planning how to evaluate this curriculum as effective sustainability education would be to outline sustainability indicators, which could also be thought of as outcomes. This would be an important arena in which to conduct additional research on sustainability pedagogy.

### **Conclusion: A Sustainable Future for Sustainability Education?**

This research has been an exploration of how place-based education can promote the emergence of sustainability within a particular social-ecological system. Two research outcomes were proposed (see Fig. 1)—a theoretical articulation of sustainability pedagogy and an increase in sustainability of community food systems in Interior Alaska. The discussion above addressed the first outcome. The more practical outcome has not been the primary focus of this paper. This research did not attempt to measure or evaluate sustainability of the community food systems of which the Effie Kokrine School is a part. This type of evaluation would require a much more extensive research design, including a more thorough development and implementation of the gardening curriculum itself. At this point, I do not know of any plans to continue to develop the EKCS gardening curriculum, but certainly gardening education itself remains a part of the school's program thanks to the commitment of the teachers and staff. Another evaluative challenge is that conceptualizing sustainability as an emergent property rather than a measurable phenomenon makes assessing sustainability extremely challenging. Complex systems do not lend themselves well to human control; rather, in the words of Dana Meadows, we must learn to “dance with the system” (2005). My research in many ways was about learning to dance with the EKCS system rather than taking its measure.

The components of sustainability pedagogy proposed above represent my attempt to synthesize relevant educational concepts from both Western and Native educational paradigms as they apply to a particular context, with the intention of providing an integrated framework for future work on sustainability education. Clearly, this research was heavily influenced by the belief that indigenous approaches to education have much to offer to the field of sustainability education. I am not an expert on Alaska Native culture; I am a Western environmental educator with an abiding interest in indigenous cultures and their relationships with place. I believe that some Native cultures have much wisdom to share about living sustainably and passing on to children these principles of sustainable living. Through participatory action research with a Native educational community I was able to collaborate with practitioners in the design of a curriculum that attempted to integrate these paradigms, informing us theoretically as well as making a practical contribution. Do these core principles of sustainability pedagogy apply to

multiple contexts or are they specific to unique settings? My hope is that this framework provides both an educational and a research model for other sustainability educators and researchers to explore by applying these components to the development and evaluation of other sustainability education programs, especially gardening programs.

There are some areas in which this integration occurred smoothly and some that did not integrate as well. For instance, the holistic and place-based educational approach demonstrated by the EKCS spiral curriculum is clearly aligned with the systems thinking advocated by sustainability educators. On the other hand, the assessment components of Western and indigenous education frameworks do not correspond so well. As mentioned in the review of literature, Bowers (2001) touches on this point with his discussion of the difference between individual-based societies like those in the Western world and societies that prioritize a different social unit as do many indigenous cultures. In addition, the truest assessment of sustainability education in indigenous cultures used to be simply whether the culture survived (Kawagley, 1995). These differences in the scale or unit of assessment have significant implications for the field of sustainability education. As a product primarily of the Western educational world, this field has not fully grappled with the question of appropriate assessment. These differences in worldviews about how to assess the effectiveness of education have interesting implications for meeting our sustainability challenges.

*Visiting Howard's camp is usually a profound experience. As I sit under the blue tarp by the river, gazing at its timeless current, I try to imagine what Howard has seen in his lifetime living on the Tanana. People of my grandparents' generation have all witnessed significant changes in the world around them, but Howard has the added value for me of observing this change from the perspective of a completely different culture—Athabascan Indian—and in a place on the fringes of American society—Alaska. The people living across the river in comfortable, multi-story homes are mostly Euro-Americans whom Howard has watched immigrating to this land for decades. As one of those Euro-Americans, I feel it can only benefit those of us from each culture to understand one another and face the challenges of the future together. These challenges are massive in scale and will take patience and ingenuity and adaptability—qualities relevant to sustainability.*

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### **Author Biography**

Dr. Henry-Stone earned an interdisciplinary doctorate in Sustainability Education through the Center for Cross-Cultural Studies at the University of Alaska Fairbanks in 2008. She continues to research and implement place-based sustainability education in the Chesapeake Bay Watershed and Appalachian Mountains of western Virginia.

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