Portland State University

PDXScholar

Dissertations and Theses

Dissertations and Theses

1-1-2011

Transforming the Soul of Education: Sustainability at the Center of Teaching and Learning in Secondary Schools

Thomas Eugene Kane
Portland State University

Follow this and additional works at: https://pdxscholar.library.pdx.edu/open_access_etds

Let us know how access to this document benefits you.

Recommended Citation

Kane, Thomas Eugene, "Transforming the Soul of Education: Sustainability at the Center of Teaching and Learning in Secondary Schools" (2011). *Dissertations and Theses*. Paper 270.

<https://doi.org/10.15760/etd.270>

This Dissertation is brought to you for free and open access. It has been accepted for inclusion in Dissertations and Theses by an authorized administrator of PDXScholar. Please contact us if we can make this document more accessible: pdxscholar@pdx.edu.

Transforming the Soul of Education: Sustainability at the Center of
Teaching and Learning in Secondary Schools

by

Thomas Eugene Kane

A dissertation submitted in partial fulfillment of the
requirements for the degree of

Doctor of Education
in
Educational Leadership: Administration

Dissertation Committee:
Dilafruz R. Williams, Chair
Samuel Henry
Andy Job
Pat Burk
Martha Balshem

Portland State University
©2011

Abstract

Humanity is facing problems on a scale never before encountered. This dissertation traces the roots of modern culture's destructive relationship to the planet with its habits of over-consumption and exceeding the limits of the planet's ecological systems. Educational institutions are embedded in and replicate an unsustainable culture. As educational leaders, we need to challenge a system that is morally and ecologically bankrupt while providing a path toward sustainability at the center of teaching and learning. Using a narrative scholarship approach and theoretical frameworks drawn from ecological thinking and place-based learning, this dissertation provides models for transforming secondary education. While critiquing the current model of high school, this dissertation argues that education for sustainability needs to be not only about curriculum change, but a change in the way we think about schooling, the buildings in which we educate, the food we provide and the relationships between schools and the communities in which they exist. It directly addresses social studies curriculum and offers a way of examining career pathways through the lens of education for sustainability.

Acknowledgments

First of all this dissertation would not have been completed without the finesse of my advisor, Dilafruz Williams. Dilafruz pushed me to clarify my thinking, adding depth and precision to my work. She mastered the fine art of firmness and support and kept me moving forward when I was sorely tempted to walk away. I am also grateful to my committee and especially appreciate Pat Burke's feedback on an earlier draft as well as excellent suggestions for further research. I'd like to thank Andy Job for his encouragement and support throughout this process and Samuel Henry for great questions and pushing me along the way toward the finish. I'd like to extend special thanks to Martha Balshem for joining us late in the process and offering great suggestions for further work and thought. I'd also like to send out well wishes to Kim Brown who challenged me to think clearer as I began this final part of the process. Finally, Jonathan Brown brought coherence and conciseness to the emerging strands of this work.

Thanks to my mother-in-law, Judith Kessler, who helped along the way to shape my thoughts from essayist into academic mode. Thanks to my parents for their constant support. My Mom always wanted a doctor in the family—I'm not sure this is what she meant. Finally, thanks to my family, who began to see school vacations as a time when I was glued to the computer while they spent time with each other. Of course there would be no family without Erika, who holds us all together.

Table of Contents

	Page
Abstract.....	i
Acknowledgments.....	ii
List of Figures.....	vi
Preface	vii
 Chapter I	
Introduction.....	1
 Chapter II	
Climate Change and Educational Change: Modern Frameworks.....	11
Roots of Modern Culture and the Educational Failure	11
Definition of Education for Sustainability	16
A Transformative Metaphor for Teaching and Learning: The Web of Life....	18
Sustainability Critique of Modern Education.....	23
Extending the Definition of Sustainability.....	24
Critical Theory: A Movement Toward Transformation	35
From Cenozoic to Ecozoic	42
 Chapter III	
Overcoming the Educational <i>Status Quo</i>	46
Resistance as Teaching Opportunity.....	46
Critique of the Industrial High School.....	47

Small Schools and Learning Communities	48
Dare We Do This?	50
Chapter IV	
Ecological Literacy and Place-Based Education	57
The Movement Toward Ecological Thinking and Sustainability.....	57
Ecological Literacy for Sustainability	63
Living Systems and Ecological Thinking: Creating the Baseline for Sustainability	66
Critical Theory and Place: Moving Toward Transformation.....	71
Transformative Education.....	75
Extending David Sobel’s Place-Based Principles to the High School	77
Learning to be Where We Are: Transformative Pedagogy for Transformative Learning.....	80
Themes and Principles of Place-Based Education	85
Chapter V	
Toward Ecological Thinking in Design and Practice.....	89
High School Design and Curriculum.....	89
Building Design.....	91
The School Cafeteria	98
Examining Career Pathways Through the Lens of Place-Based Education and Sustainability.....	106
Arts and Communication	
Business and Management Systems	
Health Services	
Human Resources	
Industrial Engineering	
Natural Resources	

Closing Thoughts on Career Pathways	124
Examining Social Studies Curriculum Through the Lens of Place-Based Education and Sustainability	125
Economics	
Caring Economics as an Alternative	
Global Studies	
United States History	
Government	
Learning from Place-Based People: Indigenous Understandings	148
Conclusion and On-going Challenges	153
Teacher and Teacher Education in the Ecozoic Period	154
Place-Based Educational Leadership.....	157
References.....	161

List of Figures

Figure	Page
1 Interconnections of Environment, Society and Economy	25
2 Education for Sustainability.....	27
3 The Well Rounded Student	30
4 High School Sustainability Design and Curriculum.....	90
5 High School Curriculum Design for Sustainability.....	106
6 Classical Economic Worldview	128
7 Nested Ecological View of Economics.....	129
8 The Era of Oil.....	130

Preface

Parker Palmer (1998) says, “we teach who we are” (p. 1). Cognizant of this, I want to take a little time to explain how I have come to work on this dissertation. This short narrative highlights the need for educational change and indicates the limits of the structure of schools and schooling, and will help the reader understand my own process and, perhaps, weigh the credibility of the arguments that follow.

I found the conventional schools that I attended to be soul destroying. Of course I had no way to articulate this at the time. When my k-12 schooling was nearing completion, I reflected on what I was prepared to do and came to the conclusion that I was ready for three things: (a) a low wage job, (b) the military, and (c) more school. I chose the latter, since I sort of knew how to do that.

That choice did not go so well, and a couple of years later I found myself beginning my political education in earnest as I began working for a citizen activist group in my adopted state of Oregon. After returning to school, I began to study a subject I actually enjoyed and felt passionate about—theater. I then tried my hand at making a living in the theater, but ultimately decided that food and shelter were necessary items for survival. I returned to activism to continue my political education and canvassed for a year talking to people about the threat of nuclear holocaust. I also began meeting and working with people engaged in environmental issues. My attitude at the time was that we needed to lower the threat of nuclear annihilation before working on saving trees. After working on a congressional campaign for a congressman who was passionate about

arms control, I then worked on the campaign to close Oregon's only nuclear power plant. I was learning about politics not from an abstract academic discussion, but by involving myself in political issues that I felt were relevant.

Eventually, however, I felt that the work that I was doing was of questionable effectiveness for many reasons, and I began to wonder why it was that people were apparently committed to a societal direction that promised a none-too-promising future. I also was perplexed by the inability of those of us who recognized the scale of our problems to communicate this to our fellow citizens, or for that matter to not spend an inordinate amount of energy in fighting amongst ourselves. These questions led me to accept the premise proffered by teachings of *Russian mystic* G. I. Gurdjieff, that man was *asleep* and living his waking existence as a kind of complex automaton. Change was impossible without a change of consciousness (Gurdjieff, 1975, 1991).

After a decade of involvement in a *school* where we worked on the teachings and ideas of Gurdjieff and strived to actualize them in our every day lives and studying many other spiritual teachings as well (both Eastern and Native American), I began to contemplate how I might engage the world and take action to make a difference. I decided to pursue a teaching license and work with young people. First among my reasons for doing this was the belief that we were essentially teaching our children falsehoods. Chief among these was that if they would work hard and *play the game*, they could gain access to the material wealth of our culture. The problem was, from my perspective, that the *pie* of the world's wealth was largely eaten; by this time, the early and mid 1990s, I was already aware of resource depletion world-wide, species extinctions, global warming, toxins in water, destruction of Indigenous cultures, etc.

So, I went back to school, first to complete my undergraduate degree before pursuing a teacher license. I completed a theater major to have a place for passion and embodied learning and also pursued a history degree, so that I could have the option of teaching social studies. I already felt that language arts and social studies should be put together along with science, politics and the environment, but I couldn't get credentialed in everything! As I studied history, I took a wide selection of classes with a couple of questions in mind: "Where did our culture go off course? How did we get on a path that imperils our future as a species?" The Industrial Revolution? The Middle Ages? I was unable to find an answer to these questions in the courses that I was taking. Then I read a book by Daniel Quinn (1995), *Ishmael*, which posited that the agricultural revolution was the source of a fundamental mind shift. This idea combined with my interest in Native American history and philosophy found a place in my thinking.

During my teacher licensure classes, as we discussed k-12 student success, achievement and the many issues that arise for prospective teachers, I posed the question to my classmates and instructor: "We are all fairly intelligent people here and yet we are measuring our teaching success by the numbers of students that we convince to join an unsustainable culture. Does anyone see a problem with that?" The question was allowed to hang in the air for (as I recall) a fairly long interval without response before the teacher continued the discussion. The question was ignored, I felt, because as a group we were not prepared or willing to address the problematic implications for the mission of schooling. This is still my question.

I have now been teaching for 15 years at both the high school and college level. I have strived for much of this time to do more than integrate sustainability into other

subjects, but to integrate other subjects into sustainability. In the beginning I was doing this without any idea that there were others engaged in similar processes. All I could do was focus on my class and the students that were in front of me. I experimented. I used Quinn and other writers, brought in Indigenous writers and philosophy, did native plant gardens and identification, worked on awareness exercises and examined alternative economics. We worked on current events and did presentations on global warming. Overtime, I also found others who were engaged in experimenting. As I shared these ideas with other teachers I began to discover that other writers had articulated some of my concerns for larger audiences through publishing. One of the first of these was the work of David Orr and another was Chet Bowers. These writers and my experience of teaching *Introduction to Education* at Portland State University to students considering a teaching license inspired me to consider the pursuit of a doctoral degree and to focus my thinking on ways to create systemic change. The problems our culture faces have only grown worse since I decided to teach, the need for change only more critical, and the scale of a single classroom seemed far too small.

As I have worked toward this idea of systemic change, I have encountered many other writers that will be a part of this dissertation, but the basis of my work has occurred largely outside of the academic world. Much of academic writing seems confined to arcane topics or discussions on how to better “convince students to join an unsustainable culture.” It is only recently that a few academic writers seem to be attempting to think beyond specialization and recognize the importance of, and our ultimate dependence upon, our working within the ecology of the Earth. Through the last 5 years or so I began to read these authors. These writers have articulated the need for system level change and

helped me formulate, reflect upon, and refine my thinking about teaching for a more just, environmentally sustainable, and spiritually fulfilling human presence on the planet.

This kind of summary makes the path sound linear and directed. It was neither, but despite the false starts and lack of focus that accompanies every life, it is one way of telling the story.

Chapter I

Introduction

At present our educational system is replicating a culture whose direction is unsustainable and, by definition, moving toward collapse (Diamond, 2005). My interest lies in addressing how to mitigate education's contribution to the destruction of our planetary home. While I believe that the scale of the problem demands large-scale solutions, it is my hope to present holistic and adaptable ideas, which can be put into practice as society's awareness of its unsustainability and sense of urgency increases. In this dissertation I will be suggesting both philosophical considerations related to seeing education holistically and ecologically as well as providing individual curriculum ideas. Education for sustainability is a process; hence instead of providing a single solution to the problem, I will provide a direction, which others can build upon and adapt to local needs and constraints. The focus of this dissertation will be at the high school level as most sustainability efforts have thus far have been targeted toward younger students or aimed at addressing students at the college level.

Before I go into some detail as to how I will proceed through the rest of this research, it is necessary to state some differences between this effort and a traditional dissertation. The preface began with a brief biography because as Parker Palmer (1998) says, "We teach who we are" (p. 1). This insight challenges the possibility for a *detached objectivity* about the perilous future we are creating for life on this planet. I am involved in this text. So while this paper will not be as *subjective* as some narrative scholarship

(Sarver, 1995) I forego the separate literature view of the traditional dissertation. Instead I weave the literature review throughout and work to synthesize ideas as I proceed. I also draw on my own experiences as an educator who has attempted to integrate Indigenous worldviews, ecological thinking, and sustainability into my teaching. Those experiences have been an essential part of the development of my thinking. Furthermore, this paper is grounded in an ecological criticism of our culture and as such calls into question the very nature of ways that we relate to knowledge and learning. Thus, it fits into the broad parameters of narrative scholarship (Legler, 1995). Finally, because of the scale of the problem I am identifying and the very nature of education, schooling, eco-justice and sustainability, this paper is interdisciplinary in nature.

In several sections that follow, I use the word *restoration*. This term does not refer to some idyllic past state where all was roses, but generally applies to the needs of the environment due to human/cultural impacts on the state of the planet's ecology. Many environmentalists (Orr, 2004a; Sterling, 2002) argue that the damage already wrought requires not merely a sustainable society but a restorative one. A restorative society is one that takes as an essential goal to repair the damages that we have already wrought, while reorganizing society as to reduce further harm. The terms restorative and sustainable are evolving concepts and more process oriented rather than fixed definitions. Modern industrial agriculture, industrial forestry and our industrial society have caused so much damage that when we contemplate a sustainable society, we must remember that we are not starting at ground zero. The ecology of the planet has been severely degraded and there is much that needs to be done to restore balance. Already many species are extinct and ecosystems are so altered that they cannot be restored to their *original*

condition, if such a construct actually exists. Nature is always in process and is never stagnate and so must be understood to exist in a dynamic balance. That balance has been severely disrupted.

Furthermore, modern environmentalism has tended to separate *nature* from humans and too often the goals become a nature freed from people. This is a false choice and is not the restoration that is needed; rather a large part of what needs to be *restored* is humanity's relationship to the planet. Human interaction with the environment, when we *come from the right place*, can be a powerful contributor to biodiversity and ecological richness. Indigenous people have long interacted with and altered their environment, many of them while living sustainably in settlements. Dennis Martinez (2005), founder of the Indigenous People's Restoration Network, points out that the most diverse ecosystems left on the planet are located in the places where Indigenous cultures are still intact. A couple of examples of how Indigenous people interacted with their ecosystems to improve diversity include the Amazonian black earth that increased soil fertility by holding nutrients in thin tropical soils (Denevan, 2001), the traditional management systems of Aboriginal people in Australia (Bowman et al., 2001), and traditional practices in the Willamette Valley to increase abundance of preferred foods (G. Williams, 2001). Thus another level of restoration that is needed is our culture's relationships and interactions with nature's dynamic balance.

The other use of the word restore is in the context of George Counts' (1932) ideas for restoring America's position as a beacon of liberty. I do not believe that Counts is ignorant of the historic exclusion of women and minorities from the promises in the United States founding documents, nor am I attempting to overlook these historical facts.

Rather, I suggest that the promises of our Declaration of Independence have served as a conceptual inspiration for many peoples worldwide. It was the promise of America to which Martin Luther King was holding the country accountable during the Civil Rights era. It was also the template that was used by women as they met in Seneca Falls, New York in 1848. Counts' writing was predicting the loss of that conceptual, inspirational ideal and has sadly been proven mostly correct. The ability of the United States to inspire and lead the rest of the world is going to be contingent upon discovering the political will to reduce our overly consumptive lifestyle and embrace alternative lines of development. Otherwise the United States will be rightly blamed for having abdicated responsibility and largely responsible for catastrophic climate change.

In chapter 2, I briefly explore the historical roots of modern culture. As modern culture is living beyond the limits of the biosphere's capacity to support life, it is important that we have some sense of how we have arrived at this historical juncture. It is essential that teachers not only become aware of this critical ecological examination of our culture, but that we teach older, high school age students to critically examine the roots of a culture that is out of balance. This chapter also examines definitions of sustainability and offers an extension of that definition drawn from the work of other educators in a way that is relevant to teaching and learning at the high school level. Previous definitions are useful and will continue to be so, but I want to look at sustainability through the lens of an educator and provide a framework for thinking about this in the context of education and schooling. In this chapter I provide some examples of how this extended definition might look in the context of teaching and learning and provide a rationale for this extended definition. I also use the importance and necessity

for the creation of a sustainable culture to critique modern educational ideas and practice. Additionally, in this chapter I review material that offers an alternative metaphoric lens for teaching and learning—the web of life. This is a relational metaphor that contrasts from the largely acquisitive and competitive metaphors that dominate educational discourse, as for example when the current President suggests that we need to acquire the skills to compete in the global economy or sets aside money to be acquired by *Racing to the Top*. I undertake an extensive examination of critical theory and its importance and limitations to the transformation of our culture from one that is out of balance to one that is sustainable. Finally, I conclude this chapter with an effort to locate this culture in its geological frame of reference—that is confronting the reality that we are passing through the end of a *geological* era and the beginning of another (Zalasiewicz et al., 2008). The scale of this transformation is, I believe, beyond the capacity of the human mind to fully comprehend, but its reality must nonetheless be faced. Educators must understand these realities and the cultural patterns that have led to them and change what we teach, how we teach, and the reasons we teach.

It is my contention that the primary goal for schooling must become education for sustainability. I believe this is a goal for all countries, as the world is currently in ecological overshoot. This means that we are currently using more resources than the planet can replace. However, the primacy of education for sustainability is most especially needed in the United States, as we are currently (and have been historically) the country that is living in the most unsustainable fashion. If the rest of the world were to replicate the style of life to which those of us living in the U.S. have become accustomed, we would need five planets (Ewing et al, 2009).

Chapter 2 clearly demonstrates the fact that we are in ecological overshoot and that the North American lifestyle is the greatest contributor to this overshoot. The questions that arise from these facts need to be explored at all levels of society including and perhaps most especially our educational institutions. These questions are disturbing to both teachers and students, but they cannot be shirked for it is today's students that will be dealing with how we address (or do not address) these questions. As Native American scholar Oren Lyons (2008c) warns us, Natural Law is non-negotiable; there are consequences to living beyond the means of the planet's ability to rejuvenate.

Chapter 3 is both a critique of the status quo in education and recognition of its power in shaping educational discourse. The industrial high school, which came into existence at the turn of the previous century, is deeply flawed and designed to replicate some of the most pathological aspects of our culture (Cuban, 1990; Gatto, 2002, 2003). As the status quo is shown to be unsustainable, its replication must be avoided. Smaller learning communities that can cultivate relationships between students, students and teachers, and schools and the communities they inhabit are far more likely to be useful in strengthening relationships between humans the places that we inhabit and the more-than-human world. As small schools offer far more potential to facilitate community within themselves, they are also more likely to strengthen students' understanding and commitment to social and ecological justice. It is also in this chapter that I draw on the historical view of the necessity for schools to be active participants in the creation of culture (Counts, 1932). Schools cannot be neutral in the same way that Howard Zinn (2002) shows that historians cannot be neutral. Schools are either actively involved in the replication of culture or they are actively questioning it. Students in high school are

beginning to develop critical thinking capacity. What better subject for them to consider and question than the subject that they have had the most experience with—school.

What kind of thinking is most likely to assist students in synthesizing the understanding necessary for adapting to a world of limits, living lives that are personally sustainable and meaningful, and contributing to the transformation our culture? I believe that we need to teach systems thinking and more specifically ecological thinking. Chapter 4 explores how such ecological thinking and ecological literacy are important to teaching and learning in this new era. Ecological thinking is a step beyond traditional environmental education. Much of environmental thinking and teaching has still been, at heart, anthropocentric. We have learned more about the environment so that we can better use it and slow its destruction. We have not examined the need to transform our culture and live within ecological limits. In this chapter I discuss the importance of systems thinking to ecological balance and sustainability, while exploring a pedagogy of sustainability—place-based education (PBE). PBE is not the only pedagogy that should be practiced as we strive toward education for sustainability and ecological thinking. It is, however, an essential component. This chapter explores principles and themes of PBE. While these principles have primarily been studied and applied at the k-8 level with far fewer examples at the high school level, I will be working to show additional ways that these ideas can be applied at the high school level. Sustainability and place are strongly coupled. We will need to better understand the places that we inhabit and recover our relationships to those places. Indigenous peoples have generally understood the limits of the places they have inhabited and we will need to study how they have cultivated that knowledge and relationship.

Chapter 5 explores how ecological thinking and education for sustainability should affect the design of the places where we educate. This chapter provides a model for high school sustainability. Our thinking is shaped by the places and circumstances in which we find ourselves. Schools, as the places where education takes place, need to become a part of the curriculum. They should embody sustainability in their design and function. Their design should be part of the program of study. We will need to reshape our schools to begin to transform the lineal industrial view of the world that is currently dominant in our culture to an ecological view. As a central component of this, we will need to rethink the way that we feed children for food is, perhaps, the most essential way that we can connect to place. The problems inherent in our food systems are often overlooked. It is the proverbial fish being unable to describe the water. Food is central to human life and the way we feed ourselves will be central to the creation of a sustainable culture. Our industrial food system is a huge contributor to global warming and the unsustainability of our culture. Food needs to be an aspect of both school design and learning.

A number of states, including Oregon, where I currently teach at a technically centered high school, include career pathways goals into high school outcomes. In chapter 5 I examine these pathways through the lens of sustainability and place-based education. Chapter 5 also includes an examination of various subject areas through the lens of sustainability, place, and ecological justice. The curriculum model I provide shows how the pathways and social studies should be aimed at the transformative goal of sustainability. I primarily focus on the social studies, as it is society that needs to become sustainable. Specifically, I offer ways of thinking about teaching and learning in

economics, global studies, government and U.S. History, while not prescribing a *one right way* of doing this. Since the primary goal of schooling needs to be education for sustainability, this will require a transformation in both how we *do* school and the outcomes we desire in the subject areas. Ideally this will involve far more integrated curriculum opportunities (through place-based education and other citizenship oriented pedagogical choices). This chapter also includes an introduction to Indigenous thinking. Indigenous people are place-based, their languages, traditions, stories and rituals frequently encode ideas about living sustainably and in relationship with a place. They include relationship with the more-than-human world, which our culture has generally objectified and commodified. Multicultural education in an age of ecological limits is going to involve our culture learning from Indigenous cultures.

In conclusion, in chapter 5 I discuss the long-term vision and on-going challenges of education for sustainability. The long-term vision is one where it is recognized that understanding the necessity of creating a sustainable culture is the most important outcome for students as they exit high school. It is not to imply that they will have a complete understanding of how to accomplish this, but that they will understand the need to engage in the process as they move into the next phase of their lives, whether or not they choose to continue their formal education. This long-term vision needs to be supported by immediate and obtainable action and this final chapter will suggest concrete steps to take. The ultimate goal of incorporating sustainability as the over-arching theme of our high schools will take time to develop. We will also need to include sustainability education for pre-service teachers so that they can weave sustainability and ecological literacy into their courses. Finally, it will require educational leaders that understand the

crisis we face and the importance of re-creating our culture so that it lives within the limits imposed for the maintenance of a healthy biosphere. Educational and school leaders will need to facilitate teacher cooperation in teaching and learning about sustainability and about ways to alter curriculum and practice. Most importantly, they will need to carve out the space for teachers to work together, for integrated study is going to be an essential part of sustainability education.

Chapter II

Climate Change and Educational Change: Modern Frameworks

In this chapter I explore some of the roots of the dominant features of our culture. I examine how our thoughts are shaped by our culture and language and how these thoughts contribute to a culture in systemic run-away. I also argue that schools are currently playing a role in the transmission and maintenance of a culture that is out of balance. Instead, I believe that schools can play a transformative role, helping the future generation search its way toward sustainability. Part of doing this will involve using new metaphors for thinking about the world and the role of our educational institutions. To be successful in this new mission for schools they will need to be grounded deeply in ideas of sustainability; hence in this chapter I also explore several definitions of the evolving constructs of education for sustainability.

Roots of Modern Culture and the Educational Failure

To frame discussion of educational change, I begin by examining the roots of our modern western culture. At first glance our ecological problems are largely caused by the growing power and spread of the industrial revolution. Indeed, having documented changes in geological strata as well as ocean and atmospheric composition, some geologists are labeling the Industrial era the Anthropocene (Zalasiewicz et al., 2008). However, industrialization merely gave additional power to an outlook based on domination. Eisler (1988) and Korten (2006) posit that the domination culture dates back at least 5,000 years. According to Daniel Quinn (1996) and Thom Hartmann (2004), the

roots of modern culture lie even deeper in the past, linked to the Agricultural Revolution of the neolithic period and the resulting change in thought and lifestyle. More significant than the cultivation of foods—which had been practiced by many peoples to one degree or another—the primary change involved the conversion of land to grow *exclusively* human food. This was the distinguishing feature of the Agricultural Revolution: treating the land as if it were made to serve people.

In spite of this, traditional textbooks do not adequately note the significant change in our relationship to the planet that ensued with the Agricultural Revolution. Our current relationship to the planet is that of conqueror and ruler: our faith in *progress* is nearly unlimited (Bowers, 1997, 2001). Our belief that technology will solve our problems is largely mechanical and unexamined. Many of the *reforms* that our culture periodically creates for itself are themselves still grounded in the assumptions, beliefs, and metaphorical constructs of agricultural-technological civilization (Bowers, 1997, 2001, 2003; Bowers & Apffel-Marglin, 2005). In order to overcome these deeply rooted systemic problems, our educational institutions must take a proactive role.

An example of the culture of conquest following from the Agricultural Revolution is the destruction of topsoil. We are currently mining the Earth's topsoil, losing approximately 25 billion tons of topsoil every year, a figure which over the course of a decade amounts to nearly 7% of the world's most productive agricultural land (Bowers, 2001). According to University of Sydney soil scientist John Crawford (as cited in Westervelt, 2009), China is losing topsoil at a rate 57 times that of replacement. Even in the United States where much better soil conservation practices are in place, we are losing soil at 10 times the replacement rate (Montgomery, 2007). Not only is this

unsustainable, agricultural land is practically irreplaceable; according to the United States Department of Agriculture (1993) it can take 500 years or more to replace one inch of topsoil. The Ogallala Aquifer serves as another example of our overuse and mining of the planet. As one of the largest underground reservoirs in the world lying beneath an area that stretches from the Dakotas to Texas, the Ogallala Aquifer is responsible for the irrigation of vast stretches of the western Great Plains—the American Breadbasket. Every year 20 billion gallons more water is pumped out of the aquifer than is replaced by rainfall. For the most part the Ogallala is a fossil water source because it is replenished at a very low rate. It is primarily constituted of water from the last ice age. As it is depleted the United States grain harvests are likely to drop and it is estimated that the world will lose more than \$20 billion of food and fiber (L. Brown, 2006; Little, 2009).

As we strip the topsoil and over irrigate, we are also manufacturing 4.1 billion tons of pesticides annually worldwide, which the moment it is used is categorized as hazardous waste (Hawken, 1993). By 2001 this figure had climbed to 5 billion tons (United States Environmental Protection Agency). In the meantime, nuclear energy opportunists are attempting to seize on the threat of global warming to restart the nuclear energy industry, which creates the most toxic of all wastes that remains dangerous for millennia. More than 60% of the Earth's eco-services—from fresh water to fish to forests—are in decline or being used unsustainably. Desertification continues to increase and by the middle of this century we may have expanded deserts by two thirds (L. Brown, 2006). One fifth of the world's coral reefs and one third of the mangrove forests have been destroyed in the last few decades (United Nations Millennial Ecosystem Assessment, 2005). Furthermore, every month we lose 3,480 square miles of rain forest

and another 4,320 square miles of land to encroaching deserts (L. Brown, 2006; Orr, 2004a).

It has been estimated that humanity is consuming up to 39% of the world's yearly net photosynthesis production (Imhoff et al., 2004). This means that one species out of the 5 to 30 million species is consuming nearly 40% of what the world is producing on land and in the oceans. Assuming that population were to double in the next 30 years with no growth in consumption (a dubious proposition considering the economic growth in China and India), humanity would be consuming 80% of the world's photosynthesis product. Consumption at this rate will cause ecological systems around the world to collapse.

Finally we are confronted with the near certainty of global warming, a change that now even many former skeptics agree is being brought about by human beings (Pachauri & Reisinger, 2007). Even the Pentagon (as cited in Stipp, 2004) suggests that global climate change may be one of the gravest threats to long-term security. While the Pentagon report is careful to point out that it is examining scenarios that are outside the consensus viewpoint, it acknowledges abrupt climate change as a *plausible* scenario. The longer the problem is studied the more evidence is accumulating that the severity and timing of climate change is worsening. The year 2010 was the hottest on record, 19 countries set all time high temperature readings, Pakistan went from a recorded high of 129 degrees to flooding that covered 25% of the country in less than a month, and Moscow, which had never had a 100 degree day in recorded history had nine in a row this past August (McKibben, 2011).

Today's students will be facing the consequences of these drastic changes and making the social, political, and economic decisions to respond to these global changes. Thus, as educators we have a moral obligation to begin preparing young adults for the significant behavior changes that they are going to have to undertake (Monbiot, 2007). Yet much of the environmental degradation described above—including the draw down of essential resources, the changing of our climate, and the overwhelming of the Earth's ability to absorb human refuse—is primarily being carried out by *well-educated* people with advanced degrees from some of our well-known universities (Orr, 1992). In light of this it seems appropriate to question fundamental assumptions about teaching, learning, the purposes of education, and modern educational institutions and policies. The fact that many of the cited statistics date from over a decade ago emphasizes a failure of our educational institutions to adequately prepare citizens to question the direction in which we are headed. So little has been done and yet so much needs to be done. It is therefore essential to change our thinking and behavior. Educators and the educational system must be a part of this process.

Not only do our various institutions perpetuate patterns of increased consumption on an unconscious level, schools actually teach curriculum which is divorced from ecological realities and justifies these behaviors (Bowers, 1997; Orr, 2004a). This is particularly evident in the subject of economics where, according to John Galbraith (2002), instructors are essentially teaching indefensible falsehoods. For example, classical economics claims that the entire world can be commodified and that all products are replaceable. Yet how can one replace an old growth forest, or the last blue fin tuna or Siberian Tiger?

The greatest test of an education is one's preparedness to face the difficult questions of the day. Yet we are graduating students who do not understand the radically different world they may well encounter in their lifetime. There is nothing in our educational goals that directly addresses the life style changes with which today's students may be forced to contend.

Ecological health and democratic health are inextricably linked. Insofar as we have a moral obligation to pass down the on-going potential for a functional democracy, our behavior of unsustainable overconsumption and our educational system jeopardize the future of democracy, for as we undermine the Earth's ecological health, we create conditions for the collapse of democratic civilization (Diamond, 2005).

Educators can no longer silently support our culture's inability to live within our means and to acknowledge our dependence on the living ecology of our planet. The transformation of modern culture is the educational mission for the 21st century. We must create a new definition of successful teaching and learning and rethink our educational institutions to achieve this. Education for Sustainability (EfS) and Ecological Literacy are the hubs around which all teaching and learning needs to revolve. The purpose of education at this point in human history is to reconnect our culture's thoughts, feelings, and assumptions to what Fritjof Capra (1996) describes as *the web of life*.

Definition of Education for Sustainability

There are numerous definitions and goals of Education for Sustainability (EfS). Some understandings are tied to earlier ideas that fall under the heading of Environmental Education (E.E), and while there is general agreement in some of the goals it is an evolving construct. One definition from *Education for Sustainability: An Agenda for*

Action (National Forum on Partnerships Supporting Education About the Environment, 1996) states that EfS is:

A life-long process that leads to an informed citizenry having the creative problem-solving skills, scientific and social literacy, and commitment to engage in responsible individual and cooperative actions. These actions will help ensure an environmentally sound and economically prosperous future. (p. 1)

A simpler definition expresses education for sustainability as learning to live within the biological limits or carrying capacity of our planet (Daily & Ehrlich, 1992).

This explanation can be viewed as too abstract and can be grounded by narrowing the focus to living within the limits of our bio-region. A bioregion is an area marked by geographic boundaries and recognizable by certain climate conditions and plant and animal life. It can be also designated by watershed boundaries such as the Columbia River Watershed in Pacific Northwest. In education for sustainability guided by a focus on bioregions, a large river such as the Columbia forms a macro-scale watershed boundary for the big picture, while students can do hands-on work at smaller local scales from the Willamette, Clackamas, and Mollala rivers to local creeks. Using watershed boundaries from large rivers to smaller tributaries can help students anywhere define parameters of place and the ecological limits of those places.

Another view of sustainability is a three-part formula that includes the economic realm, the social realm, and the environmental realm. In order for a society to be sustainable it needs to meet the needs of the present in each of these realms (or improve current conditions) while not impinging upon the needs of the future (Herremans & Reid, 2002). Thus a sustainable society would be one where current residents meet their present needs without damaging the prospects of future generations to meet their needs in an approximate manner. An ethical society might go further and work to leave the world

better than we found it. Social sustainability includes reducing economic disparity both within and between cultures. It includes providing long-term living wage jobs in sustainable industries. It also includes affordable health care for all members of society. Sustainability must include all sectors of society not merely those who can afford to shop *green*. It includes restoring urban brown fields and addressing the air quality concerns that have contributed to alarming asthma rates as well as examining the myriad of ways that society has passed on the costs of *progress* to poorer and, often, minority communities (Jones, 2009). Social sustainability is at the heart of an eco-justice curriculum (Bowers, 2001).

These definitions shed light on the interconnected nature of sustainability. These interconnected and evolving definitions can deepen our thinking about teaching and learning. The common thread is recognizing that we live in a limited world. These limits are being reached or have been exceeded. Currently our culture is exhausting both renewable and non-renewable resources at rates that far exceed the planet's capability to replace them. Education for sustainability is an effort to understand the nature of these limits and learn how to meet our needs without exceeding them. As we begin to understand the imbalances we have created, we can also work to restore damaged ecological systems so that future generations may enjoy the rich diversity of the Earth's living systems.

A Transformative Metaphor for Teaching and Learning: The Web of Life

When we think, speak, and write about teaching and learning, we are most often compelled to use metaphors such as transmission, participation, construction, and so forth. Certainly there are aspects of nearly all of these in any teaching and learning

situation, but all metaphors eventually break down. The metaphor that is suitable to frame a discussion of teaching and learning for a sustainable society is that of the web of life. This metaphor arises from Indigenous world-views captured by the saying, “All Our Relations” and is supported by modern physics and ecology (Capra, 1996, 2002). The web of life metaphor presents a new way of thinking about our relationships to each other, to the planet and a way to organize teaching and learning. We are all part of and dependent upon complex networks in this web of life. The planet is alive and everything on it is interdependent. Understanding and experiencing this interconnectedness needs to be an essential feature of our schools. We cannot separate ourselves, or our culture, from the community of life (Capra, 1996, 2002, 2009).

The history of so-called modern culture is one of disconnection with the web of life (Capra, 1996; Hartmann, 2004; Manning, 2005; Quinn, 1996). We live in a culture that views itself as separate from and beyond natural limits. The work of many authors (Eisler, 1988; Manning, 2005; Quinn, 1995, 1996, 2000) offers documentation of the roots of our unsustainable culture. Education for Sustainability (EfS) writers (Bowers, 1997, 2004; Finney, 1998; Gruenewald, 2008) advocate for a reconnection to indigenous perspectives. Indigenous writers themselves also warn of our culture’s unsustainable attitudes (Nelson, 2008). Use of ecological metaphors (the web, networks, systems, relations) to discuss education, teaching, learning, and schools facilitates consideration of modern ecological scientific understandings in tandem with indigenous views of the world.

Palmer (1998) deepens the ecological metaphor by offering a correlated pedagogical approach. He argues that effective learning occurs in community. Counter to

the paradigm of objective knowledge delivered from the impartial expert, learning occurs when people gather to study a great subject. The *great subject* of our time is transformation from a culture that objectifies life to one that is in a relationship with life.

Our culture's current relationship to the planet is one of objectification and commoditization based upon the view that the planet is a thing that people control. This idea is deeply embedded in our collective subconscious and permeates our cultural institutions from education to politics to business (Bowers, 1997, 2001; Hartmann, 2004; Quinn, 1996). The question of how to alter this dominant metaphor and facilitate an understanding of our inter-connectedness and mutual dependence on one another and the planet is one of the key questions for educational leaders to confront. For some it may be possible to achieve this change in thinking through objective analysis, while for others an emotional/spiritual connection will be required to alter their life values toward more sustainable ones, as the seduction of our consumer-materialistic culture is very powerful.

Our culture's metaphorical separation of itself from being a part of the web of life has contributed to various misconceptions. Our thinking cannot be removed from the culture in which it arises (Bateson, 1972; Bowers, 1995, 1997; Lakoff & Johnson 1980; Simon, 1998). Ideas about man ruling nature, technology solving the problems that technology and conceptual errors have created, and progress as a linear phenomenon are cultural constructs embedded in our unconscious mind. These points of view are transmitted subconsciously through our language (Bowers, 1995). So-called neutrality merely reinforces the embedded transmission of our culture's world-view. All of our institutions including education have arisen inside of this world-view and continue to reinforce and transmit it. Because of the deeply rooted anthropocentric view of our

culture, it is essential that educators embrace a metaphorical construct that places humanity within the *web of life* and sees people as interrelated with all life. As Stephen Jay Gould (as cited in Orr, 2004a) says, “We cannot win this battle to save species and environments without forging an emotional bond between ourselves and nature as well—for we will not fight to save what we do not love” (p. 43).

Primary to the difficulties that education for sustainability faces are the cultural assumptions that blind us to the need for a significant change of direction in our society and our educational mission (Bowers, 1997, 2004; Bowers & Apffel-Marglin, 2005). There is an historical momentum carrying forward dominant cultural institutions and thought patterns. Modern culture bears the economic, social and environmental heritage of the agricultural revolution. Dominant modern cultural systems have been born and bred within the context of the Agricultural Revolution—a context of conquest. Within the last several centuries the destructive capacities of this culture of domination have been greatly enhanced by the industrial revolution (Hartmann, 2004; Manning 2005; Quinn, 1995, 1996). Considering Gregory Bateson’s (1972) rubrics for analyzing systems, which include steady state, oscillating state, or run-away state, it is clear that our system is in run-away state. The dominant cultural assumptions are perpetuating self-destructive behaviors—such as *solving* climate change with nuclear power or by injecting sulfur into the atmosphere (McKibben, 2011).

There are many examples of perpetuating problematic thought patterns within educational systems. For example, an emphasis on the individual predisposes people to use education as a tool of personal advancement. Additionally, formal western education emphasizes and values analytic skills and devalues affective and place-based

relationships to the world (Bowers, 1997, 2001, 2004). Writers in the environmental and sustainability education field have suggested a transition toward an integrated, holistic view of the world in which the place-based needs of a sustainable community are given at least equal value as personal advancement and analytical skill (Bowers, 1997, 2004; Gruenewald, 2003; Orr, 1992, 2004a; Sobel, 2004; Sterling, 2002). These differences mark significant contrast in root metaphors regarding the purpose of education.

What is needed is something entirely different, simultaneously linked to a new vision of the future while re-connecting to some of the ideas held by indigenous people and a relationship to place. From the point of view of some indigenous people our disconnection from place is one of the primary causes of modern culture's *dis-ease* (Armstrong, 1996). One example of the kind of reconnection needed is exemplified in the Great Law of the Iroquois, which states that in every deliberation they must consider the impact of decisions upon the seventh generation (Lyons, 2008a; Mohawk, 2008b). In the deliberations of the Iroquois Council, leaders are to consider the outcomes of their decisions on those who will live 150 years into the future. Future generations have equal standing and are given representation in the decisions that are made in the present moment. One of the leaders in the council is actually appointed to speak for future generations (Lyons, 1980b). This point of view would require, among other things, a deeper connection to the places that we inhabit. Currently, modern culture is characterized by short-term thinking. In the following section I pursue a deeper critique of modern education in relation to sustainability.

Sustainability Critique of Modern Education

Education for sustainability posits that education is contributing to the cultural problems described above. Educational institutions are designed, to a large extent, to reproduce the culture that contains them (Bowers 2001; Tyack & Cuban, 1995; Gatto, 2003). Schools produce graduates who often lack a sense for human dependence upon the environment, do not recognize that the environment has limits, and also believe that humans and cultural constructs are somehow separate from the Earth (Orr, 1992, 2004a; Sterling, 2002). Mere reform is not enough; there must be a fundamental rethinking of the reasons for which we educate (Orr, 1992, 2004a; O'Sullivan, 1999; Sterling, 2002).

The dominant frame of our current educational vision is shaped by a mechanistic view of the universe (Capra, 1996, 2002; O'Sullivan, 1999; Sterling, 2002). In contrast, sustainability education is a view shaped by an organic view of the world. Capra (1996, 2002) advances the metaphor of a web and argued that cutting edge science reveals the hidden connections of things. Education remains generally unaware of this emergent ecological paradigm (Sterling, 2002). Moreover modern education implicitly devalues understandings of interdependence that Indigenous people have developed through their long relationships to the places they inhabit.

Educational reform is a part of nearly every political campaign and yet most reform efforts are grounded in an outdated and anthropocentric conception of the world. Reforms are generally top-down and are primarily driven by an economic view of the world in which the explicit goal is to prepare students to compete in the global market place. Such a one size fits all formula considers humans as mere interchangeable parts in a vast global corporate economic machine.

The obsession with testing and measurement grows from a positivist framework in which human growth and learning are believed to be predictable, linear, and related by simple cause and effect. Testing emphasizes a competitive world-view that is incongruent with the emergent idea of interrelationships and networks. As Sterling (2002) states, we are educated to “compete and consume rather than care and conserve” (p. 21). We must broaden our definition of crisis in education to include sustainability.

The positivist educational framework breaks the world into bits in order to study it as disparate subject areas such as economics, politics, physics, and sociology. As a result, even the highly *educated* tend to see a world of isolated problems calling for individual solutions. However, from an ecological perspective, diverse problems are seen as connected and mutually reinforcing. This view encourages us to think of the world as a coherent whole rather than to continue taking it apart (Abdullah, 1999; W. Berry, 2005; Orr, 1992, 2004a; Sterling, 2002). Transitioning toward an ecological perspective is no small task, and the process to achieve it is complex. Later chapters engage questions of what such a transition might look like in process and in practice.

Extending the Definition of Sustainability

In this section I clarify and extend the definition of the term. Earlier I pointed out that sustainability is an evolving construct and there is no single right way to approach *teaching sustainability*. One of the definitions referenced is a three-part formula involving the environment, society, and the economy (Herremans & Reid, 2002). Sustainability is located at the intersection of social justice and ecological justice. This model, pictured in Figure 1 (Adams, 2006) is particularly important for policy makers and business leaders, as it can help bring balance to current business, government, and

development practices. As we teach we can use this diagram with high school students to help them develop an understanding of how these realms are interdependent and related to creating a sustainable society.

Figure 1. Interconnections of environment, society and economy. Source: Adams (2006).

This diagram is a useful planning tool for current and future choices related to sustainability. An equitable society, where economics is balanced with social health is important, yet in the long term it must also be balanced with environmental wellbeing. When we only balance the environment with society to limit human impacts, we get a bearable, but ultimately economically weaker society. Paying attention to only economics and the environment is viable in the long run, but leaves us socially impoverished and potentially with grave inequalities. It is only when we put all three together that we are on

the road to sustainability. Using this model, students can also examine the historical forces that have created poverty, pollution and social and ecological injustice, and connect these imbalances to the legacies of colonialism and racism. Future changes toward ecological and social justice will need to address these histories. These legacies survive today through corporate efforts to maximize profit and take advantage of poorer nations and indigenous people.

This diagram has generally grown out of thinking about sustainable *development*. Education for sustainability is more than just business planning and government policy. While related to development, education involves deeper questions about human interactions and relationships with the world. As an educator concerned with the development of the whole person I add two additional components for thinking about education that will deepen our understanding of education for sustainability (Figure 2).

Two additional elements that are essential to include in a model for education for sustainability are the development of aesthetic self-expression and the nurturing of spiritual/ethical understanding. Individuals need to feel that they are involved with and contributing to their communities. In the three-part model for sustainable development, the individual is merely a part of larger systems. In the model I have created of education for sustainability, the individual is an essential element of the needed change. Systems change is contingent upon both individual and collective efforts and organization. The appreciation of beauty, connection to the arts, and creative expression are essential elements to a rich human life. However, the *liberated* individual idealized by progressive educators is often disconnected from his or her community and a threat to communal and ecological sustainability (Bowers, 1997, 2001). The individual needs to acquire skills and

attitudes to express themselves in a social, sustainable context. They need to develop skills that will provide an economic livelihood grounded in the ethics and spirit of a sustainable future for both the human and non-human world.

Education for Sustainability

Figure 2. Education for sustainability.

In Figure 2, ethics and self-expression are added to the interconnection of ecology, society, and economics. In the context of this five-part diagram, economics is not viewed as a specific subject area but as one of the outcomes that is demanded of

schools in modern western culture. Schools to a very large extent are expected to serve the economy. Furthermore, considering the dominance of the economy in public discourse and the location of schools within the economy, economics and education are coupled together. Nevertheless, in the context of subject area teaching, educators could place any subject into the diagram. For example, a science teacher could place science as a substitute for economics, transforming the model into an effective diagram for posing questions about the interrelationships of science to society, ethics, aesthetic self-expression, and ecology.

Using this five-part diagram as a way of thinking about sustainability provides a framework for reflective practice. Questions such as the following emerge: Does the goal of preparing students to compete in a global economy leave the teaching too focused on the autonomous individual? Is the unit on forests too focused on the environment and not bringing in questions related to the need for earning a living? Are we helping students to develop requisite knowledge and skills that will help them find satisfaction in leading less commodified lives? How do we help students balance the need to understand and value necessary aspects in cultures such as sustainability and justice (conservatism) with the need to question issues of justice and sustainability (liberalism)? This five-part diagram highlights the interconnections needed for sustainability even as it surfaces the tensions between competing aims.

Bowers (2001) observes that we live in a hyper individualized world that has contributed to our culture's destruction of ecosystems and communities, and that western education's emphasis on the critically liberated individual contributes to a worldview that represents a threat to community wellbeing throughout the world. However, individuals

in the *developed* world will need to critically reflect and change their habits: we need to liberate ourselves from *this* culture. So while Bowers argues that the *critically liberated* individual free from communal constraint is a threat to the world, we face the paradoxical situation of needing liberation from that perspective. Cognizant of this irony, I emphasize the importance of a spiritual/ethical component to education for sustainability, so that individual educational development is less about personal advancement within a dysfunctional culture and more about obtaining the skills necessary for participation in the transformation of that culture. David Orr (2004a) frames this as the cultivation of virtue. For certainly one of the aspects we will need to educate and cultivate in young people is the virtue of restraint in a world suffering from our culture's inability to temper our appetites. We face the difficult prospect of reorienting our culture and ourselves.

Michael Stone (2009) and the Center for Ecoliteracy identify 15 core competencies needed for sustainable living based on their rubric of a well-rounded student (Figure 3). These will be essential components of liberating us from this unsustainable culture. The Center for Ecoliteracy engages in broad-based work including connection with the National Science Teachers Association and partnership with researchers to document the effectiveness of their work. Figure 3 adds another dimension to understanding how to approach EfS. The Center for Ecoliteracy indicates that our current schooling is too focused on the development of the intellect. They point out that while we cannot neglect the intellect—for indeed rethinking the way that we think is going to be a necessary part of a transformational education—we need a bigger picture of education and people. Approaching issues and problems from a systems perspective involves making understanding of ecological principles an essential part of our schooling

and assessment in schools and is a required element of a truly thoughtful culture. The inclusion of aesthetic self-expression in my model (Figure 2) is closely coupled with the Center's idea of creative problem solving. Other than the mediums of the fine arts, the individual expresses the self most clearly as they work to creatively problem-solve in the contexts of systems and ecological thinking. Creativity without ethics can quickly become self-indulgence. Assessing for long-term and ethical impacts of human activities is also a crucial competency for intellectual development in this era of limits. Finally thinking long-term is going to be vitally important as we work to restore ecosystems and reintegrate human society into balance with our local ecologies.

Figure 3. The well rounded student. Source: Stone (2009).

We need to not only educate and use our heads; schools also need to educate the heart, hands and spirit. The way that we currently educate, especially in the high schools,

assumes that if we educate to the head the rest will follow. The Center for Ecoliteracy has developed educational goals for heart, hands and spirit, presented below.

Competencies for the heart include:

- 1) Feel concern, empathy and respect for other people and living things;
- 2) See from and appreciate multiple perspectives; work with and value others with different backgrounds, motivations and intentions;
- 3) Commit to equity, justice, inclusivity, and respect for all people.

Competencies for the hands involve:

- 1) Create and use tools, objects, and procedures required by sustainable communities;
- 2) Turn convictions into practical and effective action, and apply ecological knowledge to the practice of ecological design;
- 3) Assess and adjust uses of energy and resources.

And finally, the competencies of spirit comprise:

- 1) Experience, wonder and awe toward nature;
- 2) Reverence for the Earth and all living things;
- 3) Feeling a strong bond with and deep appreciation of place;
- 4) Kinship with the natural world and invoke that feeling in others. (Stone 2009, pp. 154-155)

These elements undergird the transformational approach toward the education of individuals suggested by the five-part diagram above (Figure 2). They also represent a departure from the current trend of standards and standardization in that these competencies can be reached in many different ways depending on the teachers and the places where learning occurs. While the Center for Ecoliteracy does most of its work at the k-8 level, these competencies are open-ended enough that teachers can use these as broad-based goals for high school students. The competencies of heart, hand, and spirit transcend traditional disciplinary boundaries and facilitate a holistic understanding of the world and human interactions with the world.

Similarly, many potential avenues of study through social justice and eco-justice writers can be used at the high school level. Examining concepts such as right livelihood is one aspect of study that connects ethics to questions of employment, economics, and self-expression. Right livelihood is a Buddhist concept that sets guidelines for obtaining a living without violating ideals of compassion and love. As Vietnamese teacher Thich Nhat Hanh (1999) explains, “The way you support yourself can be an expression of your deepest self, or it can be a source of suffering for yourself and others” (p. 113). The introduction to this Buddhist idea opens the door to perceptual and conceptual diversity in both global studies and economics. For those not ready to make such a foray, the study of the *Right Livelihood Award* also known as the alternative Nobel Prize, is a way to broaden high school students’ conceptions of ways to make a living. Aldo Leopold (1949/1966) makes the assertion that “A thing is right when it tends to preserve the stability and integrity of the biotic community. It is wrong when it tends otherwise” (p. 240). This explanation is certainly a useful conceptual framework for teachers educating for sustainability. Wendell Berry (1996) collates guidelines for conserving communities that also serve as an excellent study for high school students to consider ways to create sustainable, healthy communities. These guidelines are available in poster form for display in the classroom. The guidelines encourage citizens to be far more systemic in our thinking and approaches toward technology. They also propose looking for local solutions and building local economies before searching for solutions far afield. The point is to seek self-reinforcing communal solutions first, which by their nature will tend to have smaller ecological impacts and strengthen community bonds and resilience. Berry (1996) also suggests that communities examine solutions and products for their

traditionally hidden costs and look for ways to either keep money circulating locally or even to develop local currencies.

W. Berry's (1996) emphasis is rural communities, which suffer significant unemployment and depressed wages, and are in greater need of the application of these suggestions than are urban communities. Nonetheless urban communities are dependent upon healthy rural ones, so study of Berry's guidelines need not be confined to rural schools. Berry's ideas have potential to bridge the political divide between rural and urban communities. The ethics of living in a limited world where people are dependent on community and the biosphere is essential to education for sustainability. Examples of how these ideas can be actualized are elaborated in later sections when I discuss examples of place-based education and sustainability in the study of economics.

We also lessen our humanity when we neglect myriad non-commodified ways to participate in the world. While the individual needs education to achieve their potential, human potential is far more than the ability to participate in the economy. We need not accept the narrow definition proffered by political economists of human beings as "self-maximizing animals" (Patel, 2009, p. 27). Educators can help students to question such narrow definitions of people. Relevant questions include: In what ways can we find satisfaction and meaning outside of consumerism? What are ways that we can meet our needs without participating in activities that perpetuate social injustice and ecological degradation? These questions spur legitimate and important educational discussions. Nurturing the growth of an individual is an aspect of education, but the individual only achieves their potential in the context of a supporting community. The individual and their self-expression are connected to the wellbeing of the community. For example, in

Mayan tradition the individual's self-expression is contained within the larger context of service to the greater human and non-human community (Prechtel, 1999; M. Prechtel personal communication, August 2005).

One of the limitations of educational reforms has been a tendency to view success as facilitating the ability of minorities and poor children to access the benefits of an unsustainable economy. Increasing access to an unsustainable economy adds to its destructive power. Access to individual economic security is, of course, essential, especially in light of the tremendous disparities and historical inequities perpetuated by white majority culture, but we must redefine our understanding of economic security to ensure that the jobs that we are directing all students toward will contribute to a sustainable society (Jones, 2009). For this reason it is essential that individual development needs to be placed in the context of social, economic and ecological sustainability. In the current educational context, tolerance for diversity and multicultural education are represented by the acceptance of those who look different from the majority culture but who adapt to the dominant cultural framework of individual advancement in the market economy. We need an expanded sense of diversity that includes diversity of thought and ways of living and being that challenge our cultural constructs. This can be regarded as essential elements of study for our schools.

I am not unaware of the problematic nature of a white, middle class, educated male advocating that we need to reframe ideas of diversity and individual advancement in our society. But as Gruenewald (2008) points out, schools are among the least diverse places in the world. Moreover the type of experiences and thoughts currently fostered therein are limited. Recognizing these conditions, I argue that schooling has potential to

broaden our sense of diversity and nurture individual growth within a greater context, guided by the following questions: How do non-western and indigenous place-based cultures create sustainable societies? What are their relationships to community and the individual? Too often in our history, we have assumed that the answers to the *right* way to live were contained within the modern western *enlightened* cultural framework (Bowers, 2001). Instead, we need to bring these ideas into question with the acknowledgement that some peoples have created sustainable communities and lived well within the limits of their bioregion for millennia and that we have things to learn from them. In fact the culture most in need of emancipation from its thinking is our own.

Critical Theory: A Movement Toward Transformation

To a large extent education for sustainability is a critique of modern culture and dominant approaches to education and learning. At its root it is a call for transformation of modern culture, including educational institutions. The absence of the understanding—in learning theories and academic disciplines—of our dependence on the living systems of our planet is an educational oversight. According to Orr (2004a):

All education is environmental education. By what is included or excluded, students are taught that they are part of or apart from the natural world. To teach economics, for example, without reference to the laws of thermodynamics or ecology is to teach a fundamentally important lesson: that physics and ecology have nothing to do with the economy. It just happens to be dead wrong. The same is true throughout the curriculum. (p. 12)

Teaching for change is often correlated with the ideas of critical pedagogy, which traces its roots to Brazilian educator Paulo Freire. A number of authors (Bowers, 1997, 2003; Finney, 1998; Gruenewald, 2003) attempt to critique and expand critical pedagogy to include an interdependent view of humanity and ecology. For some this has included a

spiritual dimension (Finney, 1998); for others it is rooted in connection to place (Gruenewald, 2003; Sobel, 2004). Bowers (1997, 2003) focuses on cultural assumptions rooted in an anthropocentric view of the universe that he dates to the Enlightenment.

Critical theorists and pedagogists endeavor to create cognitive dissonance in the learner and educator by prompting examination of their own relationships to power. In the development of a sustainable society, elements of critical theory will be present as we are all invested to various degrees in the current system and its unsustainable practices. Our willingness to acquiesce to those power relationships and our own zones of comfort within the current structures will have to be brought into question. However, Bowers (2003; Bowers & Apffel-Marglin, 2005) posits that even critical theorists, as the most radical critics of our culture and its educational methodologies, share a number of cultural assumptions with the dominant culture. Bowers (2003) shows that these shared assumptions place these theorists in a double bind that:

prevent(s) them from contributing to the different expressions of resistance taking place at the local level...is too abstract and thus disconnected from the solutions that various local groups, here and in other cultures, are trying to work out in the face of corporate pressures to commodify all aspects of daily life. (p. 18)

Bowers (2003) indicates that many of the claims of critical theorists—such as consideration of globalization as a continuation of western colonialism that perpetuates poverty while enriching elites through efforts to privatize the commons—are views that he and most environmentalists share. Nonetheless some of the core assumptions that critical theorists share with the modern cultural consciousness are that: (a) economic globalization equals progress; (b) change is viewed as a progressive force in our culture and; (c) overturning tradition is embedded in our thought processes (Bowers, 2003).

These core cultural assumptions are widely shared by institutions, practitioners, theorists, and citizens alike, and complicate our ability to perceive a much-needed different way. Drawing in part on the experiences and understandings of indigenous cultures can help remove our cultural blinders.

As one example of how these cultural blinders work, Bowers (2003) highlights a tenet of critical theory that positions the only way toward liberation is through critical reflection. Bowers asked: are all cultures equally in need of this *liberation*? Does a *place-based* culture that has sustained itself for millennia need the same remedy as our unsustainable culture? A strict belief in critical reflection as the key to liberation assumes that indigenous people are in need of western liberation rather than wondering if there is something westerners could learn from indigenous cultures. There are many ways of learning, knowing and understanding that lie outside the definitional parameters of western universities. From the point of view of sustainability education, it is possible that it is our culture that is in need of liberation.

Another assumption that Bowers (2003) finds embedded in critical pedagogy is the fact that it “is based on an anthropocentric view of human nature relationships” (p. 15). Bowers postulates that this was one of the reasons for the “widely held view that humans can impose their will on the environment and that when the environment breaks down experts, using an instrumentally based critical reflection, will engineer a synthetic replacement” (p. 15). Bowers traces the origins of these cultural assumptions to Descartes and other enlightenment thinkers. Diamond (1987) Quinn (1995, 1996), Hartmann (2004) and Manning, (2005) argue that the initial roots lie in the Agricultural Revolution and

that these were deepened by enlightenment ideas and ensuing technological developments. Either way, these patterns of thinking are deeply rooted within the modern psyche.

In Bowers' (2003) view critical theorists also share with the dominant culture a belief in the superiority of our culture's mythopoetic narrative. Critical theory largely arises out of Western European thought and as a result is heavily burdened by western cultural assumptions. Examples of this include McClaren (as cited in Bowers, 2003) insisting that Marx replace all mythopoetic narratives or Wilson (1986) insisting the same for evolutionary biology or for Evangelicals insisting on the need to replace indigenous narratives with the bible. All of these represent cultural imposition that belittles the understandings of indigenous people. Our difficulty is that the belief of mythopoetic superiority is so deeply buried in our culture's subconscious that we view our metaphorical narrative of the world (whether science based or religious) as reality (Deloria, 2002). As a result, arrogance and misperception undermine local narratives that have created ecologically sustainable relationships with their environments (Bowers, 2003). It is precisely these types of ecological relationships with the places that we inhabit that we need to understand and apply.

Bowers (2001) makes the argument that individuals freed from the bonds of communal tradition can be an ecological concern as often it is the community that holds the narrative of sustainable living. This observation surfaces another belief which Bowers claims is common to critical theorists and the dominant culture: individual liberation from the bonds of tradition undermines sustainable elements and communal bonds

present in many cultures. This is what the Luddites were working to maintain in their rebellion against industrialization: an effort to maintain community bonds and work that fostered non-commodified community relationships (Sale, 1996). Traditional educational *radical reformers* have seen education as a way of emancipating oppressed peoples so that they can enjoy privileges reserved for the dominator culture. While this appears to be a noble egalitarian goal, if everyone in the world joined the individualized hyper-consumer economy, several additional planets would be needed (Bowers, 2001). Rather than the pursuing the individualistic, unsustainable, unrealistic, and unobtainable goal of all obtaining the wealth and privilege reserved for the few, our society could instead consider questions about community wealth (the root of which is wellbeing) as opposed to individual wealth.

From this perspective critical theorists share, at a deep level, the same world-view of the capitalist economy that they are critical of—namely a linear view of progress that overthrows traditional communities in favor of the emancipated individual. Sale (1996) notes that it has always been essential for the spread of our economic system that community bonds be overthrown in favor of autonomous individualism. While not all traditions are ecologically sustainable and automatically exempt from scrutiny, there has been a general failure to acknowledge that there are different ways of knowing, most especially communal knowing and communal knowledge of place. Indeed the over-throw of communities that have intimate knowledge of and connection to their places may be among the most important loss that we are suffering as it is this knowledge that the modern world most needs if it is to change course.

An example of how the traditionally labeled forces of right and left serve to undermine the forces of communal knowledge took place in Guatemala during the eighties and early nineties. Mayan traditionalists were hounded by the right, evangelical capitalists, as well as the Marxist left (Prechtel, 2003). Both sides viewed the traditional Mayans and their culture as *backwards* and needing to be liberated from an *antiquated* worldview. The result was the destruction of the traditional sustainable culture adapted to place in the area around Santiago Atitlan (Prechtel, 1999, 2003).

An additional concern Bowers (2003) raises is that the language of sustainability will be swallowed by the dominant culture without producing the needed changes. A recent example of this occurred at the 2009 Oregon language arts teacher's professional development conference under the title "Sustainability Education." The conference had nearly nothing to do with sustainability but was merely a traditional professional development workshop. This appropriation of language undermines the essential goals of education for sustainability. Another similar concern formulated by Gruenewald (2004) is that too much focus on blending environmental education with the standards movement detracts from its transformative aims. Education for sustainability represents an attempt to truly alter our culture's narrative. It recognizes that it is our culture's story that is the one threatening the stability of our ecological systems and the human prospect. Bowers' critique points to the difficulty of the undertaking, for even those most critical of our culture are bound to many of its assumptions.

Past education reform that has managed to focus on environmental issues has tended to treat environmental concerns as *add-ons* to current curriculum, rather than

focusing on making environmental concerns the central organizing principle of reform (Bowers, 1997, 2001; Orr, 1992, 2004a). A number of authors have concluded that education for sustainability cannot be an add-on to an already overburdened curriculum (King, 2000; Orr, 2004a; Sterling, 2002). The call is for an entirely new way of approaching education. The aim is to transform citizens and society as a whole so that a more democratic, just, and sustainable world is the result. This is no small task. Questions of how to achieve it and what it would look like in application are complex and problematic, but nonetheless the work must begin for the time of delay and half-measures is past (Monboit, 2007; Orr, 2009).

Critical theory clearly offers some useful criticisms of the “structures of dominance that express or govern social relationships and competing forms of communication within that system” (Fenwick, 2000, p. 256). Certainly these structures and the power relationships involved are in need of analysis and change. However, critical theorists, generally speaking, hold the view that, “politics are central to human cognition, activity, identity, and meaning” (Fenwick, 2000, p. 257). This view places critical theorists within an anthropocentric modernized culture, thus leaving the deeper cultural paradigms intact. Bowers (2001, 2003; Bowers & Apffel-Marglin, 2005) effectively points out how critical theorists are placed within the dominant cultural paradigm. The quest for a sustainable society and a supportive educational system will not be found within the unsustainable thought patterns of the dominant culture or in immediate reaction to them. Instead Bowers (2001, 2003; Bowers & Apffel-Marglin,

2005) calls for a deeper analysis, including drawing on indigenous knowledge and understanding.

From Cenozoic to Ecozoic

O'Sullivan (1999; O'Sullivan, Morrell, & O'Connor, 2002) states that education needs to recognize the demands of a new geological era—the ecozoic era. T. Berry (1988) similarly argues that our culture is between stories of two eras, the end of the cenozoic, dating from roughly 65 million years ago to the present, and the beginnings of the ecozoic. Berry (1988, 2000) argues that human activity has brought the Cenozoic era to a close. This era arose after the last great extinction at the end of the Mesozoic era that created the abundance of life forms which we find around us, but are fast disappearing in this century. This is directly related to the scientific evidence that we have entered a new geological era referred to by scientists as the Anthropocene (Zalasiewicz et al., 2008). Scientists can find in the geological strata the line that marks the beginning of the Industrial Revolution. From this they can also chart the changing of the chemistry of the ocean and the atmosphere along with the extinction of species and the alteration of the climate (Zalasiewicz et al., 2008). For T. Berry (2000) there is a spiritual/ethical component that grows out of the understanding that *human rule* for the last several thousand years has resulted in untold destruction. He lays out five principles that are essential if we are to succeed in meeting the extraordinary challenges our culture has created for all life and specifically for the survival of the human species (T. Berry, 1997) First, the earth is a communion of subjects, not a collection of objects. T. Berry argues that Descartes *de-souled* the world and our culture has become autistic in regard to our relationship with the planet. Second, the earth is a whole entity and cannot survive in

fragments any more than we could. It is not a *globalized* sameness, there is differentiation in bioregions; just as humans need habitats so do other life forms need their habitat. It is only through recognition of this that the earth can maintain its vigorous life. Third, the earth is a one-time inheritance. We have no idea of how much damage the earth can recover from and if it can rebound to its vigor after such abuse. We need to lighten our footprint. Fourth, the human community is a derivative of the larger, grander earth community. Currently our culture sees this backwards. Finally, he argues that there is a single *Earth community*. In the ecozoic era humans will either move with this integral community or both will suffer disaster. We now need to sublimate our culture's egoistic desires and create stories that will facilitate the creation of an integral earth community of both humans and the non-human world. It will be for educators to begin to frame the stories of this new geological era. The task can hardly be underestimated.

These stories are just beginning to unfold and will likely take time to develop and even longer to understand. They are also likely to have many related versions or side stories. One such version is an integration of our indigenous souls with the cutting edge of science (M. Prechtel, personal communication, August 2005). Cajete (2000) stresses the importance of the merging of western science with indigenous science and metaphoric thinking. These stories and emerging understandings will place humans within a dynamic, creative and spiritualized universe (T. Berry, 1988; Satouris, 1999a, 1999b).

We are threatened on many levels, but there are three that O'Sullivan (1999) sets out as emblematic of the terminal phase of the Cenozoic era—planetary survival, human survival, and personal survival. The greatest planetary threat is global warming (Gore,

2006; Monboit, 2007; Orr, 2009; Pearce, 2007), but the long catalogue of environmental degradation includes extinction, ocean dead zones, desertification, water pollution and resource depletion, and much more (L. Brown, 2006). For example, scientists estimate that as many as half of all species on the planet may go extinct in this century (Whitty, 2007).

O'Sullivan (1999) points to the many ways in which human survival is threatened by our globalized, technocratic world. In particular the growing disparities of wealth and ecological destruction affecting the poor in particular portend violence as people compete for resources and fend for their daily needs. Global warming threatens mass dislocations on a scale almost unimaginable (L. Brown, 2009; Gore, 2006). These dislocations and migrations are certain to destabilize nation states and create wars between them.

Corporations in search of raw materials are overrunning indigenous people, whose understandings may be crucial to our survival. These and other pressures are crushing human and animal communities. The destruction of communities threatens personal survival in both obvious and profound ways. Clearly the threats to agricultural systems through falling water tables, desertification, climate disruption, and rising sea levels represent an overt threat to individuals. But on a more subtle and profound level humans are social creatures, dependent on networks for our wellbeing. We are not fully human alone, but in relationship with community (O'Sullivan, 1999; G. Smith & Williams, 1999; Sterling, 2002). The threats to community represent a threat to individuals. In fact one can argue that sustainability education is in many ways about recovering an essential aspect of our humanity by rebuilding and recovering community.

Thus far I have focused on cultural constructs and how they have impacted the underlying ideas in our educational systems. Before laying out a detailed framework for advancing education for sustainability in our schools, I go into more depth about our educational institutions more directly in the next chapter, guided by the following questions: What is the dominant role that schools currently play? What role might they play?

Chapter III

Overcoming the Educational *Status Quo*

Implementation of Education for Sustainability (EfS) as a transformational goal of the educational system is likely to encounter resistance from entrenched influential forces in our society that feel threatened by ideas associated with sustainability. Naomi Klein (2011) argues that the ecological threats we face, particularly climate change, represent enormous challenges to the fundamental intellectual frameworks that drive capitalism and the global corporate economy. As a result, powerful political persuasion and propaganda techniques have been and continue to be used to create confusion and indifference in people (Chomsky, 2002). An obvious example of this is the so-called *debate* on global warming. While the science has been clear that humans are causing significant build-up in greenhouse gasses and that these are causing climate change, the auto, oil, and coal industries have deliberately minimized or obscured this information by clever manipulation of the media in order to perpetuate business as usual (Gelbspan, 2005; McKibben, 2005; Mooney, 2005; Orr, 2009; Romm, 2007). This is commonplace in regard to sustainability issues and further complicates implementation of education for sustainability in classrooms. These and other political obstacles will likely create problems in implementing EfS as a transformational goal of our educational system.

Resistance as Teaching Opportunity

While the aim of transforming the mission of education will not be uncontested, these campaigns have created an artificially polarized environment in which people are

pitted against one another despite a common interest in the development of a more just and truly sustainable culture. Contrary to D. Stone (2002) who argues that rationality misses the point, a rational argument for a transformation of our educational goal can be made. Nonetheless concentrated effort will be needed to expose the market interests and their obfuscations to help educators see the need for radical transformation as called for by EfS and appropriate for the new ecozoic era.

Notwithstanding the slow implementation of the ideas of sustainability, there will also be competing interests within components of the model itself. Social values, environmental values and economic values will have conflicts among them. The replacement of fossil fuels with bio-fuels, which turn valuable agricultural land into a fuel source for automobiles, is one such conflict. The United States has designed and built its economy over the last half century so that people need to commute and individuals are thus dependent upon cars for their livelihoods. Cars demand fuel and so our *greening* of fuel sources is in direct competition with food. These kinds potential conflicts of sincere interests must be recognized (D. Stone, 2002). From this internal conflict arises one of the ways that teaching for democratic values can be strengthened and students can examine conflicts and seek potential compromises as well as both transitional and long term solutions (Herremans & Reid, 2002). In this way resistance becomes teaching opportunity.

Critique of the Industrial High School

The traditional high school traces its roots to the beginning of the 20th century, an era of rampant industrialization combined with mass immigration. Gatto (2002, 2003) argues that contrary to the noble aims of citizenship and personal improvement, our

schools were designed to “ensure docile and incomplete citizens in order to render the populace manageable” (Gatto, 2003, p. 35). Democracy and the burgeoning labor movement were empowering ordinary people to influence society in a direction that threatened elites and their positions of privilege. In this context, schools were designed to isolate and sort people into *appropriate* societal roles.

Evidence for this is fairly overwhelming—ranging from tracking in schools to the fact that only 24.5% of students graduated from high school in 1940. The goal was not to graduate all students. In an industrial society students that were not college bound were largely invisible (Toch, 2003; Wagner, 2002). At the time there was a place in society for those who did not finish school, as many industries provided living wage jobs; however those jobs have since been greatly reduced, as have the union wages that accompanied them. As the nature of society has changed, there has been a concerted pressure on schools to graduate more students. Yet efforts to *reform* school are missing the point entirely. Testing, accountability and standardization are all occurring within the context of an institution that was designed a century ago. Though great teaching and exemplary teachers are able to overcome poor design, what is needed is a *reinvention* of schools and the mission of schooling. The first step is the creation of smaller schools and learning communities.

Small Schools and Learning Communities

Many experiments are being conducted all over the country in re-creating the comprehensive high school (Meier, 2003a, 2003b; Toch, 2003; Wagner, 2002). The stated purposes of these reforms efforts generally break down into three categories: raising standards (particularly for students of poor and minority groups), democratic

citizenship, and meeting the needs of the new *knowledge economy*. These goals must be placed in the context of a society that is exceeding ecological carrying capacity of the planet.

In order to achieve high standards and prepare students for the vastly different economy of today's world versus that of the early 20th century, Toch (2003) and Wagner (2002) point to the need for smaller learning communities to engage students in more rigorous curriculum. They argue that as teachers get to know students, they can make greater academic demands that larger classes and schools largely fail to do. They decry the lack of adult interaction that many of today's children experience and the alienation of schools and society at large. Both generally prefer depth over breadth of curriculum. Sustainability educators share some of these concerns, but lacking central focus on the perilous need for cultural transformation in light of possible ecological collapse, these goals serve merely to better prepare individual students to fit into an unsustainable society (Bowers, 1995, 2001; Bowers & Apffel-Marglin, 2005). Gruenewald (2004) argues that there has been inordinate focus on making environmental education serve the standards movement. Indeed, we do not need to do what we do *better*; we need to do something different. Currently, educating students to participate in a *culture of empire* (Korten, 2006), education needs to contribute instead to the building of a sustainable community. Smaller schools, generally defined at around 300-400 students, can be an important aspect of this.

Those focused on the breakdown of democratic society (Eisner, 1991, 2003; Meier, 1996, 2003a, 2003b, 2008) support modeling caring community with the primary goal being participation in a healthy society and, secondarily, a healthy economy. A

healthy democracy is an essential component of both a caring/partnership economy and a sustainable society. Changing the way school occurs is essential to fostering the development of democratic ideals. Nevertheless, while the changes that these authors are advocating are positive, it is essential that we go further. Smaller schools with unchanged goals will not create a more just, spiritually fulfilling, or sustainable society. In context of the ecozoic era educators and educational leaders making these kinds of changes must keep the needs of our perilous age foremost. Democracy is not the end goal, but a tool to achieving a more just and sustainable society.

Smaller schools may be better at equipping students for the new *knowledge*” economy as opposed to the industrial economy (Toch, 2003; Wagner, 2002). The knowledge that is at the center of teaching must be related to the transformation of our society toward sustainability—of replacing a mechanistic view of the world with an ecological one (Capra, 1996, 2002; Sterling, 2002). We must teach students what Durning (1992) calls the new *golden rule*, that each generation must meet its needs without jeopardizing the prospects of future generations to meet their needs. We need to transform our educational system in order to meet our obligations to prepare young people for conditions that they will face in their lifetimes.

Dare We Do This?

In this section I examine a historical call made by Counts (1932) for schools to participate in the changing of society. In a series of papers published under the title *Dare the School Build a New Social Order?* Counts created a comprehensive argument that forced educators to rethink the role of education in society. Elements of the challenge he issued, while grounded in the problems of the Great Depression, remain true today.

Counts (1932) was a visionary who called for a rethinking of the mission of schooling. He focused his attention on social and economic equality, the most salient issues of his time. These are two of the three realms identified by Herremans and Reid (2002) in their definition of sustainability. Today we are faced with the additional crisis of environmental collapse, which Counts, however visionary, did not anticipate. Notwithstanding this oversight, his call for the role of education as an agent of social transformation fits squarely with the needs of our own era.

Counts (1932) points out fallacies that explain why schools are so resistant to change and remain largely unaltered from their original form and mission. The belief that we are born free is one fallacy that keeps teachers from wanting to impose values on students. This is a belief that we must shed if we are to move away from a culture of unsustainability. We are deeply shaped by a culture that views the earth as existing to fulfill egocentric human desires. Freedom, therefore, is a consequence of difficult teaching and learning, not an original state. Without recognizing this, teachers tend to reinforce the dominant and unsustainable cultural paradigm.

Counts (1932) argues that the inevitable imposition of a culture's values can "release the energies of the young, set up standards of excellence, and make possible really great achievements" (p. 12). Yet this is only true if the culture is "vital and suited to the times" (p. 12). Our dominating culture is neither, despite arguments to the contrary by defenders of the status quo and reformers. Rather, the need to restore ecological health and wellbeing to our society and ecosystems is *vital and suited to the times*. It is therefore crucial to giving students reason for participation in their learning (Postman, 1996).

The next fallacy that Counts (1932) confronts is the myth that children are born good. He explained that there is no conception of individual good absent a cultural construction of the good society. This is similar to the fallacy of being born *free*. He argues that this fallacy prompts educators toward a false neutrality on the discussion of the creation a more just (and sustainable) society. For Counts, the building of a *good* society is largely “an educational process” (p. 13). This idea of education is grounded in a model of acquisition. Here acquisition is recognized to have a place as a useful but partial metaphor subordinate to sustainable relationships. From a deep ecological (Merchant, 1992) or radical place-based view education is also an opening of sensitivities to our dependence on the Earth for our sustenance and wellbeing. It includes the question of, “How can I/we leave the place on Earth where we find ourselves more vibrant for our descendents than we received it?” It is the beginning of an approach toward the Seven Generations view of the Haudanousaunee (Iroquois).

In the same way that our culture has separated itself from the Earth, we have also separated school from society. Counts (1932) argues that we need to integrate schools and society. This perspective is reiterated by place-based principles discussed in the next chapter. Interrogating the real threats that our unsustainable culture presents to the lives and communities of our students achieves such an integration of school and society. Students, and especially high school students, need to be critically examining challenges related to the creation of a sustainable culture and partnering with community groups that are working on sustainability issues. Too often education is treated as an absolute separate from the time in which it is being proffered. This construct has disastrous

consequences as it serves to maintain the status quo, while we face entirely new problems.

Counts (1932) also observes that educators view schools as intellectual endeavors that should be impartial with the goal of the creation of the agnostic professor, “who delays until all the facts are in” (p. 18). This brand of skeptical thinking facilitates the creation of a public and body politic that delays action on climate change due to a lack of complete *certainty* that it is human caused. When all the facts are known, it will be too late for action. This is true of many if not all problems related to sustainability such as population growth, habitat destruction, soil depletion and many others. Climate change is the most convenient and popularly known example of this fallacy.

Schools, according to Counts (1932), can never be completely impartial. In fact they must shape ideas for the powerful forces of the status quo that impose themselves on the minds of students without their conscious participation (Bowers, 1995, 1997, 2001). Schools can and should be shapers of ideas, but the ideas that we need to mold concern how to live within our means and to acknowledge our dependence on a healthy biosphere. In an unsustainable society, this has unavoidable political ramifications.

Perhaps even more now than in Counts’ (1932) day, students must leave school equipped to act decisively before the results of our behavior become irreversible. The idea that school is a purely intellectual endeavor in which abstract objectivity is sufficient suggests that it is acceptable to contemplate human-caused catastrophe with detachment bordering on malaise. Instead we need to be moved to act. Our schools will need to engage more than the mind, and involve our hearts, bodies and spirits as well (M. Stone,

2009). We will need to concern ourselves with ethics and consider the cultivation of virtues (Orr, 1992, 2004a).

Hesitation to impose ideas on students stems from the fallacy that educational institutions are all powerful. However, today there are many powerful forces that shape the minds of children such as modern media (Bowers, 1995, 1997, 2001; Chomsky, 2002; Mander, 1978, 1992). These forces work to preserve institutional power and an unsustainable world-view. Schools must work to counter these effects in whatever small way they can. Educators must take the risk and accept responsibility for supporting the needed change.

In fact, the educational curriculum itself has hardly been designed by neutral arbitrators (Gatto, 2003). The subject of economics, for example, was incorporated into the curriculum requirements of Arizona specifically to counter the possible influence of socialist professors. Twenty states then added economics to its required courses for high school graduation (Robin, 2008). Yet few teachers of economics understand that this was the purpose behind the introduction of the economics curriculum.

Finally, Counts (1932) claims that the idea that we must prepare students for a rapidly changing world is highly destructive. He argues that this makes a goal of insecurity and “drives everyone into an insane competition with his neighbor” (p. 23). Preparing students for competition in the changing world economy is revered in our culture, as repeatedly emphasized in Friedman’s (2007) *The World is Flat*. Venerating competition in the global economy conditions students to accept that a *race to the bottom* is the unavoidable state of affairs. Counts’ (1932) indication that this was a fervent belief in the early twentieth century reveals how little things have changed. Despite being

written in 1932, Counts' critique remains relevant today. For schools to become agents of change for a more just and sustainable society, these fallacies must be overcome.

Counts clearly shared the world-view of the dominant paradigm—including a view of linear progress from our *primitive* past to our *advanced* modern stage. He also revealed an anthropocentric world-view in which the earth was made for the use of humankind assuming human domination of the earth as natural. Despite these ecologically problematic cultural views which he takes as givens, he raised excellent points regarding transformation of public education. Counts (1932) concludes his series of essays by anticipating America's fall from being a beacon of democratic revolution to being "merely known as the richest, most powerful of the nations" (p. 37). Since victory against fascism in World War II the U.S. reputation has declined, and we are presently perceived negatively by a majority of the world community (Chomsky, 2004). The task for the current generation of educators is to facilitate the recovery of our ideals in becoming a beacon for democracy, social justice, and sustainability.

The task is formidable for reactionary forces representing the powerful and the status quo have harnessed the language of freedom to protect privilege (Robin, 2008). Not since the period before the Great Depression have elites been so adept at exploiting the language of freedom and democracy. The past three decades have been marred by growing inequality in our own nation and between nations as well as on-going and increasing ecological degradation. So-called conservatives have managed to successfully frame this inequality and environmental ruin in terms of economic freedom despite the increasing freedom of markets all over the world through the collapse of the Soviet system and the numerous *free-trade* pacts.

Counts' (1932) criticism of economic power is thus pertinent today. Transparent discussion of the enormous power and influence wielded by corporations and financial institutions must be part of the curriculum. The threats to our ecology and to our democracy, the latter of which depends upon the health of the former, must be acknowledged if students are to create a future that is an improvement from our past. Ultimately individual freedom and economic advancement without secure ecological and social foundations are chimeras. We still have the opportunity to act before global warming, peak oil, and the myriad of our excesses cause catastrophic deprivation. Consequently, the question is not, dare we? Rather, the question is dare we not? Indeed we must act now before these disruptions bring civilization and democracy to collapse (Diamond, 2005; Orr, 2009). What form will this action take? This is addressed in the next chapter as we look to raise the standards of literacy to include ecological literacy. Furthermore the following chapter introduces a pedagogical approach that helps to dissolve the traditional barriers between schools and communities—place-based education. Together these offer goals and means toward overcoming the educational status quo.

Chapter IV

Ecological Literacy and Place-Based Education

In this chapter I explore the history of efforts to reorient our education toward teaching and learning for sustainability. I begin by examining environmental education, which was the first systematic attempt to integrate concern for the environment into education. Later I review the importance of ecological thinking and literacy to education for sustainability. Modern understanding of how ecological systems work provide important guidance for our thinking about teaching and learning. I continue in this chapter with how the principles of place-based learning and ecological literacy can provide the theoretical framework and lead to a much-needed transformative approach to teaching and learning.

The Movement Toward Ecological Thinking and Sustainability

Concerns about the environment are not new. Environmental Education (EE) traces its guiding principles to the 1977 Tbilisi Declaration, a report given at the International Conference on Environmental Education, which defined environmental education in a global context for the first time (UNESCO, 1978). The document contains many excellent ideas and concerns about the environment and the need for educational change. Yet, over 40 years later despite its laudable goals and some positive results, the problems humanity faces have only grown worse.

The idea of *environmental education* is linguistically problematic. When the word environment is defined to mean that which surrounds us it suggests that we are separate

from the natural world and reiterates an anthropocentric worldview implicated in contemporary massive ecological problems. Developed from such an anthropocentric perspective, environmental thinking and education programs have generally advocated for slower use of the *resources* on which we depend so that human use can continue over a longer period of time (Satouris, 2002).

Satouris (1999b, 2002) argues that we must shift our thinking from the concept of life *on* Earth to that of the life *of* Earth. In this view, life is not an accidental occurrence on the surface of the planet, but the Earth is a living planet of which we are a part. Earth itself is a “single complex geo-biological process” (2002, p. 1). Satouris observes that at the root of many of our problems is our thinking that we are separate from the world. We must alter our thinking about the teaching and learning of the planet. If we view the planet as a living system rather than as an object of study, we can transform the way that we educate. With sustainability and ecological thinking as the overarching goals of education all subjects fall within the purview of re-imagining teaching and learning.

Luke (2001) uses a Foucauldian analysis to show that EE has, to a large extent, perpetuated the separation between humans and nature. According to Luke, nature is conceived as a *green zone* and the human sphere is represented as a *brown zone*. He argues that this has largely reduced EE to isolated curriculum units or add-ons to science classes. Orr (1992) and Bowers (2001) similarly conclude that this separation creates the mistaken impression that environmental problems will be solved by experts using a scientific/instrumental based approach rather than addressing the deeper cultural roots of the dilemma.

Furthermore, the word *environment* as contextually separate from human beings has contributed to both educators and activists excluding social inequality and power imbalances from discussions of pollution, resource expropriation and depletion, and ecological degradation. Ecological thinking and indigenous thinking see these concerns as inseparable (Deloria, 1973; Hawken, 2007). As expressed by Gruenewald (2004): “Patterns of domination and privilege maintained by hierarchical, patriarchal, authoritarian, and militaristic social structures have interconnected impacts on social and ecological systems” (p. 92).

Luke (2001) additionally points to the fact the EE has largely been reduced to a three-part *management* approach of resource, risk, and recreation. In this framework resources are managed to optimize supply and demand, risks are (under) assessed and managed after disasters occur, and recreation management occurs in parks for human leisure activities. Thus the environment is reduced to a shallow instrumental resource for human use. Larger systemic/cultural problems of human relationships and impacts on the environment are further ignored in this separation. Confinement of EE to this three-part management formula “shows how power and knowledge work out in the open as the expertise sets needed by the ruling owning, knowing, and controlling elites” (p. 193). Though he argued against an anthropocentric worldview, Luke states that nature has *no meaning* other than what humans assign to it. While I disagree with the overall sentiment of this characterization, Luke makes a useful point that educators must work to help young people find connections to and meaning in Nature in order to mitigate against continued exploitation founded on a view of nature as devoid of meaning. Teaching for

sustainability “must weave an analysis of power, politics and the state into an ecology’s sense of sustainability, survival and the environment” (p. 200).

Gruenewald (2004) also uses a Foucauldian analysis to highlight shortcomings of traditional approaches of EE. Gruenewald shows that “efforts to integrate environmental education activities into schools, though noble and not insignificant, are dwarfed by the power of the dominant educational discourse” (p. 74). Moreover, the transformational potential that EE contains in some of its goals has been muted by the “disciplinary practice [of institutionalization, which] legitimizes irrational and immoral general educational practices” (p. 76). As a result, in the United States, EE has largely been co-opted to serve the forces of industrial civilization.

Environmental education is contested in many ways and as a result the definitions employed are often so vague that almost anything can be defined as EE, ranging from a one week *outdoor school* experience to monitoring of water quality in a stream to measuring trees in a tree plantation. Gruenewald (2004) indicates that some of these activities do not connect with the larger articulated purposes of EE and are even, at times, inconsistent with them. Instead he proposes that EE must shift to focus on the meanings of education rather than submitting to the educational discourse as it is currently framed.

The dominant discourse in the U.S. about educational policy and practice has very little to do with the dilemmas and challenges posed by EE (Gruenewald, 2004). Neither environmental educators nor general educators are part of policy discussions. To provide a striking example, which highlighted the prominent role of business in the dominant educational discourse, Gruenewald (2004) describes the absence of a single teacher,

principal or student at the National Education Summit in 1999. Furthermore critics of the dominant educational discourse also tend to ignore the environment.

As a result EE is largely confined to the fringes of discussions about education. Courses in EE are often limited to thematic units or added on to disciplinary courses. In Ontario, Canada, when a one time stand-alone required environmental science class was removed from the curriculum and the goals were *embedded* in geography and general science, Young (2009) finds that students did not get much of their knowledge of the environment from school. Instead, most students obtained their environmental knowledge from the media (Young, 2009). The corporate media is an unlikely source for transformative environmental education as it has a vested interest in keeping the world moving in its current, unsustainable direction.

The deep critique of our culture that an ecological worldview suggests is largely silenced by the placement of EE within the *grammar of schooling* (Tyack & Cuban, 1995). “Claiming to be the ideal context for integrated or interdisciplinary learning in a standardized curriculum, EE often takes for granted, and fails to problematize, the value and purpose of the knowledge it is integrating” (Gruenewald, 2004, p. 82). The effort to legitimize EE within the dominant standards movement has diluted its transformative call for an ecological way of viewing the world, and has largely preserved a system that perpetuates anti-ecological practices.

Assigning EE within specific disciplines presents a number of additional problems. A primary difficulty involves the requirement that a specialist teacher move outside their area of expertise to teach ecological literacy or meet EE goals, a consequence of which is the tendency for teachers to simply ignore EE goals and teach

what they know. A secondary problem is the dilution of the holistic knowledge that underpins EE as ideas become swallowed in the isolated subject matter. For example, while one can learn about the geography of a place, it is difficult to understand the human impact on that place without incorporating present day political and economic choices and taking into consideration the lifestyles practiced by the indigenous people who once inhabited that place. These kinds of examinations of place are unlikely to occur under the rubric of geography. Science education is silent about politics and economics and mutes the ecological critique of economics and politics. Science is also silent about the people who lived in a place before being replaced by the dominant culture. Science and geography are both important tools for understanding the world, but when EE is embedded in these disciplines it overlooks important connections essential to an ecological worldview (Gruenewald, 2004).

When EE embeds itself in the dominant discourse it is acquiescing to a series of root metaphors such as anthropocentrism, progress, the flawed nature of human beings, economic competition and the rationality of the market, violence and aggressive pursuit of self-interest, patriarchy, and a mechanistic universe (Bowers 1993, 1995, 1997, 2001). These are metaphors that are jeopardizing our future, perpetuated in the discourses and institutions of our culture. As participants in those institutions we become party to their continuance. Therefore, the problem “is not changing people’s consciousness—or what’s in their heads—but the political, economic, institutional regime of the production of truth” (Foucault as cited in Gruenewald, 2004, p. 94). The goal of EE should be to challenge these cultural discourses and their hidden assumptions about the world.

The Tbilisi Declaration (UNESCO, 1978) errs when it calls for environmental education to be “integrated into the whole system of formal education” (p. 12). The aim is noble but backwards. Instead all courses should be integrated into sustainability. All disciplines need to surface the reality that we are wholly dependent on a healthy ecology for a healthy society. The word *development* occurs over 100 times in the Tbilisi document. This partly reflects the fact that many countries are mired in poverty and inequality and are in need of sustainable development, but it is also a signpost to the dominant economic paradigm and provides linguistic cover to continue the exploitation of resources in the name of development. Furthermore the document is hampered by the fact that it was authored by nation states and makes no reference to the over 300 indigenous place-based cultures that are currently located within those states as crucial models of sustainable life ways.

Ecological Literacy for Sustainability

Given the critique of modernity and its related educational connections presented earlier, one may ask, what will the goals of our new schools be? Upon what will the outcomes of schools be based? The primary outcome must be ecological literacy. Ecological literacy is a higher standard than basic literacy. It includes the components of basic literacy, but adds an understanding of our dependence upon and relationship to the planet. It should be central to the various educational policy debates. By holding ourselves to this higher standard, transformational educational leaders can claim the moral high ground against representatives of the *status quo* or even reformers. By insisting on our concern for the future of our children, and clarifying our concerns about the likely future they are to face, we can reframe the dialogue on educational reform.

Ecological literacy requires that students not only acquire all the basic skills of literacy in reading, writing, math, science, and social studies, but that they also be able to assemble these pieces into a coherent whole in order to judge how to live in a world of limits. For students to meet a standard of ecological literacy, teachers help them to become capable of integrating these subjects to understand the limits of our ecological systems and our complete dependence on them for a healthy society and economy. It is this understanding that will allow students to become active participants in the creation of an ecologically just and sustainable society. As a reformulation of the theoretical learning frame advanced by Sfard (1998), which posits both acquisition and participation as necessary metaphors for learning, the main goal of ecological literacy is to enable all of us to *participate* in a more just and sustainable society through *acquisition* of significant quantities and qualities of knowledge.

Unfortunately discussions of educational reforms rarely acknowledge the need to change, or even to examine, the goals of education in light of our ecological crisis. The debates about educational *improvement* or *reform* are almost always couched in terms of technocratic or utilitarian goals such as whole language versus phonics, the need for hands-on math, or the recent addition in the state of Oregon of a required third year of math. While these kinds of discussions can be important, content knowledge needs to be framed in the context of ecological collapse or sustainability. Schools have changed over the years, but the essential mission has been the same—to maintain the *status quo* (Cuban, 1990; Gatto, 2002, 2003; Tyack & Cuban, 1995). Traditional education reform has nearly always been focused on getting more students to fit into the mainstream and this primarily means serving the economy as it exists. It is simply no longer possible to

justify serving the economic *status quo* as a mission of our schools. The economy has become the most serious threat to the future of our students. Our curriculum goals need to reflect this reality. As educational leaders, we must not allow reform to be framed exclusively in terms of practice and basic literacy. We must redefine the argument by demanding more of our educational institutions and ourselves and frame the debate in terms of what King (2000) and Orr (1992) define as ecological literacy.

By insisting on ecological literacy as the frame, we are also giving students a reason to acquire the basic skills that they too often resist. It raises questions about whose answers are relevant. Relevance prompts commitment to learning. Postman (1996) argues that this is one of the main elements missing in discussions of education reform—why teach? The restoration of our ecological systems and the creation of a more just and sustainable society is a purpose that can call both teachers and students to the hard work of learning. It is a moral purpose for schools for the 21st century.

In the words of Orr (2004a):

(The world) needs instead hundreds of thousands of young people equipped with the vision, moral stamina, and intellectual depth necessary to rebuild neighborhoods, towns, and communities around the planet. The kind of education available to them (now) will not help much...They will need to know a great deal about new fields of knowledge, such as restoration ecology, conservation biology, ecological engineering, and sustainable forestry and agriculture. They will need a more honest economics that enables them to account for all the costs of economic-ecological transactions. They will need to master the skills necessary to make the transition to a solar powered economy. (p. 164)

The world does not need more students to blend seamlessly into the economy.

“More of the same kind of education can only make things worse” according to Orr (2004a, p. 27). He argues that we do not understand the ecological context in which we

live. We live, teach, and learn as if the laws of natural and physical sciences did not apply to us. If educators try and/or are forced by various reforms to do more of the same only better, we will be creating the same type of minds that have caused the ecological crisis and those are not the minds likely to solve those problems.

Living Systems and Ecological Thinking: Creating the Baseline for Sustainability

In this section I explore the concept of ecological thinking, drawing on the conceptual frameworks provided by Fritjof Capra (1996, 2002, 2009), Elisabeth Satouris (1999a, 1999b, 2002) and Stephen Sterling (2002). Capra states that ecological thinking is systems thinking and expressed ecological thinking in eight components: networks, nested systems, interdependence, diversity, cycles, flows, development, and dynamic balance. He concludes that, “we can design sustainable societies by modeling them after nature’s ecosystems” (2005, p. 19).

Systems thinking and in particular living systems are at the forefront of scientific thought and yet at present this has minimal impact on the way that we conceive of and practice education. Capra (2005) identifies two fundamental reasons for this. One is that living systems are non-linear; they are *networks*. Individuals in living systems thrive only because they are a part of larger networks. For example, in Mayan initiation ceremonies, after completing their initiation into adulthood the individual is given the task to serve the community for an entire year. It is recognized that the knowledge and experience gained in the ceremony would be impossible without all the visible and invisible support of the greater community (M. Prechtel, personal communication, August 2005). We live in a culture that is dominated by linear thinking in science, in history, and in economics. In

linear thinking if a thing is good than more of it will be better. By contrast, “living systems do not maximize their variables; they optimize them” (Capra, 2005, p. 20). A second reason that systems thinking has not been more widely adopted is the fact that we are a materialist culture and networks and relationships are essentially non-material. For example, in economics the difficulty to quantify community wellbeing leads to a focus on individuals. Below I describe each of the eight components of ecological thinking identified by Capra with examples of possible educational application or relevant lines of inquiry: Ecosystems are networks, nested systems, interdependent, diverse, cyclic, flowing developing, and exist in a dynamic balance.

Living systems are nested within one another: for instance there are networks of cells within plants, networks of organs within more complex animals, and networks of trees, shrubs, grasses, insects and animals in a forest. All living organisms are made up of nested systems of networks and all of those organisms are themselves nested within larger living systems including communities of systems. Using the idea of nested systems we can study the different systems of which students are a part—families, neighborhoods, schools, cities, states. All of our subject areas are nested inside the living system of the Earth itself. Seeing and teaching in this way is transformative.

All life/ecological systems are interdependent. Life is not perpetual combat. Life has succeeded by creating cooperative communities. Competition does strengthen communities, but the primary way that life succeeds is through interdependence. Plants produce oxygen, which animals can then breathe. Microscopic fungi facilitate the absorption of water by trees. Examples of interdependence in life are literally everywhere. This is not to overlook the fact that there is hazard in the creative life of the

planet. Individual species have risen and then failed because of their inability to adapt to changing conditions. However, they arose not by conquering all other life forms, but by blending into the larger ecosystems of which they were a part.

Diversity is what holds living communities together. It provides resilience in the face of uncertain events. Diversity is threatened by our mono-crop agriculture and the spread of corporate monoculture to every corner of the planet. The study of diversity is central to the creation of a sustainable society as diversity in human communities provides different worldviews. It is the cornerstone of the freedoms of speech and press enshrined in our constitution, making the study of diversity is essential to the study of government.

Ecological communities exchange resources in continual cycles. Everything is cycling—water, air, food and even the earth itself through the geological cycle. By studying cycles and how nothing in nature is wasted we can consider ways to redesign our economy and our schools so that we generate no waste. Schools can use their own *waste streams* as teaching tools. How can we make our waste food for another creature rather than leaving toxins in earth, water, and air?

Living systems develop. They pass through stages of succession from pioneer communities to mature ecosystems. How could we mimic this in our own food system? How does our food system currently conform to or depart from this aspect of living systems? These would be questions for an educator to pose to students. Development is also an evolutionary concept. Many plants and animals have developed in mutually beneficial ways. How can we create human communities that develop in mutually

supportive ways for both people and the planet? How have ecosystems developed in ways that benefit human communities in unseen and unexamined ways?

Finally all living systems exist in dynamic balance. Continual feedback loops keep the system in a state of constant adjustment to various influences. The human desire for control of nature—our refusal to accept this dynamic balance—has led to many of our ecological troubles. We are facing a whole system collapse because of our refusal to play by the rules of ecological principles. How can we restore human communities so that they live within these ecological principles? This question may be one of the most important questions that humanity has ever faced and it is time that our schools started focusing our teaching around living within the ecological community.

An ecological worldview represents a fundamental challenge to our culture. Modern western culture is grounded in a mechanistic view of the world (Sterling, 2002). According to Sterling ecological thinking can transform our view of all aspects of education from its core values and assumptions about the purposes of education to the specifics of teaching, learning and the curriculum. Building from the framework put forward by Sterling (2002), below I explore ways in which the curriculum in different subject areas could be affected by these ideas by presenting relevant examples and questions. In technology: how are complex materials produced in nature without waste? A spider's web, for instance, has the tensile strength of high-grade steel and the capacity to stretch up to 140% of its length and it is produced at the body temperature of the spider. Can our technologies mimic nature? The whole new field of bio-mimicry (Benyus, 1997) is exploring these kinds of questions. In natural science: what is a science of geo-biology? What is emergence and how do living systems develop emergent

properties? What are the qualities of mature eco-systems? Species? Individuals? In math, we could teach about fractals. In art students can explore patterns in nature. These examples suggest just a tiny fraction of the ways that ecological thinking can transform our teaching and learning. This approach encourages a change from traditional mechanistic assessment reliant upon external inspection and narrowly prescribed indicators to self-evaluation with critical support from teachers as well as broadly drawn and self-generated indicators of growth. It also involves an inclusion of qualitative measurements (Sterling, 2002).

Ecological thinking also involves an awakening to the larger patterns in many interrelated systems. Much of our thinking has been oriented toward the parts and has overlooked the larger whole in which all the parts are interrelated. As a result solutions often create different problems. As an example, the feedlot solves the *problem* of inefficiency and allows for the production of meat in enormous quantities. However, it creates huge resulting problems that sometimes leave us with e-coli 0157:H7 bacteria in our meat, a microbe that has evolved in feedlot cattle and has a resulting resistance to the acidic conditions of the human stomach (Pollan, 2007). A food system that works like an ecosystem recognizes cattle and land as parts of a larger pattern and is the only real solution (W. Berry, 2005). As an educational analog, schools modeled on industrial thinking solve the particular *problem* of what to do with young people during the day while their parents work, but create the unintended consequence of removing these people from their communities and leave them disengaged and restless in school.

Ecological thinking also incorporates a shift of focus from objective knowledge to contextual knowledge. Everything exists in relationship to everything else. The practice

of separating the parts of systems for individual study will need to shift toward studying the world in terms of relationships. It will also be necessary to move our thinking toward examining processes rather than structures. Nothing is ever static; things are always in process. Finally ecological thinking emphasizes quality over quantity. In modern schools, we have prioritized quantification to such an extent that it is implied that if we cannot measure a certain variable, it has no value (Capra, 2005). The framework of ecological thinking advanced by Capra (2005) and Sterling (2002) provides a baseline for bringing sustainability to education.

The Cloud Institute has begun the work of taking the ideas of sustainability and ecological thinking and translating them into standards and assessments. Jamie Cloud develops rubrics for measuring student understanding of sustainability concepts by connecting education for sustainability standards into nine components: Cultural preservation and transformation, responsible citizenship, the dynamics of systems and change, sustainable economics, healthy commons, natural laws and ecological principles, inventing and affecting the future, multiple perspectives, and a sense of place (Cloud Institute, n.d.). These categories create a bridge for bringing ecological thinking into the classroom. These ideas begin to frame for students and teachers how we can live well in the places that we inhabit. Living well in place incorporates the critical challenge to our modern culture and begins to frame how we can transform our culture's relationship to the planet.

Critical Theory and Place: Moving Toward Transformation

One of the features of indigenous culture is their identification with the places they inhabit. A rising theme in sustainability education is learning tied to place

(Gruenewald & Smith, 2008; G. Smith & Williams, 1999; G. A. Smith and Sobel, 2010; Sobel, 2004). Gruenewald (2003) attempts to bridge the critical pedagogy/sustainability gap, arguing that by placing a critical pedagogy in the ecology of place, it is possible to use critical pedagogy to deepen the understanding of place and teach for deep and meaningful change. Rather than only relating criticisms of society, we work to construct our learning in the places that we find ourselves. In Gruenewald's words, we need to *decolonize and re-inhabit* our world.

An effective way to teach students concepts of sustainability is to situate them in place rather than addressing the rather abstract and distant problems of rain forest destruction and global warming (Gruenewald 2003; Sobel, 2004; Kiefer & Kemple, 1999). This is particularly true of younger students. However, even older students who examine larger national or global problems are helped when educators can ground the problem back into students' own situation and community. Critical place-based teaching needs to include the places and cultures that people bring with them. Honoring stories and cultures allows students to bring, in a sense, their places to the classroom. Both Gruenewald (2003) and Sobel (2004) note that many textbooks are situated in a generalized *no-place*. This contributes to students' isolation from the places in which they are situated and where they are from. We need to locate ourselves in our bioregion and deepen our connections to the places and communities in which we are situated. It is from a sense of place that students can directly apply the principles they learn in the classroom in wide-ranging applications.

Place-based education has certain parallels with situated learning. Learning and meaning are rooted in place and as we participate and interact with the places that we

inhabit we learn from those places. Place begins with the geographically based ecosystem within which one is a part, but also includes social-cultural-historical components that shape critical theory. Based upon the definition of situated learning as requiring that we embed ourselves in a culture (Fenwick, 2000), we are presently embedded in an ecologically destructive culture that is exhausting its own resource base. We will need to dis-embed ourselves from this culture and re-place and embed ourselves in a sustainable one. This will require a transformation of our educational thinking. We must envision our communities and ourselves as situated within the web of life.

With place-based education we can deepen students' understanding and engagement by connecting students to the communities and environments of which they are a part (Gruenewald & Smith, 2008; G. Smith & Williams, 1999; G. A. Smith 2002). A current example of this is the garden, health, and food initiatives that are beginning to be developed in Portland, Oregon and other locations (D. R. Williams, 2008). These initiatives are not coordinated, but represent clear steps in the right direction. We can deepen these efforts by including concepts of sustainability. Permaculture (Hemenway, 2000; Holmgren, 2002) offers conceptual tools that we can use to engage students' thinking about food and sustainable culture. A sustainable society will require more locally based, small scale, living-wage farming that involves more people (Pollan, 2007, 2009a, 2009b). A recent study found that converting conventional farms in England to organic farms would create 73,000 jobs (Patel, 2009). This would represent a radical reversal for our culture, in which people have been moving off of farms for the last century.

Fenwick (2000) poses the question, what constitutes meaningful participation in this community? From a situated ecological perspective meaningful participation is related to the understanding of limits and the need for us to participate in communities that find alternatives to the consumptive lifestyle to which we have become accustomed. The situation that humanity finds itself facing has several potential radical tipping points. For example, global grain supplies have failed to keep up with demand in seven of the last eight years, one-third of the ocean's fisheries are in collapse and two-thirds are estimated to be in collapse by 2025 (National Farmers' Union, 2009). Additionally, global warming presents the most catastrophic tipping point that we face (Hansen, 2008; Pearce, 2007). This is the situation that we are interacting with and facing as educators.

From an ecological perspective situated learning is intimately connected to our participation in a bounded ecological community—a place. It is impossible to view our situation apolitically because over the course of millennia our culture has lived outside the bounds of ecological limits (Diamond, 2005; Hartmann, 2004; Lawlor, 1991; Manning, 2005; Quinn, 1995). From this view we are already a part of an out of balance political system. Tracing history through the present we have continually expanded into other territories through conquest, colonization, and now corporate globalization, but with the various stresses we are placing on ecosystems worldwide this cannot continue. Our educational situation therefore needs to transform our thinking first as citizens who have inherited and are a part of the problem, then as educators prepared to question our practice, and finally to prepare our students to transform an unsustainable culture.

Meaningful participation will need to include the kind of work that will contribute to sustaining and restoring our social and ecological systems. A few examples of

additional questions for schools to consider are: how can we participate in the political system to begin to move our culture toward sustainable economic, social, and ecological behaviors? What are the standards we will create to measure if students are learning to live sustainably? The answers to these questions will change and evolve over time.

Transformative Education

Considering the goals of ecological literacy, creating a sustainable culture, and a heart/spirit connection to the planet, the operable word is transformation. O'Sullivan (1999) emphasizes that our culture's pathology runs deep and that it will take a correspondingly deep therapy to transform it. Reforming it is not enough. Sustainability education demands that we learn in multiple ways, and calls us to undergo the following: examine our unconscious beliefs (psychological learning), construct new understanding of ecological limits (constructivist learning), situate ourselves within a place or bio-region (situated learning), participate in a living bio/social community (participatory learning), acquire new knowledge (acquisition learning), and work for change of the status quo (critical theory).

Education for sustainability transforms the goals of reformers. As an example, equity in education has generally been viewed in terms of disparities of achievement in standardized test scores. Education for sustainability also deals with questions of equity, but in a transformative way. Foremost, EfS is concerned that the current generation is depleting resources and altering the living conditions of the ecosphere. If the focus of equity in our schools is to enable more individuals to participate in an unsustainable consumer economy we are depriving future generations of equal opportunity. As resources are drawn down, children of today face the prospect of a civilization without

the amenities that they are currently being educated to expect. Therefore equity in the ecozoic era has to include the understanding that we live in a world of limits. How we will achieve equity between generations and how we will achieve equity in a world of limits and the current significant economic disparity are among the questions that will need to be addressed in this new era.

A number of authors (Bowers, 2003; Bowers & Apffel-Marglin, 2005; Capra, 1996, 2002; Orr, 2004a; O'Sullivan, 1999; Sterling, 2002) speak about a new kind of consciousness, an ecological consciousness. Old models of learning are in need of transformation as they are primarily based in an anthropocentric worldview in which learning is a distinctly human phenomenon that takes place on an individual basis. As a relationship of learning in connection to living ecology, an ecological consciousness calls for a redrawing of our concepts of learning and our ideas about educational goals.

Education for sustainability can be described as a holistic learning approach aimed at transforming educational practice rather than merely an idea for reforming curriculum. It begins with what Gruenewald (2004) argues is the purpose of environmental learning: to question the purposes of education itself. It includes an aim "to provide students with opportunities to become good environmental citizens, not only as consumers, but as providers of environmentally responsible goods and services" (Herremans & Reid, 2002, p. 16). A larger goal is the transformation of society into a more just, democratic and sustainable one and will involve educators and education. Students will need to understand the tools for political transformation as well as the historical roots of power that have created embedded institutions resistant to change.

Extending David Sobel's Place-Based Principles to the High School

In this section I demonstrate how place-based principles formulated by Sobel (2004) for younger students can become part of an ecologically centered high school. Sobel's place-based principles address the following themes: adventure, fantasy and imagination, animal allies, maps and paths, special places, small worlds, and hunting and gathering. Below I provide some examples to illustrate how these principles can be translated for the high school learning environment.

For younger children, adventure is in so many ways just around the corner. Older students have already enlarged their world, but spending 6 hours a day in classrooms blunts whatever sense of adventure they might have continued to develop. Would it be possible for a ropes course to be a part of every high school? Would it be possible for every high school to commit to at least one backpacking *adventure* for all students? Would it be possible for schools to incorporate regular *day hikes* as a part of physical education classes, giving students the chance to experience and explore their regional places?

Fostering a sense of fantasy and imagination is needed in our schools if we are to creatively respond to the challenges we face. One way this could be achieved would be for students to work with designers that are trying to restore damaged ecological systems. Rather than simply receiving the perfected work of adults they could be a part of the design process, thus contributing to the development of their imagination. Working in this way students would have ample opportunity to apply the understandings that they learn in science class. It could also serve as a vehicle to get students outside of the class and actually implement the landscape designs. There are an abundance of landscapes in

need of restoration both in urban and rural settings. Another example in a creative art or writing class would be for students to create their ideal, harmonious neighborhood. It would also be possible to invite members of local planning commissions to view or evaluate student work thus connecting young people's imagination to the greater community.

The cynic might ask, what are animal allies to the older student? One way of looking at animal allies is through the lens of keystone species. Keystone species are species that are essential to the health of ecosystems. They are ecosystem allies. In the spirit of place-based education, students could research local or regional keystone species, discovering which ones are in jeopardy and becoming involved in projects to restore populations. Students could also research the importance of pollinators to local food sources and plant school gardens that provide food for these ecosystem allies. Understanding the importance of pollinators provides a concrete way of understanding our ecological interdependence and planting pollinator gardens provides a way for students to be of practical use to the larger community.

A more imaginative approach would be to ask students to name an animal with which they identify. Students could begin with writing a short poem about that animal. They could proceed to research that animal, its habits, food, shelters and travel range. They could further research its spiritual or psychological symbolism. Native peoples have traditionally seen animals and plants as teachers. Learning from specific animals teaches the varied ways that creatures survive and relate to their places. Students could later revise their poems or do short essays about what they learned. Essay topics could include references to place, foods, medicines or spiritual/emotional connections. As we prioritize

place in our teaching and learning, it has the potential to transform our schools and orient our thinking toward sustainable living in the places that we occupy.

How many students know the basic skills of orientation and using maps? Students can acquire and practice these skills through work with local communities to create greenway trails. Students might work on a larger scale to map migratory routes of birds thus connecting local communities to the larger global community. For older students the activity of mapping paths relates to the broader journey of their goals in life. What path might they take to find future employment that will foster the creation of a more just, sustainable, and fulfilling world?

There are so many special places in any region. Some are historical, others scenic. How can schools be a part of maintaining and preserving the special places in our communities? How can we convert schools themselves to *special places*? One example was in the wake of Hurricane Katrina where students in New Orleans advocated for space for gardens, a cafeteria in which adults would wish to eat, and more (Rethinkers, 2008). Because of the destruction of their school, students became involved in recreating their school as a special place. Another example is the Vernonia community and school district in Oregon, whose school was destroyed in a flood. They are currently engaged in an effort to recreate their school as a center of their community.

One way to incorporate the place-based principle of small worlds is in the design of permaculture gardens, native gardens, or simply organic food gardens either on the school campus or in a community garden. Permaculture provides the most complete way of developing a *small world* as it contains a set of principles for designing gardens to mimic eco-systems. Rather than a monoculture, permaculture duplicates through design

the ways that plants and animals in ecosystems provide nourishment and services for one another. A permaculture garden becomes a place to study *small worlds* and human interaction and impact upon those worlds.

Hunting and gathering can also be facilitated through the creation of garden spaces and the supplementing of school lunches with food grown on school grounds (Briggs, 2005; M. Stone, 2005, 2009; Waters, 2005). Students could also visit local organic farms to gather produce and form relationships with local farmers. Students could also take field trips to do wild harvesting, learning about edible plants and their medicinal uses. Students could make cough syrup from cottonwood buds or salves from a variety of plants. This allows for both culinary, health and science connections. These are a few of the ways that we can apply Sobel's (2004) place-based principles with older students. By altering our thinking we can deeply change the way that we educate and align our teaching and learning to sustainability.

Learning to be Where We Are: Transformative Pedagogy for Transformative Learning

In this section I present the principles, themes, philosophical underpinnings, and reasons that Place-Based Education (PBE) is essential to schooling in the ecozoic era. David Sobel (2004) gives an inclusive definition of PBE that shows how this pedagogy is grounded in ecological thinking and essential to sustainability:

Place-based education is the process of using community and the environment as a starting point to teach concepts in language arts, social studies, science, and other subjects across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates heightened commitment to serving as active, contributing citizens. Community vitality and environmental quality are improved

through the active engagement of local citizens, community organizations, and environmental resources in the life of the school. (p. 7)

PBE is connected to ideas of localism and interdependence between people and the more-than-human world. It is grounded in diversity—both within a set locale and between places. It builds upon and fosters human adaptability. It is a study and preservation of *the commons*. The commons is our social and natural capital, which are under continual threat of reduction or elimination by global capitalism. Bowers (2005) considers the commons essential to preserve, as it is those relationships and systems grounded in the commons that contribute to the wellbeing of community and have not been commodified by the capitalist-industrial system. As such, place-based education is a counter to the homogenizing influence of globalization that is undermining communities and destroying human and biological diversity. “Finally, an education in place must be an education in ethics” (Gruenewald & Smith, 2008, p. xii). PBE is a pedagogy that touches on all the aspects of EfS described earlier in Figure 2.

PBE binds students to their communities and helps bond the community to its schools by asking “all mature citizens to take responsibility for inducting children and youth into the obligations and possibilities of adulthood” (G. A. Smith & Sobel, 2010, p. 23). PBE asks older students to become mentors to younger students and requires teachers to move outside their individual subject areas. Place is a source for teaching all subjects, serves as an organizing theme for curricular integration, and synthesizes teaching and learning.

Kehrberg (cited in Knapp, 2008) points out that “Place-based education is a broad term that refers not only to a method of teaching, but a growing movement to redefine

schooling, and a theory about how we should view education. Therefore developing one simple definition for this term proves difficult” (p. 7). While there are varying definitions of PBE, a common thread is the importance of meaningful integrated learning rooted in the larger communities and places of which schools are a part.

There are innumerable reasons to implement a place-based pedagogy. We know that education as it is currently configured is failing in several measurements. For example, children report feeling alienated in school and from the work in school. Too many districts have 50% dropout rates. Successful graduates are encouraged to participate in an unsustainable social and economic system that is destroying land bases and communities. Trying something different holds great opportunity and carries little risk.

PBE brings together economy, ecology, society, self-expression, and aesthetic/spiritual/ethical components in a unique way. It offers opportunities for students to act in their communities, to develop self-expression and to practice ethics. It creates opportunities for studies of local communities. In 2002, Gregory Smith studied a number of schools that were experimenting with place-based learning. These examples showed a higher level of student involvement and achievement. He pointed out that we know that traditional methods have alienated a large number of students. He shows that by focusing on the places and communities in which students live, students become more engaged in learning as they discover a meaningful place of service in the world by connecting school learning to the greater community. While the research is often anecdotal, the evidence is conclusive that individuals that are taught PBE are more engaged and achieve better on

traditional forms of measurement (Gruenewald & Smith, 2008; G. A. Smith, 2002; G. A. Smith & Sobel, 2010; Sobel, 2004).

In the deepest sense place-based education is not new; it traces its roots to past efforts to make schooling less abstract and isolated from the communities in which it occurs. Before the advent of formal schooling people always learned in a place-based context, from indigenous learning based on the needs of the tribe to apprenticeships in the trades. As formal schooling took the place of these more traditional educational settings and techniques, John Dewey (1938/1997) warned of the disconnect between school and community and advocated for schools that were grounded in the experiences of children. Dewey created the Lab school to link hands-on vocational experiences to academic subjects. Learning tied to place is also grounded in the ideas of project based learning, a pedagogy in which students take-on meaningful projects as a way of synthesizing learning in context and in community (G. A. Smith & Sobel, 2010).

David Orr (2005) cites Thoreau as one of the original place-based educators. At Walden Pond, Thoreau blended science, philosophy, geology, economics, history, and a kind of spiritual psychology into the study of simplification through grounding in place. Orr also credits Lewis Mumford's regional survey as an antecedent to PBE, which is described as:

Not something to be added to an already over-crowded curriculum. It is rather the backbone of a drastically revised method of study, in which every aspect of the sciences and the arts is *ecologically* [emphasis added] related from the bottom up, in which they connect directly and constantly in the student's experience of his region and community. (pp. 89-90)

Despite strong historical pedagogical roots, contemporary PBE is overlooked.

David Orr (2005) offers three reasons for this oversight. First, he argues that we tend to

undervalue those things that are most immediate. For example, residents of Washington, DC might undervalue visiting the Smithsonian Museum because it is most immediate. Second, Orr points out that we are a displaced people. We live our lives in a series of no-places such as the mall, the office, the condominium, the airport, and other components of *homogenized development*. Finally Orr observes that our mode of thought is increasingly abstract. We are disconnected from many basic aspects of life, ranging from the origins of our food to the origins of the energy that provides our heat. In addition to this list the study of place is a rebellion against the construct of modernity (Pyle, 2008). The art of living well in the places we inhabit goes against the efforts of the corporate imperative to displace and shatter communal bonds (Bowers, 2001; Sale, 1996). Community and ecological sustainability exist outside the current consumptive world economy.

G. A. Smith and Sobel (2010) note several common misconceptions about place-based learning that conspire against implementation. For example, teachers who are already extraordinarily over-burdened with frequently changing standards, curriculum, and methodologies are often resistant to yet more *add-ons*. G. A. Smith and Sobel argue that PBE is not another add-on, and that instead it is a new way of thinking about our educational mission and schools' role in society. Closely related to this misconception is the idea that PBE will require more time and energy for teachers to implement. To the contrary, research by G. A. Smith and Sobel (2010) indicate that PBE asks teachers to prepare differently, not more. Teachers who have embraced PBE have reported being invigorated rather than drained by these changes.

Another area of some resistance identified by G. A. Smith and Sobel (2010) is that place-based education is often perceived as environmental education by a different name. They posit that an important re-conceptualization relates to the fact that PBE is actually more than environmental education and includes social and economic aspects. While investigation of local ecology is an essential component of PBE, so is the study of local economies and diverse local cultures. Place-based learning is about connecting to local history and leveraging the application of math and science to solve community problems. In short it involves using all the environments that students inhabit as subjects for teaching and learning. A final misconception is that PBE is best suited for rural communities. Nonetheless place-based teaching and learning is being applied in a broad range of communities—urban, rural, liberal, and conservative (G. Smith & Williams, 1999; G. A. Smith, 2002; G. A. Smith & Sobel, 2010).

Themes and Principles of Place-Based Education

G. A. Smith (2002) identifies five thematic patterns of place-based education: cultural studies, nature studies, real world problem solving, internships and entrepreneurial opportunities, and induction into community processes. The examples he uses to highlight these patterns are compelling and cover a broad range of age groups from the lower grades to high school and diverse locales ranging from Appalachia to Alaska. Students engaged in PBE become active members of their community and true users of knowledge rather than merely receptacles for abstract national standards.

While G. A. Smith has conveniently separated these themes for educational leaders and thinkers, there are innumerable potential overlaps whereby these themes interweave to support a deeper level of engagement and thinking on the part of the

students. By linking our curriculum to these dynamic interconnected themes, teaching and learning can become far more integrated and connections between subject areas can be strengthened.

As students engage in cultural studies through interviews with older community members, they can also learn about and contribute to the economics of their area.

Students in Alaska who worked on a project to create a website learned about their native heritage as they conducted interviews and also compiled that information in a way that could be useful in strengthening potential tourist income. These students combined knowledge of place in a historical/cultural context and became part of real world problem solving as a way of facilitating tourism and bringing needed income to their community (G. A. Smith, 2002). Students in Edcouch-Elsa, Texas worked on a local oral history project and strengthened community connections as people learned of the diversity of their history. What began as a history program resulted in many other community projects that revitalized economic, social and cultural life. It also improved the number of the school's students who went to college, many of whom returned to contribute to the community (Tompkins, 2008).

G. A. Smith (2002) notes that another common element of PBE is nature studies. We are all embedded in a local biome. We are also dependent upon that biome for our wellbeing. Yet the study of local nature is rarely a part of school curriculum, as textbooks abstract the study of nature to distant places (Sobel, 2004). Following principles of PBE, students from the Environmental Middle School in Portland (G. Smith & Williams, 1999; G. A. Smith, 2002) to the Brookside School in suburban Marin county (M. Stone & Barlow, 2005) are getting outside their own schools to study local eco-systems and

understand how their communities fit into the places they inhabit and how they can act to preserve local habitats.

Another theme, induction into community process, could also be termed *initiation* into the adult community. Our community is a democratic one. Rather than reading the abstract principles of democracy in a dry textbook, G. A. Smith (2002) cites an example of fifth grade students in Seaside, Oregon who became involved in the selection of sites for additional playground equipment. They visited all the county parks and prepared a report and presentation for the county commissioners. They gave county administrators a *child's-eye view* and recommended more equipment for primary and preschool children. This type of education involves active learning about our democratic processes.

Many communities struggle with their best and brightest students leaving their community. By providing internships and entrepreneurial opportunities for students, place-based education benefits both students and their communities. Students at the Media Academy at Fremont High School in Oakland, California, have interned at local newspapers, researched and written their own stories for publication, and along the way discovered opportunities for meaningful employment in their local communities (Smith 2002). From Maine to South Dakota to Texas to Alaska, teachers and students have discovered that connections to local business strengthen individual student learning and local communities as young people find reasons and ways to put their talents to work at home (Gruenewald & Smith, 2008).

A high school calculus class, also in Seaside, assisted emergency planners in Tsunami preparation, thus applying their advanced math in a real world problem taking abstract classroom learning into the world (G. A. Smith, 2002). This is an example of

engaging in community processes with city planners, experiencing the applied use of calculus, and contributing to real world problem solving. Preparing this report also involves the use of social studies, language arts, science and math. I have personally involved students in the creation of native gardens and in city environmental restoration projects. Students interwove plant identification and ecological relationships with historical work determining why restoration was needed. They also got the hands-on experience and satisfaction of planting trees and bushes. These stories show that we are likely to facilitate engagement in far more of our students. To support PBE experiences, schools and the educational establishment must overcome the status quo. As a corollary, place-based education is a tool for changing the status quo.

Merely reforming schools will not satisfactorily meet the new challenges we face as a society. The challenges we face are unprecedented and demand a transformative mission for schools. Ecological thinking moves us beyond environmental thinking. Place-based education provides a pedagogical framework and set of principles to incorporate ecological thinking into our schools and begin the transformative process of education for sustainability. In the following chapter, I develop the design of high schools for the ecozoic era based on ecological thinking and education for sustainability. Drawing upon my experience as a teacher in Portland Public Schools (PPS) for the previous 15 years, I illustrate how an ecological sustainability focus can bring transformative change to curriculum, structure, and the design of school buildings, which can serve as educational texts for this transformation.

Chapter V

Toward Ecological Thinking in Design and Practice

In this chapter I examine the interrelationships between building design, food, career connections, and curriculum and their importance to education for sustainability. Education for sustainability calls for a reconnection with our children to the communities in which they live and this chapter shows how we can and are making the traditional barriers between schools and their communities more permeable. Our food, our school buildings, our thinking about future careers are all linked together in this chapter as I work to provide a model for transformative change in this chapter.

High School Design and Curriculum

Buildings account for nearly 33% of the total energy used in the United States, as well as 66% of electricity. School construction is the largest construction sector in the country accounting for \$37.5 billion in 2008 (National Clearinghouse for Educational Facilities, 2010). As new overall construction is greatly reduced during the current global recession, school construction as a percentage of total building is likely to increase. At this time, rethinking the way that we build schools can have a ripple effect throughout the economy and in the building sector. Rethinking school design will also directly impact the lives and learning of children. This can be a major part of transforming our society toward a sustainable ecological orientation, and can become the platform upon which students' education is built. Beyond the need for curriculum that will foster the creation of an ecologically durable society, we need places that reinforce principles of

sustainability. Figure 4 depicts high school sustainability as articulated in this chapter through design and curriculum. Two areas of design are considered, specifically the building itself and the school cafeteria. Curriculum is explored specifically through the career pathways and social studies curriculum. The high school system is nested within the larger community. The dotted lines represent permeable school walls that open doorways between school and community. The multidirectional arrows indicate that each focus area contributes to each of the others via symbiotic relationships.

*Figure 4.*High school sustainability design and curriculum.

Building Design

School design is part of the hidden curriculum. The uniform, placeless design of a vast majority of schools communicates a message that where we are is unimportant and no different from any other place. Conventional building design implies that energy is cheap and abundant, can be squandered, and the costs of energy exploitation in other communities and in nature does not need to be taken into account. Rarely in our current building do students learn about materials used in construction, about how these materials were gathered or if any harm may have ensued, and where or how those materials will eventually be discarded. In sum, building design implicitly teaches disconnection (Orr, 2004b). While valuable implicit learning can occur in schools designed from an ecologically centered perspective, building design that makes learning explicit is preferred.

It is entirely possible to make the physical structure of schools part of the teaching and learning toward the creation of a sustainable society. School design can be made to be a visible part of the curriculum that teaches that we are a part of the world and not separate from it. We can take a realistic look at what the future holds for coming generations and create buildings whose life cycles can extend for 60 years or more and will help to inform students about human interaction with the world. David Orr (2004a, 2004b) recounts the story of how he and students worked with a team of designers and builders to accomplish this in the creation of the Environmental Science Center at Oberlin College. The building filters both air and water so that both exit the building cleaner than they entered. It also produces much of its own energy needs and uses passive solar to reduce those needs.

Rather than separating schools from the rest of the world, we can design schools that are nested within human and biotic communities. To illustrate this possibility, in this section I draw upon schools and districts that have made some of their schools more ecologically friendly. Embracing ecological thinking, school buildings become part of the educational process starting at the design stage. By turning the building into a piece of visible education we can model how communities are networks in which schools are nested. Following Capra's (2002) ecological principles, schools would include the study of networks, nested systems, cycles, flows, development, and dynamic balance. Making schools part of the curriculum has the additional benefit of reducing the tendency for the young to take for granted the world as they find it. They can begin to both appreciate and critically examine the choices made. The following examples outline what this might look like if applied to school design.

As we consider the creation of new schools or the remodeling and retrofitting of older buildings, school building design can be integrated into the curriculum to imbue an understanding that life changes over time. For example, as more efficient designs become available, students can be made aware of the options and why certain choices are made, and in some cases may themselves be able to actualize the selection and implementation of improvements to the building itself. Likewise students can be involved in landscape design, determining how the landscape can support the ecology of place. In doing so, landscape will also change over time as students become involved with relevant choices. Students, as a result, would experience school as part of a dynamic balance in partnership with the local ecology and community; the school and school grounds would be part and parcel of the educational experience ranging from democratic decision making to

architectural design. The structure of the building can be made in such a way that it feels nested within the place and community where it will exist. To achieve this aim the materials should be as local as possible. The architecture should allow it to fit within its regional geography and local landscape. It should flow with its environment in such a way as to invite the outdoors in and encourage students on the inside to connect with the outside world. It should be a part of the cyclical flow of air and water using natural cooling and heating as much as possible and ensuring that any water exiting the building leaves as clean as it entered. Rainwater should be collected for both internal and external use.

Rosa Parks Elementary School in Portland, Oregon, met a number of these goals in 2007 (Anderson, 2009). Rosa Parks Elementary is clearly nested within a community: it houses both a Boys and Girls Club and a Parks and Recreation Community Center. The school is specifically intended to be a hub for the revitalization of a neighborhood long mired in poverty. The school was designed by a local architecture firm and has won several awards. One award was designated for schools as *Centers of Community*. Rosa Parks sets a precedent for community design principles that can be built upon and extended in the future. It is also a LEED (Leadership in Energy and Environmental Design) gold certified building. LEED for Schools and the Collaborative for High Performance Schools (CHPS) are the two best-known programs for certifying *green design* for schools (National Clearinghouse for Educational Facilities, 2010). Both are based on a point system for various building attributes, including health of occupants, aesthetics, efficiency, maintenance, site selection, and more. In the LEED rating system, about half the points awarded by both programs are based on analysis of energy

efficiency and indoor air quality; another quarter of points awarded come from consideration of construction and materials used, site selection, wastewater management and transportation access. The greater the total number of points accumulated the higher the certification level (United States Green Building Council, 2008).

While the Rosa Parks school design is commendable, it also demonstrates how much more progress is possible. The building only achieved two points on a five-point scale for water efficiency. Additionally, it received 6 out of 17 and 6 out of 13 points for its scores in energy and atmosphere category and materials and resources category respectively. A gold LEED rating is an excellent start, but it is possible to improve by increasing the percentage of materials manufactured regionally and reducing energy use (United States Green Building Council, 2008).

The Vernonia School District, located about 50 miles west of Portland, is an example of how ecological design can serve as a beginning point for deep community change. A flood devastated the schools of Vernonia in 2007 and the life of the small community was threatened. In an affirming story that shows how schools can become central to community life and a learning device for all, large portions of the Vernonia community and the students have become part of the design of a new k-12 school. They hope to have a new k-12 school that reaches the LEED Platinum standard. To do this the entire community has become involved in the design and rebuilding of the school. One only need look at the public meeting notes (Vernonia City Government Meeting Notes, 2010) or the local paper to witness the high level of community involvement and level of concern for sustainability issues (Laird, 2009). As part of a holistic ecological design, the building will use timber cleared from the site and a cistern for collecting rainwater. A

filtration system will be on display for students to learn about re-using storm water. The school's curriculum is being adjusted to focus on natural resource issues and water quality. Students are already involved in the creation of native plant nurseries that will both be a source for learning and a part of the landscaping. The orientation of the school will maximize natural lighting and solar panels will provide energy to the super-insulated building. The school will perform 66% better in terms of total energy efficiency and over the life of the building this will allow significantly more money to be allocated to education than running the building (Bennet, 2010).

At Northfield Mount Hermon School in Massachusetts students can access real time resource use from the own computers. Willow School in New Jersey has signs posted around the school telling students and visitors what parts of the building were made from recycled materials. The Willow School also became a source of education for the entire community as its wastewater design system became a model for other buildings in the community (M. Stone, 2009).

The tension between historical preservation and sustainability can also become a part of change in both school and communities. The Darrow School in New Lebanon, New York, serves as an example of how this tension has become part of the educational dialogue at the school. Through that dialogue came a set of sustainability indicators that are used to orient faculty and provide learning benchmarks for graduates. One of the concrete design steps taken was to create a *Living Machine* to treat the school's wastewater. The Living Machine ends in a fishpond stocked with healthy koi and frogs that confirms that the water is ready to reenter the Hudson River. The school uses the facility as a teaching lab to supplement understanding of biology and ecology for both its

own students and for outside organizations (M. Stone, 2009). Another example of how school building can be an essential part of learning is the *Green Cup Challenge* (The Green Cup Alliance, 2011). Schools participating in this challenge use energy audits to document a baseline energy usage from which they compete with other schools in their region. The building becomes a conservation teaching tool (M. Stone, 2009).

Conservation, especially in existing schools, is important, but our future schools should be largely powered by solar and/or wind energy. We can go even further and make schools net energy producers. Production of waste relies upon the idea that there is some place *away* to dispose of unwanted materials. Our schools should therefore produce and discharge no waste as a way of interrogating this ecologically problematic idea. Because original forests have largely been harvested, we will need to use wood that has either been reclaimed from previous building or logged according to certified sustainable forest practices. Whereas we are interested in creating a more just world and wish our students to participate in that creation, we must ensure that the materials we use were not taken from other people's land without fair compensation. These materials should also not be hazardous to manufacture or dispose of, and made to be recyclable or capable of decomposing into healthy soil. Since so much valuable farmland has already been paved for development we must use reclaimed land and repair whatever damage is caused by construction. The landscaping should also function as a teaching tool for either food creation or naturescaping, a method of landscaping that encourages coexistence between people and nature, thus modeling the preservation of biodiversity and the integration of human needs into the landscape.

Focus on building design surfaces the integration of various academic fields and hands-on practices, ranging from architecture to accounting, and including landscaping, biology, building, and energy analysis. Such a focus turns on its head traditional economics. It reverses the calculating for short-term costs and discounting of the future to long-term cost accounting. It encourages spending more for labor and planning and less on resources and energy. Our current method of accepted school design generally speaking involves pursuing the lowest cost now with little or no attention paid to the hidden longer-term costs of the building. This is non-ecological thinking, which solves for one problem, while creating other problems down the line such as additional costs and energy use. “For every dollar you put in to move toward grid neutrality or higher energy efficiency,” says California State Architect David Thorman (as cited in M. Stone, 2009), “you’re going to save ten to twenty dollars on the operating side over time” (p. 70). Moreover, since costs of fossil fuels are almost certain to increase, these savings could well increase by sizeable amounts.

Many positive discoveries have been associated with ecologically designed buildings. For example, the health of students and faculty has shown improvement even in neighborhoods with previously high incidents of environmentally related illnesses such as asthma (M. Stone, 2009). In some cases, there has been a noticeable decrease in student and faculty absences. The buildings, if used as teaching tools, have increased student knowledge of a variety of subjects and test scores have risen. Students show increased ethical understanding and have applied those new understandings in their school and lives. As the design and building processes have involved teams from the community, connections between the community and school have been strengthened (M.

Stone, 2009). Because ecologically designed buildings and related learning are still the exception and quite new, data is preliminary and further research is needed as new schools are built according to ecological principles.

David Orr (1997, 2004a, 2004b) argues that the disconnection of current school architecture from ecology and community teaches that hope for change is wishful thinking abstracted from the *real world*. He lists the following hard lessons and skills that students will need to learn in order to live sustainably in the future:

1. Powering civilization by current sunlight; reducing the amount of material, water, and land use per capita
2. Growing food and fiber sustainably
3. Disinventing the concept of waste
4. Preserving biological diversity
5. Restoring ecologies ruined in the past century
6. Rethinking the political basis of modern society
7. Developing economies that can be sustained within the limits of nature
8. Distributing wealth fairly within and between generations. (Orr, 1997, p. 600)

We can aid students in facing these tasks by providing models of these ideas within the architecture of schools and by involving community members in the design and building of our schools.

The School Cafeteria

An excellent example of connection to ecology is food, where we get our food, and what foods we eat. Unfortunately most school cafeterias and students are victims of a dysfunctional national system that feeds the excess of an industrial food economy. A recent example illustrating this dysfunction was the flow of surplus pork to schools during concern over the H1N1 flu virus (Pollan, 2009b). The meat was not distributed to schools out of concern for a lack of protein in students' diets, but rather in response to a rapid and significant decline in national pork sales. This is the usual state of affairs. We

usually find surplus/subsidized agricultural commodities in the school cafeteria (Pollan, 2009b).

A combination of factors has contributed to the industrialization of the food system. In part it has been an expression of technological developments—bigger tractors and industrial modes of food production have forced huge economies of scale and pressured family farms to close. Additional capital pressures were introduced via the Green Revolution, which committed farmers to huge inputs of fertilizers while increasing short-term yields. Increase in crop yields came at the expense of soil health due to the elimination of crop rotation practices and overuse of artificial fertilizers and pesticides; this condition in turn necessitated the increased usage of pesticides as weed growth accelerated as a consequence of declining soil health. The creation of refrigerated transport allowed movement of food over vast distances. At present, rather than coming from local sources, food travels an average of 1,500 miles from farm to table. Finally efforts to stabilize food prices for farmers have turned food into a commodity. Collectively these factors have contributed to the modern farm being run much more like a factory and further divorced farms from their local ecologies (W. Berry, 2005; Manning, 2005; Pollan, 2007). As farms have been consolidated to serve huge industrial food corporations such as Cargill, Archer Daniels Midland, and Monsanto, the focus has turned to optimization of profits rather than the health of people and local communities. All of the above activities are the kind of *bad solutions* that Wendell Berry (2005) points out cause a new set of problems.

Pollan (2009a, 2009b) posits that many of our agricultural policies are grounded in the experience of the Depression and the industrialization of the food system. During

the Depression many people were undernourished. As a result the government prioritized cheap production and distribution of calories, mostly in the form of corn. This has been an enormous success. There are hundreds of corn-based processed foods available to consumers and schools. American consumers and school cafeterias can cheaply access calories. However, after a certain point, calories and health are no longer positively linked. The Center for Disease Control (2007) estimates that 30-40% of all children born in the United States in 2000 will develop diabetes, likely resulting in shorter lives. The meals children receive at school are a result of long-term national food policy. Processed food with corn-based additives and preservatives is shipped to schools from vast distances, and children are disconnected from learning about how food is grown (Jirka & Sneed, 2007). Meanwhile, health classes are abstracted from the experience of eating as if the two topics were unrelated. Schools teach *about* health while providing unhealthy food and snacks. The subtext is a harmful hypocrisy that reinforces the idea that problems are to be talked about, but not really solved. This is a moral failure that will add extraordinary economic costs to an already costly healthcare system.

Our schools need to be redesigned as integral, nested parts of the local food and health system. Efforts by the Center for Ecoliteracy (CEL) in Berkeley, California have incorporated ecologically thinking and sustainability into school cafeterias. The CEL works with chef and food activist Alice Waters to support garden-based learning at Martin Luther King Middle School. The school works in a whole-system way to create an ecological education curriculum through the school lunch program. The Edible School Yard (ESY) provides opportunities for all students to work in the garden and have cooking classes. Students are learning about gardening and making connections between

their health and fresh locally grown produce. The lessons have blended science, foreign language, and math (M. Stone & Barlow, 2005).

Studying how food gets from seed to table provides opportunities to investigate fundamental natural and ecological processes such as energy flows, nutrient cycles, and how one organism's waste becomes another's food. It also creates opportunities for learning about larger human systems and the relationships between education, agriculture, and economic, social and political institutions and processes. A study by Harvard Medical School commissioned by the CEL found greater gains in ecological understanding and greater overall academic progress among students at the ESY than in comparable non-ESY schools. Teachers at the ESY reported better behavior in class and that students with the greatest gains were also eating more fruits and vegetables (Stone & Barlow, 2005).

Schools do not exist in isolation; they are nested within districts, communities, food systems, and bioregions, all of which are nested within larger national and global economies. Cognizant of this, CEL took ecological thinking and principles to the next level by engaging the entire Berkeley school district. As a result, parents and the CEL pushed the district to adopt the first district-wide school food policy in the United States.

Among the food policy's goals were:

to ensure that no student in Berkeley is hungry...provide nutritious, fresh, tasty, locally grown food that reflects Berkeley's cultural diversity...ensure that food served shall be organic to the maximum extent possible...maximize the reduction of waste by recycling, reusing, composting, and purchasing recycled products. (M. Stone & Barlow, 2005, pp. 234-235)

In partnership with the future mayor of Berkeley, they worked to create enforcement and reporting procedures to monitor progress toward achieving these goals. When it was

noticed that it was cheaper to buy imported apricots from Turkey while local apricot orchards were becoming unprofitable and being bulldozed, questions arose about how local could best be supported. There was no school mechanism for giving priority to local produce in purchasing decisions. Small farms are being pushed out of business, while school food dollars are supporting mass agribusiness. While the question of how schools can support local human-scale diverse food systems is an on-going question, there are now five counties in California incorporating both urban and rural networks of food service directors, educators, farmers, and community-based organizations working together to address these and other questions and model sustainability in schools (M. Stone & Barlow, 2005). Harvest of the Month (California Department of Public Health, 2007) has created a network for collaboration between educators, nutritionists, parents, media outlets and retailers to provide healthy food, and curriculum to allow students hands-on opportunities to create school gardens throughout California.

There are a number of local initiatives in Portland, Oregon working to put food on the agenda as a way to promote health, connectedness, and sustainability. Portland Public Schools (PPS) is among a number of school districts that have begun to make changes to the kind of foods served in schools. In 2006 PPS banned soda from vending machines and reduced the portions of French fries and cookies in high schools. Abernethy Elementary went significantly further by creating the *Garden of Wonders*, which provides food for the cafeteria directly from the school's garden and has become part of the curriculum. Modeled after Berkeley's Edible School Yard project, the district initiated a *scratch kitchen* where food was cooked on site. Research has indicated that students engaged in this hands-on, place-based, garden-based, ecological learning have

dramatically improved their science test scores and understanding of healthy eating choices (Klemmer, Waliczek & Zajicek, 2005; Skelly & Zajicek, 1998). These and other programs are modeling ecological and place-based learning through connecting to community, local farmers, and parental involvement.

Rethink New Orleans (RNO) is a group of community organizers, artists, architects, media experts, educators, and middle school students that came together following the devastation of Hurricane Katrina. As this organization began to meet and ask questions about how to redesign New Orleans schools after the hurricane, it was the students that decided to focus on school food and the cafeterias. The recommendations they came up with join healthy eating with local economies and holistic school design. Students recommended more local fresh foods—a healthier idea for them and local farmers. Students suggested that school designs include space for outdoor vegetable gardens, cafeterias that “adults would like to eat in,” and a sink for washing hands. They also included sustainability recommendations such as composting, and elimination of Styrofoam trays and sporks. In this way the cafeteria is also designed to teach about sustainability, aesthetics, and life cycles. Students felt that eating should be a socially connecting experience, not like trough feeding stockyard cattle; noting that the time allotted for lunch was inadequate they requested more time to enjoy their lunch and their friends (Rethink, 2008). These initiatives include involving students in the architectural design of the schools.

From Maine to Florida to Washington schools are beginning to view school food through the lens of ecology and place. Schools linked up with local growers in Florida in a program to both provide healthy fresh, locally produce to students and reliable market

for local farmers, creating a win-win situation in which children gained access to healthy food and economically struggling farmers gained access to a sizable market. On Lopez Island, Washington, schools have teamed up with local growers to learn about *Island Intelligence* bringing community and schools together with monthly dinners hosted at the school with the goal to “provide seasonal organic produce for hungry people, support local farmers, publicize the Lopez Island farm-to-school program and strengthen connections between the school and the community” (M. Stone, 2009, p. 46). Because of its success, Lopez Island Farm Education project expanded to include a greenhouse at the school with a paid position to create a farm-to-school program and a Green Building design class, which as partnered with the Lopez Island Land Trust to build affordable housing (M. Stone, 2009).

In Belfast, Maine, middle school students at Troy Howard Middle School are providing year-round produce in a town where temperatures drop to -10 in the winter. Students researched greenhouse design and were able to build a greenhouse that needed no supplemental heating. They have used this project to integrate math, social science, and science goals into their garden curriculum. Students have also created their own business enterprises that now support the entire garden program excepting the teacher’s salary. They donate food to a local food bank and coordinate their efforts so as not to impact the sales of local businesses. The stated purpose of the program is “to grow academically empowered, successful young people who integrate sustainability into their lives by producing and learning to satisfy their needs locally” (Stone, 2009, p. 36).

Many of the current and growing lists of examples of school food reform have been at the k-8 level. These examples exemplify ways in which food systems can be

planned and developed. The CEL addresses 10 food systems themes that include: food policy, curriculum integration, food and health, finances, facilities design, the dining experience, professional development, waste management, and marketing and communication (M. Stone, 2009). Change can begin at any one of these 10 points as the themes are interconnected. Working on one theme will lead to work on other points. The key is to enter where one has identified group interests, resources, opportunities, and understandings. CEL partnered with the University of California for a research study that showed that these efforts have had a positive benefit in students' nutritional knowledge, food choices, and overall health (Rauzon, Wang, Struder, & Crawford, 2010). Some of the lessons learned through these programs have included: serving healthy food results in students who are more attentive in the classroom and improvement in test scores; when offered healthy food alternatives that they have been involved in growing, students choose better diets; community support and involvement contributes greatly to success; rather than being an *add-on* teachers can use garden based study to meet subject area standards; lasting reform takes coordination and policy changes and can involve everyone from the federal government to the food service employees (M. Stone, 2009; Rauzon et al., 2010).

These examples need to become the norm rather than the exception both for the immediate health of students and the long term need for local food economies. Building on these examples, high schools can replicate some of these developments and tailor them in age-appropriate ways to include healthy food choices in high school cafeterias and career pathways. Changing the way schools approach food requires much time and

effort, but the change is necessary. Nesting our schools within local ecologies and economies will ground our schools in place and sustainability.

In the following two sections, I address how Career Pathways and Social Studies Curriculum can designed for sustainability. I have developed a model in Figure 5 to highlight the discussions that follow.

Figure 5. High School Curriculum Design for Sustainability

Examining Career Pathways Through the Lens of Place-Based Education and Sustainability

In this section I link the ideas of place-based education (PBE) and education for sustainability with career learning pathways in high schools to illustrate one way of

providing a meaningful context for student learning. Career pathways or career clusters are being implemented in a variety of ways across the United States from Arkansas to Pennsylvania to Michigan to Oregon. While there are differences from state to state, there are significant similarities. With an extensive push to connect high school students to careers and employment, the credit requirements for career pathways will likely increase. In Oregon there has been suggestion of requiring up to three career pathway credits. While this specific suggestion has been placed on hold, the conversation about implementing goals related to career pathways is still vibrant. Linking the career pathways to place-based learning allows for concrete community connections between school, economics, and sustainability.

The career pathways initiative was launched by the state of Oregon based upon the recognition that many potential well paying mid-level careers existed that required more than a high school diploma but less than a four-year university degree. The idea of the pathways project was to ease the transition between high school and community college and other training programs for these types of jobs. As young people see the requirements for these various careers, the goal of the pathways project is to enable students to envision and plan steps to take to match their interests with future employment. While the practical component of the pathways project appeals to the necessity of finding suitable employment and serves as a positive counterpoint to the abstract nature of schooling for many students decried by Dewey (1938/1997), schools are overly focused on training students to fit into the existing economy. The pathways project is currently an expression of this trend. To counter this, students can be linked to future careers as part of the transformation of the educational mission for the ecozoic era.

Using place-based ideas and focusing on transformational green careers, we can provide students with ways of thinking about the need to find meaningful and well paying careers that are truly sustainable and grounded in sustainable communities. In light of the ecological crisis we face, all careers must be grounded in sustainability.

In what follows, I focus upon career pathways as they have been outlined in the state of Oregon, yet the proposals I offer can be used anywhere, even in states in which the pathways program has not yet been formally adopted. I specifically illustrate ways in which education for sustainability and place-based education can be integrated at both the introductory and advanced levels of participation in the following six career pathways identified by the state of Oregon:

1. Arts and Communication
2. Business and Management Systems
3. Health Services
4. Human Resources
5. Industrial Engineering
6. Natural Resources

I explore the pathways one-by-one and provide examples of application through the lens of PBE and sustainability. Continuing in the form of auto-ethnography and narrative scholarship, I draw upon the work of other scholars, teachers, and communities, as well as from my own experience. I also provide suggestions that others might use to further develop their own ideas. The purpose is to provide an outline rather than a single prescriptive approach as the kinds of changes discussed must be adaptable to the communities in which they occur.

Arts and Communication

All careers require effective communication. Likewise, self-expression is an essential part of psychological wellbeing, cultural sustainability, and communal health, as discussed in relation to the EfS model presented in chapter 2. Many career pathways involve using a variety of means to communicate. Recognizing the role of self-expression in sustainability, it is important that all students have ample opportunities to enhance their ability to communicate and receive access to an array of different media tools. Arts and communication may be incorporated into the language arts classroom. One quarter of the required year of freshman language arts could be adjusted to focus on introducing students to the arts and communications pathway. The specialist Arts and Communication teacher could team teach with the language arts teacher for that quarter of the year, allowing the school to serve four language arts classes during the course of one academic year. A second quarter of freshman language arts classes could be devoted to appreciation of the arts. Students could be taken on field trips to see plays, hear music, and visit art galleries. Students would be encouraged to perceive Arts and Communication as broad-based and not limited to fine and performing arts.

Considering the nature of the arts in the creation of healthy sustainable communities where human situations, emotions, and aesthetics are portrayed and expressed, students can be given opportunities for meaningful connection to place and application of the Arts and Communication career pathway. To deepen the level of student appreciation developed during the freshman year, more innovative volunteer opportunities and pathways to credit can be created that involve attendance at plays, concerts, gallery events, and back stage internships. Using technology as a practically

applicable medium for Arts and Communication, students could network with the community via internships with graphic artists or software companies. Students could, for example, work with local businesses to create cards and logos, giving priority to businesses that are working to create a more just and sustainable world. Alternatively, students could explore community events and create informational flyers, or connect with community activist groups to publicize meetings, rallies, or other events.

Mark Graham (2008) argues that art is more than just individual expression; it is “a language for conversation about experience, a way to inquire about the world, even a way to change how we see the world and our relationship to it” (p. 30). Introducing students to the world of art involves maintaining essential aspects of our humanity intact. Graham uses art to engage students with the larger community. Engagement with the larger community is a critical component of PBE and education for sustainability. In an increasingly mechanistic school system compelled by an urge to measure everything, we need to be aware of and foster the development of all aspects of our human selves.

There are ample opportunities for community engagement for students who pursue more advanced courses in the Arts and Communication career pathway. Students studying the fine arts of drawing, painting, and photography can be encouraged to explore the places where they live and give expression to them. Students can use art to express the spiritual and emotional aspects of their communities and landscapes. Art can show the tensions that exist in our landscapes between the current unsustainable culture and needed changes toward a sustainable culture. Exploring these questions through art involves making complex connections between individual students and the places they

inhabit, and opens a door to ecological and relational thinking via the Arts and Communication career pathway.

Business and Management Systems

The Business and Management Systems career pathway is “for students who are interested in the real world marketplace of ideas, products and people” (PPS, 2011, para. 2). Career fields include finance, accounting, hospitality/tourism, information systems, marketing and management. Students in other career pathways might be encouraged to take a business management or entrepreneurial class, as many careers such as medicine or carpentry also require business skills. Despite explicit reference to the *real world* in the description of the Business and Management Systems career pathway, many of the themes remain abstract for 14-year-old freshman. For upper classmen this career pathway has much to offer in terms of linking place-based education and sustainability via green business careers.

One of the goals of place-based education is to reduce the level of abstraction that confronts students by grounding learning in place. In an effort to develop more resilient locally based economies learning about small businesses in the community is a good place for students to start. Since 1995 the Rural School and Community Trust has focused on using place-based ideas to connect schools to local economic, social, and business concerns (Bartsch, 2008; Tomkins, 2008). They find that “when students’ academic work is linked to the needs, issues, and community development imperatives of the local community, their level of engagement in both academics and community increases” (Bartsch, 2008, p. 69). The goal of such local problem-based projects dovetails

with those of teaching business and management skills—getting students to see that they are not merely consumers but also producers of goods and services.

Engaging students in their local communities creates a kind of social capital that increases community stability, resilience, and sustainability. As an example, in response to statistic detailing that in Maine during the 1990s the state lost an estimated 27,000 students to out-migration with only 37% of seniors enrolling in college, the Rural Trust engaged communities and schools in a variety of projects designed to increase student involvement in schools and communities. One such project was the Local Fisheries Knowledge Project, which was conducted in partnership with the National Oceanic and Atmospheric Administration (NOAA). This interdisciplinary project had students exploring and learning about the “connections between fisheries, marine environments, their communities, and their own lives by documenting and preserving the knowledge and experiences of local fishermen and others in marine-related industries” (Bartsch, 2008, p. 75). As students conducted over 100 interviews, they gathered and analyzed data and entered it into an online publically accessible database created by NOAA. As students learned about how decisions are made with regard to sustainable use of coastal and ocean resources, the community—which had hitherto harbored distrust toward NOAA—began to shift its views toward the agency and its decision-making processes. Teachers also noticed a change in students’ career aspirations as more of them realized the connection between education and securing reliable careers in marine sciences and management (Bartsch, 2008).

The work of Rural Trust in Howard, South Dakota, provides another example of linking the Business and Management Systems career pathway with communities via

place-based and sustainable thinking. One known aspect of economics is that money tends to flow out of rural and poorer urban communities; by contrast, the more money people spend locally rather than at large chain stores the greater the gain to the local community (Mander & Goldsmith, 1997). For the Howard community, the first step in improving local economic conditions was to involve teachers, students, and community members in formulating a working definition of a sustainable community. The group concluded that a sustainable community should first and foremost meet the basic needs of the people—which include food, water, shelter, clothing, and jobs—and that it should grow and develop within ecological limits. After deciding this, the next step was to get students out into the community in order to learn more about the place where they live and to create a resource center in the school. These activities broke through the traditional barrier between schools and communities from both directions (Tompkins, 2008). Students conducted a community cash flow study to investigate where people spent their money and their views of local businesses, later presented their findings to those businesses, including the desire of community members to have evening shopping hours and a local bank ATM. This information exchange resulted in a substantial shift in community buying patterns, increasing local business sales by 41%. Numerous other projects included building a community greenhouse, undertaking a school-wide study of cancer clusters, and establishing a community garden. These projects have been carried out using broad-based discussion and the community has developed a 10-year plan related to goals created in cooperation with Rural Trust, schools, and community members. Consequently, Miner County has been “selected by the Northwest Area Foundation as one of the places in the northern Great Plains that showed promise for

reducing poverty and developing a thriving economy” (Tompkins, 2008, p. 184). The example of the Howard community illustrates how schools and students can become resources for creating sustainable communities through local engagement.

Similar types of work are being undertaken in urban and suburban communities and schools (see G. A. Smith & Sobel, 2010). Like the rural Howard community described above, poorer urban communities also often experience cash outflow resulting in the collapse of local businesses. Urban schools can study thriving small businesses, meet with community members about addressing unmet needs, and help strengthen local and sustainable economies. While more economically prosperous communities may have different challenges and concerns, students can still become more involved in the real world betterment of the economic and social wellbeing of their local communities through surveying local businesses and attending and conducting meetings to share their findings. Through such activities, we begin to shift the view of schools as separate places toward valuable community resources that can create social capital and build resilient economies.

Finally, as future leaders and citizens, students can study businesses that have committed themselves to thriving within ecological limits. Students may investigate the businesses of the future and determine how local economies can be made more resilient and less dependent upon fossil fuels. While business practices have often been the sources of many ecological, social, and economic problems, they also offer great potential for constructive change (Hawken, 1993). Students in the Business and Management Systems career pathway can explore these possibilities in advanced classes

through partnering with and studying local businesses that are working on sustainability issues.

Health Services

The current definition of the Health Services career pathway targets “people who like to work with people or animals, have strong science and inquiry skills, [or] are interested in how the body works, and work well in teams” (PPS, 2011, para. 3). The current definition and career suggestions reflect a biased view of health as achieved through intervention and treatment of illness rather than a broader perspective that includes community and individual wellbeing. As an example of a contrasting perspective, the Iroquois do not view health/sickness in a dualistic manner, but rather as a continuum along which one is moving toward or away from health (Underwood, 2000). From this perspective, culinary programs are an essential component of a movement toward health. Viewed through the holistic lens of sustainability and place-based education, disparate career pathways become strongly linked. Since health begins with what we eat, exploration of the culinary arts serves as a bridge between the Health Services and Natural Resources career pathways. Building on the earlier discussion of sustainability, food, and cafeterias, it could also be possible to supplement cafeteria food through farm-to-school connections and collaboration with the Business and Management Systems career pathway. More significantly, high school cafeterias can be seen as the hub of a culinary pathway embedded within the Health Service career pathway. Food service can be part of the business end of the school district and part of teaching systems-based learning for students learning about the interconnections of economy, ecology, and society and embedded sustainable systems thinking. All of this

can be done while providing a viable option for students who may not be interested in a university education. Sustainability and ecological thinking cannot and should not be confined to the university student.

Another place-based and sustainability learning possibility in the realm of health would be the study of the school itself. In older buildings not designed according to green building principles, students could study air quality or research the materials embedded within the building that might compromise the health of students and teachers. They could research the costs of remediation as well. In a newer green building students could examine the qualities and design that positively affect the health of occupants. Students could also research the products used for cleaning and maintaining the building for toxicity and available alternatives.

In more advanced classes within the Health Services career pathway, students can conduct research concerning community health issues or speak with community health workers about the leading health problems in their area. This too would be a natural cross-pathway connection to human and/or natural resources that would broaden students' conception of the health services field beyond the roles of doctor or nurse. An example of application comes from the Greater Eggleston Community High School in Roxbury, Massachusetts. Environmental sciences teacher Elaine Senechal began a process of integration between the school and several community groups housed in the building (Senechal, 2008). The health concern identified by the community was the high rate of hospitalization for asthma—eight times higher than the rest of the state. A multi-disciplinary project was developed wherein students observed and mapped the neighborhood showing areas of concern including facilities housing vulnerable people

such as daycare centers, schools, and elderly centers. The students learned how to take soil samples, organize community meetings, give presentations, prepare flyers, and organize protests (Senechal, 2008). Students discovered that over 100 diesel vehicles passed the school each hour. They learned that eight of the nine trash transfer stations in the Boston area were located in Roxbury and that the Massachusetts Bay Transit Authority (MBTA) had a large bus depot nearby in which many empty busses idled during the day. Students learned about the real world situations of environmental injustice and how many poorer urban communities bear a disproportionate share of environmental toxins created as a by-product of modern life. After much effort, students were able to meet with a representative of the MBTA and present a list of demands, among which were a reduction in idling time, an increase in natural gas busses, and the location of more depots outside the neighborhood. Eventually these demands were met, resolving one significant cause of a leading community health issues (Senechal, 2008). Students were also able to get the state Environmental Protection Agency (EPA) to install state-of-the-art air monitoring stations throughout Roxbury and a flag system to notify people of the air quality on any given day. Students were able to assist over-taxed health clinics to conduct additional on-going research of asthma rates and to establish a correlation between poor quality air and health problems experienced by community members.

Over the course of several years students achieved many other community objectives as well (Senechal, 2008). In addition to the positive community results, students also benefitted. The Greater Eggleston Community High School largely serves poor and minority students often impacted by gang activity. Through the projects detailed

above, these students became a positive force in their community. They engaged in their schoolwork. They learned about and applied democratic principles, including the value and importance of collaboration toward common community concerns. They transformed their previous sense of school as a competitive and alienating place. This example highlights the value of place-based ideas in the Health Services career pathway. Not every community necessarily suffers from such egregious environmental and health injustice, but there are plenty of other community health issues that students can partner with community groups to study and take action on, such as urban environmental brown zones, water quality issues, and access to healthy foods and health clinics. As part of upper class work in the Health Services career pathway students can shadow intern in a variety of health related services, thus gaining a glimpse into community health concerns.

Human Resources

Human Resources is a poorly named career pathway that demonstrates a cultural bias toward seeing everything in terms of economics. A more balanced and appropriate name might be community services. Nevertheless the study of human resources is clearly connected to place and long-term community sustainability. Students conducting the kind of community research described in the previous examples are engaged in family and social services and community development. A way to introduce students to the Human Resources career pathway that grounds the otherwise abstract nature of future jobs in place and lived experience would be to include human resources in psychology classes. Psychology is an essential aspect of human wellness and thus can be included in students' health requirement. Studying the needs of long-term community health and development is connected to sustainability.

Many aspects from the previous examples could be viewed as ways to connect students in careers related to human resources. The project in Howard, South Dakota, for example, resulted in the creation of a ten-year plan that included projects in wind energy, organic beef, housing, and community service projects (Tompkins, 2008). These kinds of projects introduce students to the many facets of the Human Resources career pathway in business and government and engage students in real world questions concerning living within ecological limits.

Human resources are clearly linked to the study of society and represent one way that we can link career pathways to standard academic work. An example of such a linkage comes from Edcouch-Elsa High School through work initiated by Francisco Guajardo (Tompkins, 2008). Guajardo began with an oral history project to connect students to their community. Over time as students studied and learned the history of their community the project evolved into a social science research methods class that wrote grants for community and school projects. Subsequently, this historically impoverished and low-performing school has seen much improved academic performance and sent more students to college. Even more significant for long-term community development, a high number of students have returned to their community as teachers and social workers, while others, though not returning, have assisted students and community members in accessing grant monies (Tompkins, 2008).

Teaching is one of the human resources often neglected when educators think of careers for their students. We are generally too aware of the workload and the low status relative to other professions. Yet while it is true that teaching is on the low end of pay scales for professionals in our society, for many students the teaching profession can be

an entryway into a middle class wage. This may be particularly true for socio-economically disadvantaged students. As our student body has become more diverse our teaching professionals have not and there is a need for diversity in the teaching ranks. What better place to begin than by directly addressing this in our schools.

Industrial Engineering

Paradoxically, industrial engineering is the most problematic and promising of the career pathways in terms of sustainability. Industrialism is at the heart of the current unsustainable way of life and accounts for much of our alienation from place. Therefore a new look at industrial technologies and engineering is required. Traditionally this career pathway has sought to put students into a welding booth and get them working on small engines. Yet, early in the introduction to the Industrial Engineering career pathway students need to confront the problematic nature of industrialism. While there have been myriad benefits from industrialism, there have been dire consequences as well. The latter need to be seriously contemplated by students in this career pathway in consideration of ecological crises looming in the future.

As Van Jones (2009) argues, there are potentially millions of jobs in green energy related fields. In order to reduce our carbon footprint we are going to have to reorganize and reconfigure the electric grid and reduce dependency on fossil fuels. The most ready-to-go renewable clean energy is wind power. Wind turbines include 8,000 machined parts, and have more steel than 26 cars (Jones, 2009). The wind economy is a major source of manufacturing jobs. In addition the transformation of the electric grid and the installation of hundreds of thousands of solar hot water heaters and panels requires

engineering and manufacturing skills. Schools can work with local communities to identify and connect students to these areas of needed development.

With global climate disruption fresh water is going to become an increasingly scarce resource. Water use and resources are already significantly over stretched (L. Brown, 2009). Water efficiency and recovery of lost habitats are important issues. Through the Industrial Engineering career pathway students can develop the necessary skills and aptitudes for engineering and see that what will be needed in the future is an ecological approach to engineering. It is therefore crucial that an understanding of ecology not be limited to biologists, but that schools work to create integrated approaches that bring engineering, politics, ecology, agriculture, and sustainable economics together.

Designing and engineering the buildings of the future will be the responsibility of those students who undertake the Industrial Engineering career pathway. Students can be introduced to green technologies through classroom speakers at the introductory level and through job shadows and internships as upperclassmen. Students should study and understand green building certification programs. The Industrial Engineering and Business and Management Systems career pathways could be integrated to study and create local green building or manufacturing businesses.

If the design features discussed earlier are incorporated into the school the building itself becomes an introduction to the Industrial Engineering career pathway. In older schools lacking green design features students can take a critical theory approach to *deconstructing* the building. Students can pose such questions as: where does the water come from? Where does the wastewater go? What does it contain when it leaves? Where does our energy come from? What the consequences of this energy use? Does this

building use more than other similarly sized schools? Why or why not? What materials were used in the construction of this building? These are some of the ecologically minded, place-based questions related to sustainability with which students can familiarize themselves within the Industrial Engineering career pathway. This career strand offers a pertinent example of the connection between traditional literacy and ecological literacy. It offers the potential for students to see and experience the practical hands-on service to the future of their communities. This gives a reason to do the hard work of advanced math that is needed for green engineering projects of the future as well as providing the technical skills to serve those designs if the math is not one's forte.

Natural Resources

The dominant cultural lens is evident in the designation of the natural world as a *resource* rather than as an ecological system. Nonetheless, this career pathway is the most closely linked with sustainability and place-based education. The Natural Resources career pathway is stated to be for those students “who are interested in the physical world around them and understand our environment and the impact it has on our lives” (PPS, 2011, para. 6). This career pathway offers avenues of study important and of potential interest to all students: the physical world and its interconnecting ecological systems.

One natural connection for introducing this career pathway to students would be to sequence it with the health/foods curriculum described earlier. Students could be taken out of the classroom to visit and learn about ecological systems connected to human wellbeing directly (e.g., farm to table) and indirectly (e.g., old growth forest). Another introductory connection would be for students to examine the school landscaping, inquiring as to whether or how landscaping contributes to the ecological functioning of

the school (e.g., filtering wastewater) or is suitable to the regional climate (e.g., native plants). The possibilities of study and exploration on the school grounds are limitless. Advanced students might create small business ventures with students in marketing classes, exploring the field of horticulture. They could develop seed sales like the students in Maine (Bartsch, 2008) or create a native plants nursery, which might be a natural outgrowth of the existing landscaping. Students might visit, apprentice or form partnerships with local forestry or small farming organizations. Students might visit or host local native tribal members to learn about how native peoples sustained themselves and lived on the traditional lands. Students could compare ancient native science and ways of learning with western science and the associated worldview (Cajete, 2000; Kawagley & Barnhardt, 1999).

An example of such integration comes from Alaska. Native people have inhabited some of the places on this continent for thousands of years, but schools have tended to undervalue native ways of learning and understanding. The Alaska Native Knowledge Network (ANKN) was originally conceived as a way of reaching native Alaskans and bringing the ancient knowledge of place and ways of learning into schools. The idea was to make school learning more relevant while preserving community knowledge, but it also offers promise for expanding ways of seeing and understanding for all students. Among the outcomes of the ANKN program has been the development of a *map* of cultural ways of learning including a Native Knowledge Stream and a Western Knowledge Stream. Community elders were interviewed to learn from them what they considered to be their core values. The ANKN also created a spiral pathway for

promoting experiential and inquiry-based pedagogy. All of these elements help students understand their place in the natural ecology (Barnhardt, 2008).

G. A. Smith's (2002) documentation of student work in Seaside, Oregon is another excellent example of place-based education and sustainability ideas related to the Natural Resources career pathway. Students involved in the mapping of Tsunami zones and the creation of warning signs are working to understand the physical world and the impact it has on their lives. Students in Maine working with the Local Fisheries Knowledge Network are also engaged in the goals prescribed by the Natural Resources career pathway. Likewise, students in Howard, South Dakota, are engaging with the physical environment through the inclusion of city beautification projects in the 10-year community development plan. Clearly the Natural Resources career pathway has extensive links to science courses such as physics, chemistry, biology, and ecology, and can be integrated with other career pathways. The Natural Resources career pathway is important for more than just those students who are science oriented, as it provides so many potential connections to sustainability in all its dimensions.

Closing Thoughts on Career Pathways

The career pathways offer a concrete link from school to community. The nature of the pathway requirements almost mandate changes in the traditional barriers that have existed between schools and the places where they are located. It is important that schools not simply bend the pathway requirements into the form of traditional schooling, but use place-based ecological and sustainable thinking to transform the way that schools work, rethink the way we teach as well as what is taught, where it is taught, and who the teachers are. While each of the pathways was addressed separately with limited

discussion of overlaps, they cannot help but blend because the real world is an integrated whole living system composed of nested and interconnected smaller systems.

Examining Social Studies Curriculum Through the Lens of Place-Based Education and Sustainability

Education for sustainability and place-based pedagogy need to be the central foci of learning in the ecozoic period. We are facing new ecological problems on a scale that is nearly unimaginable. To teach as if these problems did not exist is to contribute to and facilitate unsustainability. Subject area definitions themselves contribute to our inability to think clearly about the interrelated aspects of necessary changes. The boundaries between subject areas need to become more permeable with skill sets prioritized for community sustainability.

As Sobel (2004) points out in his definition of place-based education, it is the starting point, not the endpoint. Examining the career pathways is one way of moving past the starting point. I now offer some suggestions for concrete ways to move EfS and PBE into subject areas. In the high school curriculum it is necessary that while students continue to study local places they also move beyond these realms and begin to examine and understand the relationships between places and the creation of sustainable cultures. In this section I examine some of the subject areas within the broad framework of social studies in the typical high school curriculum and illustrate how they can become avenues for study in sustainability. This is far from a monolithic approach, as teachers, students, and schools will need to adapt curriculum to their own situations and the communities in which they reside to the larger goals of sustainability. The purpose of this section

therefore is not to limit what teachers can do but to show important ways that education for sustainability can be included in high school teaching and learning.

Economics

Reexamining and rethinking economics and the cultural constructs embedded within it is one of the essential elements of creating a curriculum of sustainability. Economics must be seen as dependent upon and serving a healthy ecology and society. Heretofore economics has been the dominant lens through which our culture interprets the world. Not only does it affect the content of the curriculum and the goals set for education, but it also shapes the institution of schooling itself through the language of efficiency (Callahan, 1964).

The word economics is derived from the Greek root *oikos*, which Aristotle distinguished from *chrematistics*. Aristotle categorized *Oikonomia* as the management of the household so as to increase its value to all members of the household in the long run, whereas *chrematistics* was the manipulation of wealth and property to maximize short-term gain for the owner (as cited in Daly & Cobb, 1994; Eisler, 2007; Hawken, 1993). Expanding the definition of the household to include current national and global economic structure, it is evident that although the root of the word originates from *oikonomia* the practice reflects *chrematistics*. The global economy is managed for the short-term profit of elites, and disregards the lives of people that it impoverishes, the growing inequality between rich and poor, the destruction of communities, and the ecological devastation it leaves in its wake (Daly & Cobb, 1994; Eisler, 2007; Korten, 1995, 2006). It is unsustainable in nearly every way.

Classical economics traces its origins to Adam Smith (1937) who wrote *The Wealth of Nations* at the time of the American Revolution. The work was grounded in a world of seemingly inexhaustible resources where markets were primarily local and human impact on the natural environment was limited. None of these conditions exists today and yet we continue to rely upon this worldview when teaching economics. Furthermore this antiquated worldview is embedded in most of our assumptions about the world that we consciously and unconsciously pass on to students. Even so-called educational reform efforts prepare students to enter into this fantasy worldview and are considered successful when more students are convinced to partake in a system that cannot be sustainably maintained.

Classical economics and Marxism are both based upon an extraction economy in which raw materials have no value until they are converted to marketable items by human work (Figure 6). Hence a forest has no value until it is logged, a river has no value until it is dammed, and the ocean has no value until it is fished. Through the commoditization of the world, all items have come to be considered replaceable. Yet living systems are not replaceable. While such a misperception of reality might be forgivable 200 years ago, in light of present day ecological knowledge attempts to perpetuate such misguided thinking is reprehensible.

Figure 6. Classical economic worldview.

In this worldview the economic realm is the system that is given primacy. Social and ecological realms are seen as subsets of the larger circle of economics and dependent upon the economic realm. A healthy society is seen as dependent upon a healthy economy, and as such people serve the economy in hopes of later achieving a healthy society. The argument is also proffered that economic development is the highest priority after which we will have a healthy environment. It is, in other words, a completely distorted lens through which to view the world.

This model of the world is a far cry from the interdependent model for sustainability presented earlier in chapter 2 (Figure 1). The economic realm should be made to serve society, not the other way around. It must meet the needs of the current generation without leaving a spoiled world for those later to come. It cannot relentlessly pursue higher profits at the expense of local communities. Our economy is wholly

dependent upon a healthy ecology. Without the largess of Mother Earth there would be no modern economy. A healthy society is also dependent upon a healthy environment. A more appropriate model for use in teaching economics is shown in Figure 7).

Figure 7. Nested ecological view of economics. Source: Iacchus (2009).

Classical economics is further premised on the idea of expansion. In the 17th and 18th centuries there appeared to nothing wrong with this premise, though consideration of Native American perspectives might have caused reexamination of this belief. At the time, the recently discovered American continents appeared inexhaustible. The colonies provided a wealth of materials to England and continual growth and expansion created more wealth for all. At present we have reached limits of expansion, as there are no new lands to be discovered; this period of expansion is over.

The concept of waste has neither cost nor existence in classical economics. It is dismissed with the term *externality*. We behave as if and think that the environment can perpetually absorb the most toxic stews without any costs. The planet is viewed as an unlimited sink for waste. Oscar Wilde's description of cynics as those who "know the

price of everything and the value of nothing” (as cited in Gore, 1993, pp. 187-188) well describes the present economic accounting system.

The industrial economy and classical economic theory are wedded together in a view of the earth as a supplier of raw materials to satisfy human wants. While individual teachers may teach otherwise, the schooling *system* is designed to fit students into the modern economy, not to challenge its fundamental precepts. We teach as if our economy, based on the availability of cheap fossil fuels, can go on forever. It cannot. Our entire economy is based on the flow of products made possible by fossil fuels. We prepare students as if this system will continue indefinitely, although the reality is that this period of high energy is a temporary blip on the screen of human history. Everything in our modern economy has been developed on the rising side of this curve. Figure 8 vividly illustrates the temporary nature of the era of oil. Barrels of oil used per year are represented on the y-axis and time in increments of thousands of years is represented on the x-axis.

Figure 8. The era of oil. Source: Bukowinski (2009).

Economics is failing as a tool for measuring social wellbeing, yet schools continue to teach classical economic principles both implicitly and explicitly and maintain as a major aim facilitating student participation in this system. Economist James K. Galbraith (2002) describes the problems of modern economics in the following words:

Self-absorption and consistent policy error are just two of the endemic problems of the leading American economists. The deeper problem is the nearly complete collapse of the prevailing economic theory—of the structure that supports their policy ideas. It is a collapse, so pervasive, that the profession can only deny it by refusing to discuss theoretical questions in the first place. (p. 4)

Caring Economics as an Alternative

Teaching economics in a time of limits requires new economic thinking and language. Riane Eisler (2007) argues for a more inclusive way of looking at economics, which she labels a partnership economics. Rather than just measuring the government economy and the market, she argues that we need to include the unpaid community economy, the household economy, and the natural economy. She rightly indicates that the market economy would not function were it not for the currently invisible household and natural economies. This way of looking at economics places it within the context of education for sustainability.

Eisler (2007) and O’Sullivan (1999) both argue that we need to rethink the nature of work in light of the increasing automation occurring in the work place. This rethinking is a task that students can take part in, asking questions such as: what are the things we can do for each other? What work needs to be done to restore our ecology? What infrastructure can benefit people and society? How can we pay for these needs? There are many other questions that students might pose and discuss as they work on the complex task of envisioning a more just, sustainable, and healthy society that truly meets the needs

of the present generation without harming those who will come after us. Our economics and social studies classes need to be focused around such meaningful questions and conversations rather than transmitting fixed ideas and curriculum.

A useful resource that can be used is E. F. Schumacher's (1975) essay *Economics as if People Mattered*, in which he outlines what he calls Buddhist economics.

Schumacher's essay blends economics, ethics, self-expression, ecology, and society. It poses questions about the choices we make with regard to our view and organization of our economic life. It argues for a reframing of the way that we think about work. From the Buddhist point of view work exists to give a person a chance to utilize and develop their faculties, to overcome self-centeredness by collaborating with others in a common task, and to bring forth needed goods and services for a becoming existence. These principles are a truly different way of thinking about the world of work that would create wonderful opportunities for student learning. Exploration of differing perspectives could, for example, lead to a study of the Kingdom of Bhutan and their goal to create a Genuine Happiness Index (GHI) as a measure of social and economic wellbeing that would replace Gross Domestic Product (GDP).

The Genuine Progress Indicator (GPI) developed by Herman Daly and John Cobb (1994) is another attempt to develop a better tool for measuring social and economic health. Unlike the GDP, which only knows how to add, the GPI recognizes that there are certain economic activities that either diminish our well-being or indicate that society is not functioning optimally. For example, it subtracts for things like prisons, which ordinary GDP simply views as construction and so adds it on to the economic growth for the year. Another tool that is being used to analyze social well-being of the country is the

index for social health, which uses 16 indicators ranging from the rate of infant mortality to food security and affordable housing. Sadly between 1970 and 2009 this index has declined by 20% (Institute for Innovation in Social Policy, 2009).

To teach classical economics is to teach a worldview that is rapidly leading toward ecological destruction. What is needed is for teachers to use books and articles that outline a different view of economics where the goal is to suggest ways toward a restorative economy and to recognize that the role of business is not merely to make money but to contribute to the greater good of society and its long term ecological prospects. O’Sullivan explains that, “education within the context of ‘transformative vision’ keeps concern for the totality of life’s context always at the forefront” (O’Sullivan et al., p. 2). This means that teachers need to learn about these different economic stories so they are able to teach them.

Global Studies

An easy and diverse entry point into themes of sustainability is global studies. Students need to study diverse cultures and ways of thinking about how individuals and societies relate to their world. In this context ethics and narratives are components that cultures use to pass down their sense of who they are and how they fit into their environments. Indigenous societies around the world should be a central focus of global studies rather than the more traditional approach of studying global history as the inevitable progressive development from *primitive* societies to the modern nation state. Global studies can be one of the central doorways to help students ponder questions of sustainability, such as: what are some of the traditions that people have developed to live

sustainably in the places they occupy? What can we learn from them? These questions offer a way into teaching and learning about indigenous people.

Efforts of indigenous people to resist colonization are also an essential area of study. A diverse study of the world must include global voices that are resisting the spread of modern colonization currently disguised as the *globalized economy*. Vandana Shiva's (2008) work on environmental justice is exemplary in this context. Shiva argues that we are witnessing a global enclosure of the commons that parallels the enclosure movement in England that dispossessed rural sustainable economies and forced people off the land. This modern enclosure is being carried out by multinational corporations and is dispossessing the world of clean water, healthy air, and living soil. It is an effort to maintain a mechanistic, fossil fuel driven, unsustainable economy. In this sense, it is the endgame of a system that threatens all life on Earth.

Shiva (2008) gives voice to the global poor who have contributed the least to the multiple threats that humanity and the planet face yet are likely to suffer the first and worst of the consequences of the relentless focus on economic growth. To truly include global perspectives in our global studies curriculum we need to study and listen to the voices that seek alternative forms of development. Current anti-ecological development models are about making people more dependent on multi-national corporations and opening up resources to exploitation by the rich rather than facilitating self-reliance of local communities. Education needs to critically examine more varied place-centered economic models as alternatives.

In South America the study of Andean resistance to globalization is collected in essays compiled in Apffel-Marglin's (1998) *The Spirit of Regeneration*. This text offers

an opportunity for teachers to bring new ideas from other cultures into the classroom. The collaborative work of indigenous people and the Pachamama Alliance, a group of allied Westerners, to secure rights of Nature in the new Ecuadorian constitution presents another possibility for study. The Ecuadorian constitution is the first national constitution that secures the rights of the non-human world. The rise of the Zapatista movement in Oaxaca, Mexico, is another indigenous response to globalization and the destruction of community that offers true cross-cultural study. From another direction teachers and students could examine David Korten's (1995, 1999, 2006) writing. Korten describes from his long experience how *development* meant to lessen poverty has, generally speaking, increased it while strengthening corporate power and undermining local communities. He demonstrates how *globalization* is a new word for *colonization*.

Another possible course of study would be the role of shamans in animistic cultures. In these traditional cultures, shamans occupy a place as an intermediary between the more-than-human world and the human community. They are concerned with balancing the needs of people with the needs of the ecological community in which the people live (Abram, 1997; Prechtel, 1998, 1999, 2004). Prechtel's (1999, 2004) books offer pathways to connect with literature goals and bridge the gap between subject areas by examining the rich metaphors of Mayan stories and beliefs. Studying other cultural traditions, narratives, ceremonies, customs, and practices does not mean blind acceptance of or service to the interests of local elites. Nor is it a call to ignore forms of dehumanization tolerated by a particular culture (Bowers, 2001). Rather it is a call to resist the cultural certainty that has long been a part of the historical relationship between Western colonizing cultures and the rest of the world. It is a call to open our minds to

what we can learn about the non-commoditized reciprocal relationships that certain traditions have been able to maintain despite being subjected to 500 years of cultural violence.

Other avenues of study include the writings of Gandhi and the Dalai Lama. These two figures provide windows into two different cultural groups along with insights into ethical frames that are very different. These ethical frameworks connect all or most of the areas that I have suggested by the foundation of an education for sustainability. *Ethics for a New Millennium* (Dalai Lama, 2001) is complex but can be used in a high school classroom. A study guide has been developed that is available free from the Dalai Lama Foundation. This book lays out an extraordinarily logical-rational framework for community and environmental ethics. Gandhi is most well known for his historic non-violent resistance to the British Empire. The study of this resistance by Gandhi and the development of the *Satyagraha* are particularly relevant to the creation of a sustainable society. However in his own study Gandhi came to understand the importance of local sustenance (Kumar, 1997). One of the ways that he helped organize resistance to the British was through strengthening local sustainable economies. Those that he influenced, such as Eknath Easwaran (1998), extended Gandhi's teaching more concretely into the environmental realm. Individual change, non-violent change, social justice, local economies, and environmental stewardship are all components of the development of a sustainable society. Learning about these ideas cannot be left to chance but needs to be integrated into global studies curriculum in formal schooling.

Another key element of global sustainability that can be addressed through global studies curriculum is population issues and the role of women in economic sustainability.

Access to education for women is connected to self-actualization, social justice, economic, community, and social sustainability. The study of the Indian province of Kerala offers an entirely different way of examining economic development as an alternative resource for teachers wishing to examine these important issues. Kerala has made the education of women a top priority and has the lowest birth rate and least economic disparity in India (McKibben, 2007).

Women are also centers of resistance to corporate globalization. They are creating parallel structures within their communities to counter the downward homogenizing effects of globalization, and are using micro-credit systems to enhance their personal opportunities and strengthen communities. Some of the stories of these efforts are compiled in the collection *Women's Activism and Globalization* (Naples & Desai, 2002). Women all over the world are challenging basic assumptions of the dominant culture ranging from individual advancement over community well being, traditional constructs of *women's liberation*, definitions of security, and more. In Okinawa, Japanese women have challenged the concept of global stability and security by asking whose security is it if soldiers rape women and children. They argue that the army itself is a mechanism of violence and are pressing for the demilitarization of the Asian-Pacific region (Fukumura & Matsuoka, 2002). One of the great benefits of these stories and those of a similar theme is that they demonstrate to students that the actions of ordinary people can make a difference in the struggles against seemingly irresistible forces and help to frame deeply held cultural constructs.

Another possible unit of study for the global studies curriculum is the Earth Charter (Earth Charter International Secretariat, 2001). The Earth Charter was launched

in 1994 by Mikhail Gorbachev and Maurice Strong, and has since been submitted to numerous international groups during the drafting process and endorsed by 51 nations and over 2,000 groups representing millions of people. One of the founding principles of the document is that caring for the earth and caring for people are two dimensions of the same task. The Earth Charter views ecological problems as unfolding from economic development decisions and sees these decisions as the root of injustice, violence, poverty, and oppression.

While the Earth Charter's broadness, brevity, and lack of analysis may weaken it as a political tool, these aspects actually strengthen it as an educational resource as it will foster inquiry and reflection into the interrelated themes of peace, justice, and sustainability. The Earth Charter also offers avenues for students to take action and learn by doing. Gruenewald (2004) suggests that the Earth Charter offers a way to challenge, "the problematic social practices that general education supports" (p. 95). Rather than a set of standards linked to those of other fields, the Earth Charter's principles transcend disciplinary boundaries and provide a framework for studying and creating dialogue about "the complex ecological interactions between science, politics and culture, between social and ecological systems, and their impact on human and non-human life" (Gruenewald, 2004, p. 94).

For those more interested in a thematic approach to global studies, I recommend a new way of looking at the world through an old lens—the elements of Fire, Water, Earth, and Air. The theme of Fire would include an examination of energy as the driving force of our culture's expansion to every corner of the world. Energy has been cause for war. The positive and negative benefits of fossil fuels can be studied. The pervasiveness of oil

in our economy and the consequences of such dependence would be an element of EfS. The probable occurrence of *Peak Oil* and the ramifications of this event together represent important elements of study, along with evaluation of renewable energy options and their capacity to replace fossil fuels.

The element Water may become the next major and on-going source of conflicts in the world. The study of water usage and scarcity and associated potential impacts upon human and non-human communities would serve as excellent connectors to EfS themes. The pollution of waters and efforts that have been made to eliminate sources of pollution could be studied in a global studies curriculum. Students could examine what countries are most threatened by water scarcity. There are endless questions to pursue in a study organized around the theme of the element Water. How will water scarcity affect the production of food crops for human communities? How will urban areas be affected? Is access to clean water a human right? The United Nations has determined that access to clean water is a human right (Goodman, 2010). How did they come to this decision and what were the arguments? What are the reasons that the United States abstained from this decision? How are global water supplies going to be affected by climate change? Water is the source of all life and its importance can hardly be overstated. Students could also study how people are resisting the privatization of water all over the world. For instance, in Bolivia the privatization of water and the ensuing price hikes led to massive protests and the eventual collapse of three successive governments. The Bolivia story is an inspiring account of what people can do in the face of large, seemingly unbeatable, corporate forces.

Earth, as a unit of thematic study, allows for wide latitude of interpretation. Foremost among the realities we must face is that there is no economic replacement for healthy soil. One approach to the study of Earth would be for students to study geography through the lens of how people have adapted to and been shaped by the places they live. Earth could also be studied within the context of agriculture, its history and future. Agriculture's effects on land could be examined and techniques for soil improvement learned and applied on local campuses. The human contribution to desertification and efforts such as the Green Belt movement lead by Nobel Prize winner Wangari Maathai to slow this process could be an important area of study.

Air is perhaps the easiest element with which to teach interdependence. We all know that air knows no international boundaries—the best example of this is global warming. Discussion of global warming opens the door to consideration of environmental justice, political processes, economics, and intergenerational equity. Students can study the likely effects of global warming on different parts of the world and how human and non-human communities are likely to be impacted. They can study solutions that will lead them back to the study of Fire.

One of the wonderful potential points of a curriculum that revolves around the elements is the easy and ready connection to all of the sciences—physics, chemistry, geology, and the study of minerals, biology, and ecology. Like the Earth Charter, a thematic curriculum using the elements would be a way to erode the traditional disciplinary boundaries. It might also be a way for some of the more specific ideas elaborated earlier in this section to be included and tied together. For example, human population and its impacts on all of the elements could be one of many over-arching

themes. One of the lesser known limits humanity is facing is the dwindling supplies of scarce minerals and metals. Corporatism and the commoditization of the world would also work well as an object of study through the lens of the elements. Corporate control of energy and recent efforts to privatize water along with ensuing resistance provide good examples of how change can be organized. While one need not adopt all of the ideas illustrated above, they are meant as possible avenues for exploration. The key is to transform our current study of the world and ground it within the framework of education for sustainability.

United States History

Continuing with the idea of using the elements as themes of study, I now explore what this might look like in a curriculum of U.S. history, beyond the traditional chronological approach. One of the ways of examining the history of racial injustice in this culture is through the lens of energy. Energy (Fire) is intimately tied to American foreign policy and history. It is not often noted that slavery is in fact the usurping on another's energy for personal gain. The control of the economy by the few and on-going class and racial oppression can be seen as the stealing of the labor energy of the many for the benefit of the few. The rise and power of the plutocrats in U.S. history is connected to the rise of coal and oil development and the railroads. Energy has shaped U.S. foreign and military policy and our relationships to the rest of the world. The use of energy has been the major factor in the rise of American power. It is clearly tied to our economic system and the decline of easily accessed oil is going to radically reshape our future. The industrial revolution and all of its ensuing consequences from the automobile to mass production to unions are tied to the development and use of fossil fuels. The study of

energy presents students with real world problems and issues to study both in current and historical events.

Earth as a theme can lead to a discussion of Manifest Destiny, the idea that Europeans were fated to conquer control of the North American continent. Such discussion can lead to a critical examination of land policies with regard to Native Americans. This study offers excellent opportunities for cross-cultural views of land ownership and the very different views of people's relationship to land. For example, a study of the removal of Cherokee people is a study of our culture's demand for control of land. This can naturally lead to an examination of the Mexican-American War and the expansion of territory in which it resulted. It might also lead to the examination of the expansion of United States power to non-continental areas such as the Philippines and Cuba. The dust bowl is another example of the misuse of land and the effort to repair that damage is an excellent example of intentional action. The story of the control of land is the story of massive accumulations of wealth and the deprivation of people from their ancestral homes.

The 1997 film *Cadillac Desert* (Else et al.) provides a history of water use and control. Through the damming of rivers in the western United States vast land areas were opened to agriculture, presaging the rise of cities and delivery of electricity to nearly all Americans. The study of politics in this era and the benefits and costs associated with these ecological policies can serve as areas of study at the high school level. Water as a primary source of early transportation of goods offers ways to look at commerce and politics and the early development of corporate power. One of the major achievements of the environmental movement in the U.S. is the Clean Water Act. The organizing work

that led to its passage involves a study of interest groups and our political system. Its positive impact on U.S. waterways is undisputed and demonstrates the possibilities of people making a positive change. The overuse of water and the problems of water scarcity in the future as well as the impact of climate change on water availability provide real world problems that link past, present, and future through the study of sustainability. Tensions that already exist between agricultural water needs and rising urban demands are only going to become more acute as the effects of climate change become more apparent.

Air can be examined very broadly and offers unique and perhaps oblique entryways into the study of history. Law could be viewed through this element. The historical role of the media, its importance to democracy, and its current domination by large corporate powers can all be viewed through the lens of air. The Clean Air Act offers the same potentials as the Clean Water Act for study of political change processes. The altering of our atmosphere by the burning of fossil fuels would also be included in this thematic area.

Using the elements to study history offers the potential to spiral through history rather than taking a straight linear approach. It creates areas of potential disciplinary cross over between the elements themselves, as well as between time periods, issues of control, use, and reciprocity between human and non-human realms and what happens when reciprocal relationships are ignored at the individual, social, and economic levels.

We must broaden the definition of U.S. history to include *place*, which leads to a study of the history of other people than those who originated from Europe, immigrated from Asia, or were forcibly brought to the Americas. A sustainable world is going to

involve our culture learning from other cultures and that should begin with the study of native culture in the Americas. We should learn about the local tribes and the reciprocal relationships with the land, as well as their narratives and understandings developed over millennia. The study of indigenous narratives should not be limited to local tribes, though this is a good place to start as these stories will relate to local ecological concerns and involve local species and human adaptation.

In addition, the study of U.S. history should include acknowledgement of the Iroquois Confederacy, which is identified as the oldest continuous democracy in the world (Lyons & Mohawk, 1992). Though controversial, the Iroquois influence on the development of the U.S. Founders' thinking is an official area of study in New York schools and should be so in all states. Study of the Iroquois should not be limited to how they have helped us in the past; it should also include study of how their democracy is different from that of the United States and what we might still be able to learn in order to transform our culture into a sustainable one (Lyons & Mohawk, 1992). The story of the founding of the Iroquois Confederacy is both moving and instructive. The Iroquois Confederacy is founded on unique characteristics relating to both peace and justice. Peace and justice are central components in what is known as Great Law (Lyons, 2008a, Mohawk, 2008b). While other governments may argue for peace and justice, none have framed them as key components of their governmental organization (Lyons 2008a, Mohawk, 2008b). The study of the Iroquois Great Law allows for interesting comparison between ideas of individual liberty and communal wellbeing.

The rise of corporate power in the U.S. must be an object of study in both history and economics, as corporations wield nearly incomprehensible power in the United States. As Ritz (2001) explains:

Corporations today act in the capacity of governments. Energy corporations determine our nation's energy policies. Automobile corporations determine our nation's transportation policies. Military manufacturing corporations determine our nation's defense policies. Corporate polluters and resource extraction corporations define our environmental policies. Transnational corporations determine our trading policies. And the wealthiest among us—with the wealth deeply rooted in corporations—determine our tax policies. (p. xiv)

The study of the rise of this enormous concentration of power is essential as it is often taken for granted and has become part of our unexamined cultural background. The study of the concerns of the founders of our country with regard to corporate power can continue with specific court cases that have expanded the rights of corporations as equal to the rights of people while usurping rights of the non-human world. In addition, any study of U.S. history needs to reference Howard Zinn's (1995) *A People's History of the United States*. Zinn's long advocacy on behalf of the marginalized and in support of peace is an essential component for a broader perception of the history of the United States. His recent death is a loss to all who strive to understand the lessons of history to create a more just world.

Government

The study of U.S. systems of government is required in most schools in the United States. Comparisons are made between the United States and other modern states delineated as either democratic, socialist, or dictatorships (McClenaghan, 2006). What is often lacking is comparison with indigenous place-based governments to provide a broader holistic view of how people have governed and continue to govern themselves

around the world. Indigenous knowledge and indigenous governance are grounded in thousands of years of accumulated experience in place and may offer essential understandings for creating a sustainable future.

There are numerous possibilities for giving students a broader range of the study of government. For instance one can begin with the study of the principles stated in the Declaration of Independence. These principles have inspired many people. They are embedded in modern governments across the globe. The U.S. Declaration and Constitution grew largely out of resistance to external control and the ideas of the European Enlightenment. As a result the focus of thought is around liberty, individual rights and property ownership. From here students can examine the Iroquois Constitution and the story of its creation. The Iroquois Constitution grew out of internal strife and so has a different focus—peace and justice (Mohawk, 2008b). Chief Oren Lyons (2008a) explains that the Iroquois Constitution is grounded in three basic principles—peace, equity, and the power of good minds. Students can study these principles and see whether and how they connect to principles embedded in the modern state. They can read portions of the Iroquois Constitution to understand how these compare with the Declaration of Independence and U.S. Constitution. They can also compare the differences in the procedure for selection of leaders. The Iroquois women are responsible for the selection of the male chiefs. The clan mother chooses from her clan the leader she feels is best qualified; he is then subject to a consensus review of all the women any of whom may reject him, in which case the clan mother will choose again. Later the council of chiefs may also reject the choice. Thus from the Iroquois perspective *politics* are eliminated and the focus is on the quality of the leaders rather than their popularity (Lyons, 2008a).

Students can discuss the strengths of such a system and why it might be favored over popular election. It is certainly a different kind of democracy than the one that current government textbooks take for granted.

Another topic for students to consider would be a comparison between the way ideas are debated in our government and the way ideas are debated in the Okanagan culture, where the purpose of community discussion on possible courses of action is not to win a debate but rather to shed as much light on the topic at hand as possible. Okanagan leaders pick people in the community to perform certain roles in the discussion of important decisions of community problems. One role is to speak for the land—this role is for people who are tasked to always ask themselves and the larger community how decisions might affect the land. Another role is for certain people to focus on relationships and ask how a decision might affect people—elders, children, parents, working people, etc. A third group is tasked with examining affects of action on community resources. A final fourth group is asked to think of creative solutions. They are the visionaries and are asked to think in new ways. The Okanagan believe that these perspectives are essential to community problem solving and they have designed their community governance to make sure that these aspects are included (Armstrong, 2005; Marlowe, 2008). Students can consider the following questions: how does this compare to the kinds of procedures we see in U.S. government debates? What do we have to learn from this kind of structure? These are meaningful questions that students are ready and enthusiastic to consider.

Learning from Place-Based People: Indigenous Understandings

In order to transform our culture into a sustainable one we are going to need to learn from indigenous people who have lived sustainably in the places they have occupied for millennia. As we seek guidance from indigenous people we must acknowledge that we are approaching unknown territory. Humility will be an essential component of the learning. We also need perspective. Homo Sapiens have been on the earth for at least 250,000 years. Modern civilization traces its roots back 10,000 years. Our language, our assumptions about human beings, our religion, our science, all of our institutions, our questions and answers—in sum the culture of civilization—is grounded in largely hidden premises constructed over the last five to ten thousand years. We believe that this *modern* way of thinking and living is the only way to think and live; fortunately we are mistaken. On a macro scale, our culture is very young and indigenous peoples are our community elders (Hartmann, 1998). We need to learn from them and bring their understandings into our schools. Many place-based and ecological education scholars stress the importance of bringing our communities together and learning from our elders (Bowers, 2001; Gruenewald, 2003; G. Smith & Williams, 1999; G. A. Smith, 2002; G. A. Smith & Sobel, 2010; Sobel, 2004). As a caution, Friedel (2009) points out that their oppressors have usually defined indigenous people. Therefore as we study indigenous thinking and learning we must be careful not to impose dominant cultural ideas of who they are or what they should be.

In order to do this the first thing that we will have to do is overcome the deep-set *Western* cultural biases that are revealed in the ways that we characterize indigenous and native people and their belief systems. While we have moved past pejorative words such

as *savage*, continued use of qualifying words like *supernatural*, *ancestor worship*, and *primitive* as descriptors of realms of indigenous knowledge such as religion, economy, or science, exposes deep set prejudice and a sense of cultural superiority (Cajete, 2000). A primary prejudice is the notion that progress is linear in nature and that our culture exists at the *top* of human thought and experience. Learning from indigenous people is not about adopting a pre-modern lifestyle. However, from a pragmatic perspective, learning techniques of living on and within a landscape can serve to connect people to the natural world in a deeply profound way. A deeper need is to learn about the underlying worldview and understandings of native people. This concrete knowledge of living within the earth is the knowledge that we all possessed before we were absorbed into a culture that has exempted itself from the community of life. In its modern formulation it is the illusion of objective detachment, yet the human community is in a state of constant interaction with the greater community of life. We cannot exempt ourselves from it. How this knowledge will need to manifest in order for humanity to reintegrate itself with the planet is as yet undetermined, but the study of this question is a critical area for inquiry (Cajete, 2000).

As cultural historian Thomas Berry (2000) puts it, we need to come to view “the universe [as] a communion of subjects rather than a collection of objects” (p. 243). From a Native American perspective, the entire world is alive. While this may be a foreign view to western education, it is a view that deserves study and consideration. This is not about imposing a set of beliefs upon students, but rather about opening our inquiry to consider perspectives that are radically different from our own. This brings the idea of diversity to a whole new depth of cognitive and cultural pluralism.

There are unlimited ways that a relational worldview has the potential to affect our thinking. One example comes from Jeanette Armstrong (2005), who describes how the view of the world as relational shapes her Okanagan community's decision-making process, *En'owkin*. The process of *En'owkin* embraces a nested ecological view of human beings. An individual who manifests their potential as a result of physical, emotional, intellectual, and spiritual wellbeing is nested within a trans-generational family, nested within a living historical network of community, and nested in a relational network of land. All components are related and interconnected (Armstrong, 2005). Furthermore, when the community meets to make decisions, the systems is deliberately designed not to reach a decision on the first day. Although the speakers tend to be those with special knowledge or skills, anyone is allowed to speak. Solutions are only begun to be offered in the next session and are generally focused around questions to community *elders*, *mothers*, *fathers*, and youth. These terms are used to describe ways of thinking rather than men, women, and children. Elders speak for the land, mothers for the community, fathers for logistics and action, and youth for creative energy and change in the community. Armstrong herself was trained to speak as an elder while still a young woman. The point of the process is not to debate or persuade but to honor and understand these perspectives as fully as possible. Full agreement on decisions is acknowledged to be nearly impossible, but it is not based on majority rule. Armstrong argues—and the state of affairs in the U.S. political system demonstrates—that majority rule leads to division, polarity, and on-going dissension. In the *En'owkin* approach the goal is to ensure that views are expressed and honored. The aim in discussion is not to win a debate, but to strive to clarity and resolve conflicts (Armstrong, 2005; Marlowe, 2008).

Perceiving the world as a sentient being with which humans need to cultivate relationship radically shifts our economic approach. For example, the Northern Cheyenne has refused to allow coal strip mining on their reservation because it kills water beings. There is no cost/benefit analysis that can capture this kind of view. Indeed, Adamson (2008) indicates that it is this quality of worldview that makes traditional economies so markedly different from western economic paradigms.

Indigenous knowledge has sustained communities since time immemorial. It forms the basis for decision making in healthcare, agricultural practices, food preparation, natural resource management, and education. According to the Canadian International Development Agency,

Indigenous Knowledge represents the accumulated experience, wisdom and know-how unique to cultures, societies, and/or communities of people, living in intimate relationship of balance and harmony with their local environments. These cultures have roots that extend into history beyond the advent of colonialism. They stand apart as distinctive bodies of knowledge, which have evolved over many generations... (Setee, 2008, p. 45)

This knowledge base lies outside our western culture and may provide critical insight into its transformation toward a sustainable culture.

According to Burkhardt (2003) American Indian philosophy is concerned with the right road for humans to walk in relation to all that is around them. Philosophy, literature, science, and religion are all one. Native philosophy tells us, “We are, therefore I am” (Burkhardt, 2003, p. 25). This stands in stark contrast to Descartes’ dictum, “I think, therefore I am.” Burkhardt (2003) uses the story written by Plato about Thales to contrast American Indian thought from *Western* thought. Thales is walking down the street one day and is so distracted by the heavens that he falls into a well. Plato argues that this is

how the philosopher must be—so focused on the big questions of what man is or the nature of the universe that he is unaware of his surroundings and the goings on around him. Burkhart says that were one to replace Thales with Coyote it would be possible to tell a similar tale from a Native American perspective with an opposite meaning. Coyote (Thales) would be an object of ridicule for such inattentiveness to the world around him, and would serve as a humorous object lesson. Coyote in this story would be shown to be in a wrong relation with the world. Burkhart argues that Native American philosophy is concerned with right ways of being and relating to the world, not abstract ideas. Native American teachings are about the right road in relation to other beings around them. Melissa Nelson (2008) posits that Native thinking is about “a good human being living in reciprocal relation with all of our seen and unseen relatives” (p. 3). Rebecca Adamson (2008) points out that native languages even lack a word for religion, but rather, “the closest expression of belief literally translates to the way you live” (p. 38).

Many indigenous people refer to original instructions given to them. For the Iroquois these original instructions are partly encoded in what is called the Thanksgiving Address. The Address gives thanks to all beings for carrying out their duties and for the assistance that they give to human beings. The task for human beings is to understand the laws governing life and reciprocate and participate in what Oren Lyons (2008c) calls *Natural Law*. We are given the freedom to choose and our current unsustainable culture is *choosing* to not fulfill these responsibilities. The consequences of the damage that has been caused will unfold according to law (Lyons, 2008c). The study of the concept of original instructions which remind us that life has its own intelligence beyond human

comprehension is an important component of weaving indigenous understandings into our schools.

Conclusion and On-going Challenges

There is sufficient evidence, supported by increasing numbers of research studies, that the natural resources upon which civilization depends are rapidly being depleted. The resulting problems that we face are likely to require significant changes in thinking and lifestyle. The premise of this thesis is that a viable solution is to provide the foundational knowledge needed for sustainable living. Sustainability must become the reason for education, held as foremost priority at every level and in every subject area. As has been shown, many elementary schools have taken great strides in raising the level of students' ecological understandings. These efforts need to continue and be built upon. A great need at this time is for change at the secondary level. Figure 5 visually depicts high school curriculum design for sustainability incorporating the career pathways and social studies as key elements. As Figure 5 captures, sustainable education gives a reason and a context for learning, two qualities with which high school students struggle. Young adults are preparing to move into the world and if properly educated about both the problems and the potential solutions can help to change the world. A number of suggestions have been made regarding how education for sustainability can be achieved in our schools via design and curriculum. To accomplish this transformational objective requires teachers at the high school level to move beyond their traditional subject area passions and significantly modify the system.

Teacher and Teacher Education in the Ecozoic Period

The focus of this dissertation has been on reexamining high school design and curriculum through the lens of sustainability. However, none of the suggestions can come to fruition without teachers who are interested, motivated, and trained in the ideas of ecological learning. We need to address the preparation of teachers who are well versed in sustainability and ecological concepts.

Neil Postman (1996) suggests that teachers would better understand the difficulties that students have in learning if they taught outside their specialty area. One of the principles of ecology is that everything is connected. However, at the high school level teachers generally teach isolated subjects in a fragmented way. One way to motivate teachers to understand connections between subject matters would be to create a pay incentive for teachers to earn master's degrees in subject areas outside of their teaching field. Teachers are currently rewarded for experience and for additional learning, generally related to the subject they teach. Creating an incentive plan to learn material outside of their original interest, teachers would not only be grounded in the struggles that their students face to learn new material, but might also discover new connections between subject areas. This is a far better and more holistic motivation than current proposals to link pay with test scores, which we see leads to a narrowing of learning for students and creates incentives for teachers to teach to the test. Asking teachers to engage new material creates an on-going sense that schools and teachers themselves are parts of learning communities (Senge, 2003) where people strive to make connections and recognize larger patterns of nature rather than being narrow depositors of isolated knowledge.

As suggested, teachers must be given time to work together to create integrated curriculum that will meet these goals. One way to achieve this is through instituting common preparation times. We can also allow more teachers to actually teach together. By putting teachers together students can more easily see connections between subject areas and colleagues who have mastery of these subjects can support teachers who are extending their knowledge. This incentive system and cooperative teaching model could be extended to counselors as well, who currently spend a majority of their time working with students in isolation. By inviting counselors into the classroom and incentivizing their learning in new subject areas they would have opportunities to see students in a classroom setting and get to know and better understand them. Administrators could also be afforded opportunities and incentives to work beside teachers in this way. Currently administrators are separated from the classroom by their job descriptions.

Another approach would involve creating more opportunities for teachers to team-teach block classes of integrated subjects. One example would be a linkage between statistics and social studies. Students would learn math and see how it is applied in society to help create public policy and determine spending on issues related to poverty, schooling, and the environment. Students could also study the misuse and manipulation of statistics for political gain. Science and social studies would be another positive pairing. Students could benefit from thinking about these subjects together.

Recognizing the unique challenges of our age calls for a change in the way that we prepare teachers. Teacher education programs need to make sustainability, place-based learning, and ecological literacy required parts of their curriculum. We cannot expect teachers to teach about sustainability if they themselves have not completed

course work in these areas, thus grounding their knowledge in basic concepts.

Sustainability and related ideas and understandings must not be relegated to the fringes of educational programs, but must become central to them.

Edmundson (2003) outlines the challenges of educating teachers to teach for sustainability. In light of the challenging work of an on-going critical examination of our culture, Edmundson argues that a cohort structure is essential to an ecological educator program. He points to the communal support structure that is a fundamental feature of cohorts as crucial to the development of ecological educators. The cohort structure also allows leaders in cultural and ecological thinking and teaching to have extended work time with prospective teachers rather than the fracturing that would occur if students were constantly moving among different teachers.

It is necessary to integrate education for sustainability into the entire curriculum, and as Edmundson (2003) posits the teachers who work with pre-service teachers in their subject matter methods courses also provide examples of how to integrate sustainability ideas into and through their course work. He notes that teachers will face many on-going tensions and dilemmas that require time for exploration within the relative safety of the teacher education program with subject area specialists and cohort leaders.

Our ecological problems are so deeply intertwined with our culture that teachers and students must confront deeply rooted assumptions. I have confronted many of these assumptions throughout the dissertation, from anthropomorphism and the idea that the planet is a *resource* to serve humans, to the linear notion of time and progress. These assumptions are embedded in our language and thinking. Seeing, examining, questioning, and understanding the implications of our cultural assumptions is a large part of the work

of educating teachers that can weave sustainability themes into their courses.

Furthermore, with the necessity of bringing indigenous understandings into the high school curriculum, a course in cultural anthropology should be required for pre-service teachers, especially prospective social studies teachers.

Place-Based Educational Leadership

Another aspect that will need to be transformed is our conception of educational leadership. Traditionally, leaders in our society take command. This model is based on a hierarchical view of the world where command is top-down and linear. Wheatley (2006) notes that people criticize her ideas about leadership arguing that people need to be told what to do, and that the leader's job is to provide stability and control and to give orders to passive people. This criticism is founded upon the belief that the real world demands machine-like efficiency and obedience and leaders need to use fear and reward to create predictable and disciplined organizations. Yet this so-called real world has been invented by western thought (Wheatley, 2006).

Modern physics and ecology tell us that the world is composed of relationships (Capra, 1996, 2002). Yet our culture and organizations, including schools, revere the individual. Individuals only realize their potential in relationship with others. This is true of students and teachers. Individuals are nested in and dependent upon a variety of community relationships. Ecological leaders will need to nurture relationships to transform schools into places that prepare students to live in a sustainable way and to actualize their potential. Rather than having staff meetings to discuss directives issued from above, teachers need to collaborate in order to cross-disciplinary boundaries. It is

the role of administrators to create the time, space, and resources for this to occur (Wheatley, 2002).

We have developed organizations as if people and the world are machines. The world we live in is not a machine and will not bend itself to the machinations of corporate order. Nature is non-hierarchical and change and actualization are driven through complex non-linear networks (Capra, 1996, 2002). Educational organizations and their leaders—from superintendents to building principals to teacher leaders—need to be highly adaptive in an era of great change. They also need to recognize the limits of control and still be able to provide guidance and influence.

One way for such leaders to exert influence is by holding to the purpose of education for sustainability. By staying true to a vision of educating for planetary health, educational leaders can return the classroom teacher caught in the day-to-day struggles of teaching to the larger purpose and transformative vision of education for sustainability. The role of the leader is to keep the vision foremost and to create time and space for people to work together in order to actualize this vision.

Building on Greenleaf's (1996) writings on servant leadership, Wheatley (2002, 2006) argues that 21st century leaders need to have more faith in people. Leaders might be care takers of the vision, but the vision is given life in collaboration with others. In this era the needed vision is for an education that will serve the needs of creating a healthy sustainable society. Educational leaders must see themselves as hosts to the teachers that will be doing this day-to-day work. Leaders must become comfortable with uncertainty. As Jon Young (personal communication, June 2007) urges, we ought to be “in this for the long haul...because to change this culture to one that lives for the seventh generation may

take a couple of hundred years.” This is the task of the servant leader to serve a distant future where an insane culture is gradually turning toward sanity. The transition will be long, during which time we will need to be more comfortable exploring questions than delivering answers.

There are numerous systemic barriers to such servant leadership during the ecozoic period emanating from the broader culture. One is the hierarchical design of our institutions. Another obstacle is the push for testing and objective results. This effort is narrowing the focus of teaching; while there are skill sets that we want graduates to master, there are a host of goals related to critical thinking, democratic citizenship, ecological understanding, and knowledge of place that are not assessed by standardized tests. In theory, the push for objective measurement represents an effort to close the achievement gap—a worthy goal. However, as Gruenewald (2008) points out, in “efforts to close the achievement gap, the underlying structure and purpose of school, which can be described as meritocratic competition for scarce social and economic rewards in a capitalistic society, remains largely unchallenged” (p. 141). Rather than focusing on test scores, we need to ensure that we are graduating students with a sense of the need to live sustainably and to transform this culture into a sustainable one.

In order to develop an education that will foster sustainability, society will have to be grounded in knowledge of place. In a country as large and geographically varied as the United States such knowledge will be grounded in many places. This is one of the reasons that a standardized curriculum represents an obstacle to a sustainable future, because there is no *standardized* place, but many particular places each unique in ecological, social, and economic relationships. It is important that students recognize the

assets and limits of the bioregion they inhabit. Ecologically centered curriculum will look different from place to place. Educational leaders will need to support such diversity.

Finally, the earth is not an intellectual construction. Our relationship to the earth is not experienced through our head, but through our heart. As schools graduate students with little heart/spirit connection to place, we risk their wellbeing and the very nature of humanity's place in the greater scheme of the unfolding of planetary life. Educational leaders need to understand and work to actualize education as more than an intellectual endeavor.

Education for sustainability must become the central mission of our schools. It is not enough to just talk about this in the classroom, but we must model it in our buildings and our use of food and materials. It must be lived in the ways we connect to the places in which we live. The careers that we are helping students to envision must include their relationships to each other and their ecological home. We can either ignore the perils we face and educate for a world that is out of balance and cannot last, or choose to begin to educate our children so that they and we will create a more just, ecologically sustainable and spiritually fulfilling society that will last into the indefinite future.

References

- Abram, D. (1997). *The spell of the sensuous*. New York, NY: Vintage.
- Abdullah, S. (1999). *Creating a world that works for all*. San Francisco, CA: Berrett-Koehler.
- Adams, W. M. (2006, January 29-31). *The future of sustainability: Re-thinking environment and development in the twenty-first century*. Report of the ICUN Renowned Thinkers Meeting. Retrieved July 10, 2010, from http://cmsdata.iucn.org/downloads/iucn_future_of_sustainability.pdf
- Adamson, R. (2008). First nations survival and the future of the earth. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 27-35). Rochester, VT: Bear & Co.
- Anderson, J. (2009, October 30). There's a new kid on the block. *Portland Tribune*. Retrieved July 27, 2010, from http://www.portlandtribune.com/news/story.php?story_id=115501268780833500
- Armstrong, J. (2005). En'owkin: Decision-making as if sustainability mattered. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 11-17). San Francisco, CA: Sierra Club Books.
- Apffel-Marglin, F. (1998). *The spirit of regeneration: Andean culture confronting western notions of development*. London, England: Zed Books.
- Apple, M. (1981). Social structure, ideology, and curriculum. In L. Barton & M. Lawn (Eds.), *Rethinking curriculum studies: A radical approach* (pp. 131-159). New York: Wiley.
- Arenas, A. (2003, Spring). School-based enterprises and environmental sustainability. *Journal of Vocational Education Research*, 28(2), 107-124.
- Armstrong, J. (1996). "Sharing one skin": Okanagan community. In J. Mander & E. Goldsmith (Eds.), *The case against the global economy and for a turn toward the local* (pp. 460-470). San Francisco, CA: Sierra Club Books.
- Armstrong, J. (2005). En'owkin: Decision-making as if sustainability mattered. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 11-17). San Francisco, CA: Sierra Club Books.

- Barnhardt, R. (2008). Creating a place for indigenous knowledge in education: The Alaska native knowledge network. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 113-134). New York, NY: Erlbaum.
- Bartsch, J. (2008). Youth as resources in revitalizing our communities. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 65-84). New York, NY: Erlbaum.
- Bateson, G. (1972). *Steps to an ecology of mind*. New York, NY: Ballantine.
- Bennet, S. (2010, November 16). Vernonia school to be sustainable showcase: School will help community emerge from devastating effects of '07 flood. *Architectural Daily, The Future of Architecture*. Retrieved March 26, 2011, from <http://www.architecturaldaily.com/NewsArticle.aspx?ArticleId=85>
- Benyus, J. (1997). *Biomimicry*. New York, NY: Harper-Collins.
- Berry, T. (1988). *The dream of earth*. New York, NY: Random House.
- Berry, T. (1997). The ecozoic era. In H. Hannum (Ed.), *People, land, and community* (pp. 191-203). New Haven, CT: Yale.
- Berry, T. (2000). *The great work*. New York, NY: Three Rivers Press.
- Berry, W. (1996). Conserving communities. In J. Mander & E. Goldsmith (Eds.), *The case against the global economy and for a turn toward the local* (pp. 407-418). San Francisco, CA: Sierra Club Books.
- Berry, W. (2005). Solving for pattern. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 30-40). San Francisco, CA: Sierra Club Books.
- Biello, D. (2009, September 23). Grappling with the anthropocene: Scientists identify safe limits for human impacts on the planet. *Scientific American*. Retrieved December 12, 2009, from <http://www.scientificamerican.com/article.cfm?id=scientists-identify-safe-limits-for-human-impacts>
- Birnbaum, R. (1988). *How colleges work: The cybernetics of academic organization and leadership*. San Francisco, CA: Jossey-Bass.
- Bolman, L., & Deal, T. (2003). *Reframing organizations: Artistry, choice, and leadership*. San Francisco, CA: Jossey-Bass.

- Bowers, C. A. (1995). *Educating for an ecologically sustainable culture: Rethinking moral education, creativity, intelligence, and other modern orthodoxies*. Albany, NY: State University of New York Press.
- Bowers, C. A. (1997). *The culture of denial*. Albany, NY: State University of New York Press.
- Bowers, C. A. (2001). *Educating for eco-justice and community*. Athens, GA: University of Georgia Press.
- Bowers, C. A. (2003, Spring). Can critical pedagogy be greened? *Educational Studies*, 34(1), 11-21.
- Bowers, C. A. (2004). Comments on David Gruenewald's "A Foucauldian analysis of environmental education." *Curriculum Inquiry*, 34(2), 223-232.
- Bowers, C. A. (2005). *Educating for a sustainable future: Mediating between the commons and economic globalization*. Retrieved from <http://www.cabowers.net/pdf/Educatingforasustainablefuture.pdf>
- Bowers, C. A., & Apffel-Marglin, F. (Eds.). (2005). *Rethinking Freire: Globalization and the environmental crisis*. London, England: Lawrence Erlbaum Associates.
- Bowman, D., Choquent, D., Cooke P., Fisher A., Jackson, D., Russell-Smith, J. Whitehead, P. J., & Yibaruk, D. (2001). Fire ecology and aboriginal land management in central arnhem land, northern Australia: A tradition of ecosystem management. *Journal of Biogeography*, 28(3), 325-343.
- Bridges, E., & Hallinger, P. (1995). *Implementing problem-based learning in leadership development*. Eugene, OR: University of Oregon, Educational Resources Information Center, Clearinghouse on Educational Management.
- Briggs, M. (2005). Rethinking school lunch. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 241-249). San Francisco, CA: Sierra Club Books
- Brown, L. (2006). *Plan B: Rescuing a planet under stress and a civilization in trouble*. New York, NY: W.W. Norton.
- Brown, L. (2009). *Plan B 4.0: Mobilizing to save civilization*. New York, NY: W.W. Norton.
- Brown, T. (1988). *The vision*. New York, NY: Berkley Press.

- Bukowinski, J (2009). *The era of oil*. Retrieved from <http://jbukowinski.com/generationGreen-y/?p=8>
- Burkhart, B. (2003). What coyote and thales can teach us: An outline of American Indian epistemology. In A. Waters (Ed.), *American Indian thought: Philosophical essays* (pp. 15-26). San Francisco, CA: Blackwell.
- Cajete, G. (2000). *Native science: Natural laws of interdependence*. Santa Fe, NM: Clear Light Pub.
- California Department of Public Health. (2007). *How to grow healthy students*. Retrieved May 10, 2011, from <http://www.harvestofthemonth.com/program-overview.asp>
- Callahan, R. (1964). *Education and the cult of efficiency*. Chicago, IL: University of Chicago Press.
- Capra, F. (1996). *The web of life*. New York, NY: Anchor Books.
- Capra, F. (2002). *Hidden connections*. New York, NY: Doubleday.
- Capra, F. (2009, October 15). *Sustainability and ecological literacy*. Paper presented at the Sustainability Education Annual Bioneers Conference, San Rafael, CA.
- Center for Disease Control. (2007). *Diabetes fact sheet*. Retrieved March 25, 2010, from <http://apps.nccd.cdc.gov/DDTSTRS/FactSheet.aspx>
- Chomsky, N. (2002). *Manufacturing consent: The political economy of the mass media*. New York, NY: Pantheon.
- Chomsky, N. (2004). *Hegemony or survival: America's quest for global dominance*. New York, NY: Holt Publishers.
- Clean Air Act, 42 U.S.C. §7401 (1970 & Amend. 1977, 1990).
- Clean Water Act, 33 U.S.C. §1251 et seq. (1972 & Amend. 1977).
- Clinchy, B. M. (2000). *New directions for teaching and learning*. San Francisco, CA: Jossey-Bass.
- Cloud Institute. (n.d.). Education for sustainability content and performance standards checklist. Retrieved January 2, 2010, from http://www.sustainabilityed.org/download/pdf/EfS_Core_Standards.pdf

- Cohen, M. D., & March, J. G. (2000). Leadership in organized anarchy. In M. C. Brown II (Ed.), *ASHE Reader Series: Organization and governance in higher education* (5th ed.; pp. 16-35). Boston, MA: Pearson Custom.
- Counts, G. (1932). *Dare the schools build a new social order?* London, England: Feffer-Simmons.
- Cuban, L. (1990). Reforming again, again, and again. *Educational Researcher*, 19(1), 3-13.
- Daily, G. C., & Ehrlich, P. R. (1992, November). Population, sustainability, and earth's carrying capacity. *BioScience*, 42(10), 761-771.
- Dalai Lama. (2001). *Ethics for the new millennium*. New York, NY: Riverhead Trade.
- Daly, H., & Cobb, J. (1994). *For the common good: Redirecting the economy toward community, the environment and a sustainable future*. Boston, MA: Beacon Press.
- Deloria, V. (1973). *God is red*. New York, NY: Putnam
- Deloria, V. (2002). *Evolution, creationism, and other modern myths: A critical inquiry*. Golden, CO: Fulcrum Publishing.
- Deloria, V. (2006). *The world we used to live in*. Golden, CO: Fulcrum Pub.
- Denevan, W. M. (2001). *Cultivated landscapes of native Amazonia and the Andes*. Oxford, England: Oxford University Press.
- Dewey, J. (1997). *Experience and education*. New York, NY: Touchstone. (Original work published 1938).
- Diamond, J. (1987, May). The worst mistake in the history of the human race. *Discover Magazine*, pp. 64-66.
- Diamond, J. (1997). *Guns, germs, and steel: The fates of human societies*. New York, NY: W. W. Norton and Co.
- Diamond, J. (2005). *Collapse: How societies choose to fail or succeed*. New York, NY: Viking Press.
- Durning, A. (1992). *How much is enough: The consumer society and the Future of the Earth* (The Worldwatch Environmental Alert Series). New York, NY: W. W. Norton & Co.

- Earth Charter International Secretariat. (2001). *The Earth charter*. Retrieved from <http://www.earthcharter.org>
- Easwaran, E. (1989). *The compassionate universe*. Tomales, CA: Niligiri Press.
- Edmundson, J. (2003). Translating theory into practice: Investigations toward the design of a model for a cultural-ecological teacher education program. *Dissertation Abstracts International: Section A. Humanities and Social Sciences*, 64(10), 1164.
- Eisler, R. (1988). *The chalice and the blade*. New York, NY: Harper Books.
- Eisler, R. (2007). *The real wealth of nations: Creating a caring economics*. San Francisco, CA: Berrett-Koehler.
- Eisner, E. (1991, February). What really counts in schools. *Educational Leadership*, 48(5), 10-11, 14-17.
- Eisner, E. (2003). Preparing for today and tomorrow. *Educational Leadership*, 61(4), 6-10.
- Else, J., Harrar, L., McCann, D., Halperin, J., Talpin, J. (Producers), Else, J., & Harrar, L. (Directors). (1997). *Cadillac desert* (Motion picture). Homevision, KTEH, PBS: San Jose, CA.
- Ewing, B., Goldfinger, S., Oursler, A., Reed, A., Moore, D., & Wackernagel, M. (2009). *The ecological footprint atlas 2009*. Oakland: Global Footprint Network.
- Fenwick, T. (2000). Expanding the conceptions of experiential learning. *Adult Education Quarterly*, 50(4), 243-272
- Finney, S. (1998). The sky, the earth, my heart, the people: An ecological dimension to critical pedagogy. *Teaching Education*, 9(2), 39-46.
- Friedel, T. (2009). *Urban indigenous youths' perspectives on identity, place and place-based learning and the implications for education*. Ph.D. dissertation, University of Alberta (Canada), Canada. Retrieved August 19, 2010, from Dissertations & Theses: Full Text (Publication No. AAT NR55347). DAI-A 71/01.
- Friedman, T. (2007). *The world is flat*. New York, NY: Picador.
- Fukumura, Y., & Matsuoka, M. (2002). Redefining security: Okinawa women's resistance to U.S. militarism. In N. Naples & M. Desai (Eds.), *Women's activism and globalization: Linking local struggles and transnational politics* (pp. 239-263). New York, NY: Routledge.

- Furman, G., & Gruenewald, D. (2004). Expanding the landscape of social justice: A critical ecological analysis. *Educational Administrator Quarterly*, 40(1), 47-76.
- Galbraith, J. K. (2002). How economists got it wrong. *The American Prospect*, 11(7). Retrieved January 2, 2010, from http://www.prospect.org/cs/articles?article=how_the_economists_got_it_wrong
- Gasses tipping ocean balance. (2008, May 23). *The Oregonian*, p. A1.
- Gatto, J. (2002). *Dumbing us down*. Gabriola Island, BC, Canada: New Society Publishers.
- Gatto, J. (2003, September). Against school. *Harper's Magazine*, pp. 33-38.
- Gelbspan, R. (2005, May/June). Snowed. *Mother Jones*. Retrieved January 2, 2010, from <http://motherjones.com/politics/2005/05/snowed>
- Goodman, A. (2010, July 29). *Democracy now*. Retrieved August 6, 2010, from http://www.democracynow.org/2010/7/29/in_historic_vote_un_declares_access
- Gore, A. (1993). *Earth in the balance: Ecology and the human spirit*. New York, NY: Penguin Books.
- Gore, A. (2006). *An inconvenient truth*. New York, NY: Rodale Books.
- Graham, M. (2008). The fringe of nirvana: Aesthetic places and the art classroom. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 29-48). New York, NY: Erlbaum.
- The Green Cup Alliance. (2011). *Green cup challenge*. Retrieved May 10, 2011, from www.greencupchallenge.net
- Greenleaf, R. (1996). *On becoming a servant leader*. San Francisco, CA: Jossey-Bass.
- Gruenewald, D. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher*, 32(4), 3-12.
- Gruenewald, D. (2004, Spring). A Foucauldian analysis of environmental education: Toward the socio-ecological challenge of the earth charter. *Curriculum Inquiry*, 34(1), 71-106.
- Gruenewald, D. (2008). Place-based education: Grounding culturally responsive teaching in geographic diversity. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 137-154). New York, NY: Erlbaum.

- Gruenewald, D., & Smith, G. (Eds.). (2008). *Place-based education in the global age*. New York, NY: Erlbaum.
- Gurdjieff, G. (1950). *Beelzebub's tales to his grandson*. New York, NY: Harcourt Brace.
- Gurdjieff, G. (1991). *Life is real only then, when "I am"*. New York, NY: Viking.
- Hahn, T. (1999). *The heart of the Buddha's teaching*. New York, NY: Broadway Books.
- Hansen, J. (2008). Tipping point: Perspective of a climatologist. In W. Woods (Ed.), *State of the wild 2008-2009: A global portrait of wildlife, wildlands, and oceans* (pp. 6-15). Washington, DC: Island Press, pp. 6-15.
- Hartmann, T. (1998, November). The lost people. *Spirit of Change*, 13(45).
- Hartmann, T. (2004). *Last hours of ancient sunlight*. New York, NY: Three Rivers Press.
- Hawken, P. (1993). *The ecology of commerce: A declaration of sustainability*. New York, NY: HarperCollins.
- Hawken, P. (2007). *Blessed unrest: How the largest movement in the world came into being and why no one saw it coming*. New York, NY: Penguin.
- Hawken, P., Lovins, A., & Lovins, I. H. (1999). *Natural capitalism*. Boston, MA: Little Brown Co.
- Hemenway, T. (2000). *Gaia's garden: A guide to home-scale permaculture*. White River Junction, VT: Chelsea Green.
- Hertsgaard, M. (2004, November 1). Climate, the absent issue. *The Nation*. Retrieved January 2, 2010, from <http://www.thenation.com/doc/20041101/hertsgaard>
- Herremans, I., & Reid, R. (2002). Developing awareness of the sustainability concept. *Journal of Environmental Education*, 34(1), 16-20.
- Holmgren, D. (2002). *Permaculture: Principles and pathways beyond sustainability*. Hepburn, Australia: Holmgren Design Services.
- Institute for Innovation in Social Policy. (2009). *The index of social health*. Poughkeepsie, NY: Vassar College
- Iacchus, S. (2009). Sustainable development diagram. Retrieved July 10, 2010, from Wikimedia Commons http://en.wikipedia.org/wiki/File:Nested_sustainability-v2.gif

- Imhoff, M. L., Bounoua, L., Ricketts, T., Loucks, C., Harriss, R., & Lawrence, W. T. (2004). Global patterns of human consumption of net primary production. *Nature* 429(6994), 870-873.
- Jensen, D. (2002). *A language older than words*. White River Junction, VT: Chelsea Green.
- Jensen, D. (2004). *The culture of make believe*. White River Junction, VT: Chelsea Green.
- Jirka, B., & Sneed, J. (2007, Fall). Commodity foods: Is it time for a change? *The Journal of Child Nutrition and Management*. Retrieved March 26, 2011, from <http://docs.schoolnutrition.org/newsroom/jcnm/07fall/jirka/index.asp>
- Jones, V. (2009). *The green collar economy: How one solution can fix our two biggest problems*. New York, NY: Harpers.
- Kawagly, A. O., & Barnhardt, R. (1999). Education indigenous to place: Western science meets native reality. In G. Smith & D. Williams (Eds.), *Ecological education in action: On weaving education, culture, and the environment* (pp. 117-142). Albany, NY: State University Press.
- Kiefer, J., & Kemple, M. (1999). Stories from our common roots: Strategies for building an ecologically sustainable way of learning. In G. Smith & D. Williams (Eds.), *Ecological education in action: On weaving education, culture, and the environment* (pp. 21-46). Albany: State University Press.
- King, R. (2000). Defining literacy in a time of environmental crisis. *Journal of Social Philosophy*, 31(1), 68-81.
- Klein, N. (2011, March 9). "My fear is that climate change is the biggest crisis of all" Naomi Klein warns global warming could be exploited by capitalism and militarism. Retrieved from <http://www.democracynow.org/2011/3/9/>
- Klemmer, C. D., Waliczek, T. M., & Zajicek, J. M. (2005). Growing minds: The effect of a school gardening program on the science achievement of elementary students. *HortTechnology*, 15(3), 448-452.
- Knapp, C. (2008). Place-based curricular and pedagogical models: My adventures in teaching through community contexts. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 5-28). New York, NY: Erlbaum.
- Korten, D. (1995). *When corporations rule the world*. San Francisco, CA: Berrett-Koehler.

- Korten, D. (1999). *The post-corporate world: Life after capitalism*. San Francisco, CA: Berrett-Koehler.
- Korten, D. (2006). *The great turning: From empire to earth community*. San Francisco, CA: Berrett-Koehler.
- Kumar, S. (1997). Gandhi's swadeshi: The economics of permanence. In J. Mander & E. Goldsmith (Eds.), *The case against the global economy and for a turn toward the local* (pp. 418-424). San Francisco, CA: Sierra Club Books.
- Laird, S. (Ed.). (2009, October). New school design is both practical and innovative: Plans would make Vernonia School the first Leeds platinum certified public school in the nation. *Veronica's Voice, Special School Bond Issue*. Retrieved March, 26, 2010, from <http://vernoniasvoice.com/files/VernVoiceSchoolBondIssueFinal.pdf>
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.
- Lawlor, R. (1991). *Voices of the first day: Awakening in the aboriginal dreamtime*. Rochester, VT: Inner traditions.
- Leakey, R., & Lewin, R. (1996). *The sixth extinction: Patterns of life and the future of mankind*. New York, NY: Anchorbooks.
- Legler, G. (1995). Narrative scholarship: Storytelling in ecocriticism. Retrieved October 14, 2010, from <http://www.asle.org/site/resources/ecocritical-library/intro/narrative/>
- Leopold, A. (1966). *A sand county almanac*. New York, NY: Ballantine Books. (Original work published in 1949)
- Little, J. B. (2009, March). The Ogallala aquifer: Saving a vital U.S. water source. *Scientific American, Special Edition*.
- Living Building Institute. (2009). *The living building challenge*. Retrieved November 28, 2009, from <http://www.ibl.org>
- Luke, T. (2001). Education, environment and sustainability: What are the issues, where to intervene, what must be done? *Educational Philosophy and Theory*, 33(2), 187-202.
- Lyons, O. (2008a). A democracy based on peace. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 59-65). Rochester, VT: Bear & Co.

- Lyons, O. (1980b). An Iroquois perspective. In C. Vecsey & R. W. Venables (Eds.), *American Indian environments: Ecological Issues in native American history* (pp. 171-174). New York, NY: Syracuse University Press.
- Lyons, O. (2008c). Listening to natural law. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 22-26). Rochester, VT: Bear & Co.
- Lyons, O., & Mohawk, J. (1992). *Exiled in the land of the free: Democracy, Indian nations and the U.S. Constitution*. Santa Fe, NM: Clear Light Publishers.
- Mander, J. (1978). *Four arguments for the elimination of television*. New York, NY: Harper-Collins.
- Mander, J. (1992). *In the absence of the sacred: The failure of technology and the survival of the Indian nations*. San Francisco, CA: Sierra Club Books.
- Mander, J., & Goldsmith, E. (1997). *The case against the global economy and for a turn toward the local*. San Francisco, CA: Sierra Club Books.
- Manning, R. (2005). *Against the grain: How agriculture has hijacked civilization*. New York, NY: North Point Press.
- Marlowe, S. (2008). Ethics from the land: Traditional protocols and the maintenance of peace. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 39-41). Rochester, VT: Bear & Co.
- Martinez, D. (2008). Restoring indigenous history and culture to nature. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 86-97). Rochester, VT: Bear & Co.
- McClenaghan, W. (2006). *Magruder's American government*. Upper Saddle River, NJ: Prentice Hall.
- McKibben, B. (2005, May/June). Climate of denial. *Mother Jones Magazine*. Retrieved January 2, 2010, from <http://motherjones.com/politics/2005/05/climate-denial>
- McKibben, B. (2007, March/April). The enigma of Kerala. *Utne Reader*, pp. 103-112.
- McKibben, B. (2011, April 9). *Act for our climate*. Speech delivered at Vancouver, Canada April, 9, 2011. Retrieved April 12, 2011, from http://www.archive.org/details/ES_110422
- Meier, D. (1996). Supposing that... *Phi Delta Kappan*, 78(4), 271-276.

- Meier, D. (2003a). *In schools we trust*. Boston, MA: Beacon Press.
- Meier, D. (2003b). So what does it take to build a school for democracy. *Phi Delta Kappan*, 85(1), 15-21.
- Meier, D. (2008). Schooling for democracy or the workplace. *Phi Delta Kappan*, 89(7), 507-510.
- Merchant, C. (1992). *Radical ecology: The search for a livable world*. New York, NY: Routledge.
- Mohawk, J. (2008a). Clear thinking: A positive solitary view of nature. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 48-53). Rochester, VT: Bear & Co.
- Mohawk, J. (2008b). The Iroquois confederacy. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 54-58). Rochester, VT: Bear & Co.
- Monbiot, G. (2007). *Heat: How to stop the planet from burning*. Cambridge, MA: South End Press.
- Montgomery, D. (2007). *Soil erosion and agricultural sustainability*. Retrieved December 5, 2009, from <http://www.pnas.org/content/104/33/13268.full>
- Mooney, C. (2005, May/June). Some like it hot. *Mother Jones Magazine*. Retrieved January 2, 2010, from <http://motherjones.com/environment/2005/05/some-it-hot>
- Naples, N., & Desai, M. (Eds.). (2002). *Women's activism and globalization: Linking local struggles and transnational politics*. New York, NY: Routledge.
- National Clearinghouse for Educational Facilities. (2010). *U.S. k-12 school construction data 1999-2008*. Retrieved July 26, 2010, from <http://www.ncef.org/cd/School-Construction-Data-1999-2008.pdf>
- National Forum on Partnerships Supporting Education About the Environment. (1996). *Education for sustainability: An agenda for action*. Washington, DC: U.S. Government Printing Office.
- National Farmers' Union. (2009, May 11). *Lowest food supplies in 50 or 100 years: Global food crisis emerging*. Retrieved December 5, 2009, from the Organic Consumers Association web site: http://www.organicconsumers.org/articles/article_5660.cfm
- Nelson, M. (2008). *Original instructions: Indigenous teachings for a sustainable society*. Burlington, VT: Bear & Co.

- Orr, D. (1992). *Ecological literacy: Education and the transition to a postmodern world*. New York, NY: State University Press.
- Orr, D. (1997). Architecture as pedagogy II. *Conservation Biology*, 11(4), 597-600.
- Orr, D. (2004a). *Earth in mind: On education, environment, and the human prospect*. Washington, DC: Island Press.
- Orr, D. (2004b). *The nature of design: Ecology, culture and human intention*. Oxford NY: Oxford University Press.
- Orr, D. (2005). Place and pedagogy. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 85-95). San Francisco, CA: Sierra Club Books.
- Orr, D. (2009). *Down to the wire: Confronting climate collapse*. New York, NY: Oxford University Press.
- O'Sullivan, E. (1999). *Transformative learning: Educational vision for the 21st century*. New York, NY: Zed Books.
- O'Sullivan, E., Morrell, A., & O'Connor, M. A. (Eds.). (2002). *Expanding the boundaries of transformative learning*. New York, NY: Palgrave.
- Pachauri, R. K., & Reisinger, A. (Eds.). (2007). *Climate change 2007, synthesis report: A report of the Intergovernmental Panel on Climate Change*. Retrieved November 27, 2009, from http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_cover.pdf
- Palmer, P. (1998). *The courage to teach*. San Francisco, CA: Jossey-Bass.
- Patel, R. (2009). *The value of nothing: How to reshape market society and redefine democracy*. New York, NY: Picador.
- Pearce, F. (2007). *With speed and violence: Why scientists fear tipping points in climate change*. Boston, MA: Beacon Books.
- Pollan, M. (2007). *The omnivore's dilemma: A natural history of four meals*. New York, NY: Penguin Group.
- Pollan, M. (2009a). *In defense of food: An eater's manifesto*. New York, NY: Penguin Group.

- Pollan, M. (2009b, October). *In defense of food: The omnivore's solution*. Plenary presented at the Bioneers Conference. Available from http://store.bioneers.org/product_p/2009-pollan.htm
- Portland Public Schools. (2011). *Pathway descriptions*. Retrieved January 16, 2011, from <http://www.pps.k12.or.us/departments/pathways/2632.htm>
- Postman, N. (1996). *The end of education: Redefining the value of education*. New York, NY: Vintage Books.
- Prechtel, M. (1998). *The secrets of the talking jaguar*. Boston, MA: Element.
- Prechtel, M. (1999). *Long life, honey in the heart: A story of initiation and eloquence from the shores of a Mayan lake*. New York, NY: Putnam.
- Prechtel, M. (2003). *The toe bone and the tooth*. New York, NY: Thorsons Publishers.
- Pyle, R. (2008). No child left inside: Nature study as a radical act. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 155-172). New York, NY: Erlbaum.
- Quinn, D. (1995). *Ishmael*. New York, NY: Bantam/Turner Books.
- Quinn, D. (1996). *The story of b*. New York, NY: Bantam Books.
- Quinn, D. (2000). *Beyond civilization*. New York, NY: Three Rivers Press.
- Rauzon, S., Wang, M., Struder, N., & Crawford, P. (2010). *Changing student's knowledge, attitudes and behavior in relation to food: An evaluation of the school lunch initiative*. Berkeley, CA: University of California at Berkeley, College of Natural Resources and School of Public Health. Center for Weight and Health,. Retrieved March 26, 2011, from http://www.ecoliteracy.org/sites/default/files/sli_eval_full_report_2010.pdf
- Rethinkers. (2008.). *Twelve recommendations for public schools food and cafeterias*. Retrieved November 27, 2009, from <http://therethinkers.com/download/recommendations-2008.pdf>
- Ritz, D. (Ed.). (2001). *Defying corporations, defining democracy*. New York, NY: Apex Press.
- Robin, C. (2008, June 23). Out of place. *The Nation*. Retrieved January 2, 2010, from <http://www.thenation.com/doc/20080623/robin>

- Romm, J. (2007). *Hell and high water: Global warming—the solution and the politics—and what we should do*. New York, NY: Harper-Collins.
- Sale, K. (1996). *Rebels against the future: The Luddites and their war against the industrial revolution: Lessons for the computer age*. New York, NY: Perseus Books.
- Santone, S. (2004, January). Education for sustainability. *Educational Leadership*, 61(4), 60-63.
- Sarver, S. (1995). *Narrative scholarship: Storytelling in ecocriticism*. Retrieved October 14, 2010, from <http://www.asle.org/site/resources/ecocritical-library/intro/narrative/sarver/>
- Satouris, E. (1999a). Earthdance. Retrieved March 27, 2007, from <http://www.ratical.org/LifeWeb/Erthdnce/erthdnce.html>
- Satouris, E. (1999b). *The evolving story of our evolving earth*. Retrieved August 16, 2009, from <http://www.ratical.org/LifeWeb>
- Satouris, E. (2002). *What's wrong with environmental education?* Retrieved March 27, 2007, from <http://www.ratical.org/LifeWeb/Articles/theBridge0302.html>
- Schumacher, E. F. (1975). *Small is beautiful: Economics as if people mattered*. New York, NY: Harper & Row
- Senechal, E. (2008). Environmental justice in Egleston Square. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 85-112). New York, NY: Erlbaum.
- Senge, P. M. (2003). *The fifth discipline: The art and practice of the learning organization*. New York, NY: Doubleday.
- Settee, P. (2008). Indigenous knowledge as the basis for our future. In M. Nelson (Ed.), *Original instructions: Indigenous teachings for a sustainable future* (pp. 42-47). Rochester, VT: Bear & Co
- Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27(2), 4-13.
- Shiva, V. (2008). *Soil not oil*. Cambridge, MA: South End Press.
- Simon, S. (1998). *Subjectivity and the experiencing body: Toward an ecological foundation in adult learning*. (Doctoral dissertation, Portland State University). (UMI No. 9904058)

- Skelly, S., & J. Zajicek. (1998). The Effect of an interdisciplinary garden program on the environmental attitudes of elementary school students. *Hort Technology*, 8(4), 579-583.
- Smith, A. (1937). *Wealth of nations*. New York, NY: Modern Library.
- Smith, G., & Williams, D. (Eds.). (1999). *Ecological education in action: On weaving education, culture, and the environment*. Albany, NY: State University of New York Press.
- Smith, G. A. (2002). Place-based education: Learning to be where we are. *The Phi Delta Kappan*, 83(8), 584-594.
- Smith, G. A., & Sobel, D. (2010). *Place- and community-based education in schools*. New York, NY: Routledge.
- Sobel, D. (2004). *Place-based education*. Great Barrington, MA: The Orion Society.
- Sobel, D. (2008). *Childhood and nature: Design principles for educators*. Portland, ME: Stonehouse Publishers.
- Speth, J. G. (2004). *Red sky at morning: America and the crisis of the global environment*. New Haven, CT: Yale University Press.
- Spretnak, C. (1999). *The resurgence of the real*. New York, NY: Routledge.
- Sterling, S. (2002). *Sustainable education: Re-visioning learning and change*. Bristol, UK: Green Books for the Schumacher Society.
- Stipp, D. (2004). The Pentagon's weather nightmare: The climate could change radically and fast—that would be the mother of all security issues. *Fortune Magazine*, 149(3). Retrieved January 2, 2010, from http://money.cnn.com/magazines/fortune/fortune_archive/2004/02/09/360120/index.htm
- Stone, D. (2002). *The policy paradox: The art of political decision making*. New York, NY: W. W. Norton.
- Stone, M. (2005). Sustainability—a new item on the lunch menu. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 227-240). San Francisco, CA: Sierra Club Books.
- Stone M. (2009). *Smart by nature: Schooling for sustainability*. Healdsburg, CA: Watershed Media.

- Stone, M., & Barlow, Z. (2005). *Ecological literacy: Educating our children for a sustainable world*. San Francisco, CA: Sierra Books
- Theobald, P., & Siskar, J. (2008). Place, where diversity and community converge. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 197-220). New York, NY: Erlbaum.
- Toch, T. (2003). *High schools on a human scale: How small schools can transform American education*. Boston, MA: Beacon Press.
- Tompkins, R. (2008). Overlooked opportunity: Students, educators, and educational advocates contributing to community and economic development. In D. Gruenewald & G. Smith (Eds.), *Place-based education in the global age* (pp. 173-196). New York, NY: Erlbaum.
- Tyack, D., & Cuban, L. (1995). *Tinkering toward Utopia: A century of public schools reform*. Cambridge, MA: Harvard University Press.
- Underwood, P. (2000). *The great hoop of life*. Bayfield, CO: A Tribe of Two Press.
- UNESCO. (1978). *Final report: Intergovernmental Conference on Environmental Education*. Retrieved July 5, 2010, from http://www.gdrc.org/uem/ee/EE-Tbilisi_1977.pdf
- United Nations Department for Economic and Social Affairs Division of Sustainable Development. (1998). *Consumption and production patterns: News and trends*. Retrieved November 27, 2009, from <http://www.un.org/esa/sustdev/sdissues/consumption/cppnt3.htm>
- United Nations Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Desertification*. Retrieved January 2, 2010, from <http://www.millenniumassessment.org>
- United States Department of Agriculture. (1993). *Inch of soil poster* (NRCS-P1-06). Washington, DC: Author.
- United States Environmental Protection Agency. (2001). *2000-2001 Pesticide market estimates: Usage*. Retrieved December 5, 2009, from <http://www.epa.gov/oppead1/pestsales/01pestsales/usage2001.htm>
- United States Green Building Council. (2008). *Project profile: Rosa Parks Elementary School*. Retrieved July 27, 2010, from <http://www.usgbc.org/ShowFile.aspx?DocumentID=5110>
- Vernonia city government meeting notes. (2010). *Vernonia k-12 school project: Public meeting agenda, 10/14/2010*. Retrieved March 26, 2011, from

<http://www.vernonia-or.gov/announcements/Vernonia%20K-12%20School%20Project.pdf>

- Wagner, T. (2002). *Making the grade: Reinventing America's schools*. New York, NY: RoutledgeFarmer.
- Waters A. (Ed.) (2003). *American Indian thought: Philosophical essays*. San Francisco, CA: Blackwell.
- Waters, A. (2005). Fast food values and slow food values. In M. Stone & Z. Barlow (Eds.), *Ecological literacy: Educating our children for a sustainable world* (pp. 49-55). San Francisco, CA: Sierra Club Books.
- Westervelt, A. (2009). *Peak soil has a simple fix, but will we manage it?* Retrieved December 5, 2009, from <http://solveclimate.com/blog/20091119/peak-soil-has-simple-fix-will-we-manage-it>
- Wheatley, M. (2002). *The servant-leader: From hero to host*. Retrieved June 11, 2008, from <http://www.margaretwheatley.com/articles/herotohost.html>
- Wheatley, M. (2006). Lessons for the real world. *Leader to Leader Magazine*. Retrieved June, 11, 2008, from <http://www.margaretwheatley.com/articles/leadershiplessons.html>
- Wheeler, K. A., & Byrne, J. M. (2003, March/May). K-12 sustainability education: Its status and where higher education should intervene. *Planning for Higher Education*, 31(3), 23-29.
- Whitty, J. (2007, May/June). Gone. *Mother Jones Magazine*. Retrieved from <http://motherjones.com/environment/2007/05/gone>
- Williams, D. R. (2008). Sustainability education's gift: Learning patterns and relationships. *Journal of Education for Sustainable Development*, 2(1), 45-50. Retrieved from <http://www.pdx.edu/elp/learninggardens>
- Williams G. (2001). *References on the American Indian use of fire in ecosystems*. Retrieved October 21, 2010 from http://www.wildlandfire.com/docs/biblio_indianfire.htm
- Wilson, E. O. (1986). *Biophilia*. Boston, MA: Harvard University Press.
- Wilson, E. O. (2003). *The future of life*. New York, NY: Vintage.

Young, J. (2009). *All education is environmental education*. M.Ed. dissertation, Queen's University (Canada), Canada. Retrieved October 10, 2010, from Dissertations & Theses: Full Text (Publication No. AAT MR48206).

Zalasiewicz, J., Williams, M., Smith, A., Barry, T., Coe, A., & Brown, P., ... Stone, P. (2008, February). Are we now living in the Anthropocene? *Geological Society of America Today*, 18(2), 4-8.

Zinn, H. (1995). *A people's history of the United States*. New York, NY: Harpers Collins.

Zinn, H. (2002). *You can't be neutral on a moving train*. Boston, MA: Beacon Press.