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## Frankenfoods: Are We Bioengineering Our Children and What Can Curriculum Do?

Patra Rickman

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FRANKENFOODS: ARE WE BIOENGINEERING OUR CHILDREN AND WHAT CAN  
CURRICULUM DO?

by

PATRA RICKMAN

(Under the direction of John Weaver)

ABSTRACT

In this dissertation I explore the effect of biotechnology and food production on children's physical and mental health. What we eat affects our well-being and unknowingly, we have little control of what exactly we are consuming. Children have even less control and feel the effects of additives and chemicals more than adults. Many of the effects of bioengineered foods are unknown at this time. My dissertation will be a theoretical exploration of biotechnology in food using a bioethical critical perspective. I use my personal experience and research to examine the effects of processed and genetically engineered foods on people, especially children, to inform about the need for a change in curriculum that supports an awareness of the environment and the methods employed in food production. Lately, headlines have been full of illnesses and deaths resulting from processed foods and obesity has become a larger national concern. Lurking just below this is the effects of consuming the "Frankenfoods" of biotechnology. The full and lasting effects of eating genetically modified foods are not yet known: however there are links to precocious puberty, cancer, and other illnesses. I inform the public of the importance of understanding the effects of what we are putting into our bodies and the bodies of our children. I posit that we need to educate in a way that enhances our connection to the natural world with a sustainable and holistic curriculum that employs the Montessori Method.

INDEX WORDS: Frankenfoods, Bioengineered Foods, Genetically Modified Foods, Precocious  
Puberty, Sustainable, Holistic, Montessori.

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by

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B.S., Georgia Southern University, 2000

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DOCTOR OF EDUCATION

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## DEDICATION

To my daughter, Maia, who shows me every moment of every day just how precious is life.

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## CHAPTER I

### INTRODUCTION

Right there, in the middle of every **school** day, lies time and energy already devoted to the feeding of **children**. We have the power to turn that daily school lunch from an afterthought into a joyous **education**, a way of caring for our **health**, our **environment**, and our **community**. (Waters, 2008, p 50-51)

In education mind and heart have historically been seen as complementary. It was not until the Industrial Revolution that *logos* and *mythos* began to be viewed “as...conflicting...ways of making meaning of the world” (Arguelles, McCraty, & Rees, 2003, p 13). The emphasis on the mind in learning in our capitalistic culture has shifted curriculum away from a holistic emphasis and has resulted in a world dominated by science and technology with little regard for its effects. No single form of educating can fully address the complexity of human existence. When I began teaching, I too focused on *logos* alone as I knew no better. I was given a Teacher’s Edition, twenty-one students, and little else. It was not until I began my journey through curriculum theory at Georgia Southern University that I began to question this method of teaching. Maxine Greene describes this feeling in *Teacher as Stranger* (1973):

[T]he traveler returns home, but it is not the same. Things once before unnoticed or taken for granted are seen in a new light. Much has happened on the journey, but is yet to happen on the journey to come. We have to be reflective thinkers and take a “stranger’s vantage point on everyday reality. (p 267)

I will never be the same since I have started my journey, but the change is welcome, albeit scary at times as I start anew out of my comfort zone toward the middle. The journey to self is complex. Mary Aswell Doll (2000) writes that this type of journey is incredibly difficult and

often viewed negatively. But this journey is necessary because everything in our lives; past, present, and future affects and changes us. “I wander in the world and the back worlds, in bold abstractions, landscapes, cultures and languages, social castes...my soul is exposed in learning things, just as it ventured onto the slop of glaciers and still remains there.” (Serres, 1997, p 32). On the journey, we affect and are affected, we must ponder these events as they occur and again in greater depth, after they occur, in order to gain knowledge from them. The middle passage is often left out of Western thought, but it is here that most thought and learning takes place. It is a place of discomfort and unease. The middle is a place of uncertainty in which important learning can take place. I no longer sit casually and watch my life go by. I am still affected by what happens, but now I can also have an effect on those around me. John Weaver writes about a “bumptious bioscientific actor...a prickly person who asks the tough questions and demands responsibility from scientists, biotech corporations, and universities” (2010, p 47-48). I see that this is what I have become in my quest to understand what is happening to food. As an ecofeminist I hope to “reverse the assaults of production on both biological and social reproduction by making problems visible and proposing solutions” (Merchant, 1995, p 7). Everything that happens every day influences my life and everything I do influences someone. This all started with my pregnancy and my desire to protect my unborn child from innocuously imbibing potentially harmful substances and has grown into a desire to protect all people, especially children. Serres discusses the impact one has upon others “the moment you acknowledge otherness, learning has this modifying effect” (Huyghe, 1993, p. 22). Now that I really know this I can no longer be content with middle-of-the-road, I have to reach out and find my whole self and help those I teach do the same. In an interview with Francois-Bernard

Huyghe, Serres discusses the importance of learning across the curriculum that I feel illustrates the importance of holism in education:

The idea of cross-fertilization means first of all devising an education system that does not separate the exact sciences and the humanities in a foolish, dangerous way. It then occurred to me that cross-fertilization was the global concept underlying all learning processes. If you start to learn physics, your life and your world are going to change. You become crossbred by the very fact of learning. (1993, p. 16)

This quote exemplifies the inherent presence of holism in education, when you learn you are changed. The idea of the factory model of education where information is segmented and taught out of context does not work. The primary goal of a Montessori education is to help each child reach full potential in all areas of life. Activities promote the development of social skills, emotional growth, and physical coordination as well as cognitive preparation. The holistic curriculum allows the child to experience the joy of learning, time to enjoy the process and insure the development of self-esteem, and provides the experiences from which children create their knowledge. This is the education of the whole child through teaching the connections of all aspects of life in all subjects. This is becoming trendier in education and teaching across the curriculum is becoming a by-word for administrators but we are not quite there. What is happening is teachers are inserting questions across subjects, but are not fully integrating them. J.P. Miller explains that “[h]olistic education is an approach aimed at teaching the whole person... school curricula have broken knowledge into courses, units, and lessons that are often filled with unrelated factual material... holistic education cultivates a curriculum of connectedness” (2006, p 101). Holistic education aims to being about an intrinsic respect for life and a love of learning through direct engagement with the environment. An example of this in

Montessori's Cosmic Education, five great lessons that helps one feel part of the wholeness of the universe. They show how everything is interdependent. Continuing to break apart education is also breaking apart ourselves, I believe that focusing on the whole will help us as educators and parents generate well-informed and caring people. Jeffrey Hopkins said "[a] compassionless perspective leads to the mania of thinking that mere economic success...is the be-all and end-all of human existence; it gives rise to amoral and even immoral pursuit of money, in which one does not recognize the difference between adequate external facilities and true internal satisfaction" (Miller, 2006, p. 60). Education should nurture the soul, help people find their own destiny or calling, and ground thinking in experience with the natural world (Miller 2006, 1988, 1983 & Dewey 1968/1929, 1959/1938).

John Dewey (1959/1938) criticized traditional education for lacking in holistic understanding of students and in designing curriculum. He believed the excessive focus on content took away from the contribution education could make to the well-being of individuals and society. There is a transformative learning derived from learning holistically that changes how the learner interacts with the world. Dewey agrees "what is needed is the habit of viewing the entire curriculum as a continuous growth, reflecting the growth of the mind itself" (1962/1904, p.19).

### **You Are What You Eat and You Teach What You Are**

My life has seemed to have a pattern – everything goes along as I have come to expect it, then bam – something huge happens to put everything in a tailspin. I never intended to become a teacher nor a parent for that matter. I had always lived my life believing in the tenet of eat, drink

and be merry for tomorrow we die. I had absolutely no direction before my pregnancy. I worked in restaurants, saved money to travel, and spent money on dining out and sampling wines. By the time I was 32, I had traveled across the United States, Europe, the Caribbean, and parts of Latin and South America several times. I had memories and little else. I finally decided to try going back to school; I thought perhaps to earn my PhD in anthropology so that I might teach at a university. When I discovered I was pregnant, everything changed. I had never spent much time around little children before: I moved away from my family just before my eldest niece was born and only saw my family once a year until I moved back home when Maia, my daughter, was one year old. I could not have asked for a bigger blessing or better gift than when I became pregnant at age 32; this event changed my life and put me on a better path. While pregnant I became fascinated with children and considered home schooling Maia. To learn more, I volunteered at a local pre-school and a Montessori elementary school in my neighborhood. I had never heard of the Montessori Method before I was instantly intrigued and decided after months of working with these teachers and children that I, too, would become a teacher. I started the application process at the University of Minnesota, but my mother told me of a two-year Masters program in Savannah that would allow me to start teaching after a summer of coursework, so we moved back home.

The program in Savannah taught the basics of classroom management, legal responsibilities, and curriculum. The curriculum I learned from this school was the core knowledge elementary students needed, but it was presented in a “[c]ome and get it, but you’re on your own as to what to make of it all” (Graff, 2003, p3) manner for teacher as well as student. It did not delve into the ways to teach and the hidden curriculums many teachers harbor that I later learned of while a student at Georgia Southern University. Fortunately, through

“complicating the conversation” (Pinar, 2004) and dialogue (Friere, 2006) that I have learned through discourse with my professors, I have reconnected with my ability to think for myself. A teacher, of all people, should not be prejudiced. To really know what she/he feels inside, she/he must explore her/himself for –isms. Some teachers may not realize just how prejudiced they may be towards girls, or boys, towards skin tones, towards religious inclinations, cultural, or economic backgrounds. Teachers teach what they know and what they believe, whether it be consciously or unconsciously. Education Professor Max “van Manen also says that ‘good teachers *are* what they teach’; they embody it; similarly, they teach what they are” (Schubert, 2009, p 58). All teachers should be exposed to learning and to dialogue to heighten their awareness of what they are actually passing down to students, because it is those beliefs and actions that perpetuate the hatred and lack of interaction. If not, we merely reproduce the status quo of the ideal white, middle-class student and set up so many to abject failure because we are not recognizing and respecting the differences.

I can relate to Florence Krall who states that “early in the journey, I suddenly realized that walking at my side was a modern-day Artemis” (1994, p 117) a guide to help me learn. Dialogue is that guide. I discovered the power of dialogue in the classes I have taken in graduate school. We are allowed to speak, to present our ideas and thoughts without intimidation. “[D]ialogue characterizes an epistemological relationship. Thus in this sense, dialogue is a way of knowing...[it] is an indispensable component of the process of both learning and knowing” (Friere, 2006, p 17). Dialogue allows the freedom of individuality. It shows the importance of self in the curriculum. “Students have to assert themselves into history in order to construct their own identities since there are numerous others who wish to define their existence as future workers and consumers” (Weaver, 2005, p 101). Through dialogue you can make that assertion

into history and come to know yourself all the while helping students come to know themselves. You teach what you are. If you know not what you are then you cannot know what you are teaching. This really makes me question what is being put consciously or unconsciously into the curriculum. We are moving away from the child with current curricula, as Huebner asserts:

That curriculum has become so formalized and abstract, so often distant from the everyday sense of conversational signals, we asserted, how profoundly the process of education has been institutionalized and bureaucratized. Instead of employing school knowledge to complicate our understanding of ourselves and the society in which we live, teachers are forced to “instruct” students to mime others’ (i.e., textbook authors’) conversations, ensuring that countless classrooms are filled with forms of ventriloquism rather than intellectual exploration, wonder, and awe. (Pinar, 2004, p 186)

Unlike the majority of my classmates, I did not take a teaching job that first fall. Instead I chose to be a teacher’s assistant in order to learn more about the inner workings of the classroom and to learn more about myself before jumping in as lead teacher. Because of this I was disqualified from GaTAPP (Georgia Teacher Alternative Preparation Program) but was able to continue earning my degree as an alternative education student. Continuing toward my master’s degree, taking care of a toddler, working full time in a public elementary school and full time in a restaurant at night to pay bills left me little time to learn who I was. My life had been spent knowing only who I wasn’t and fighting against what I had grown up with.

My second year in the University’s program, I got a job as a teacher, continued working in a restaurant, and still had little idea of what I was teaching my students or why. I was at a Reading First, Everyday Math school – which meant teaching solely from TE’s (teacher’s editions) and having not to think about the what and why of teaching. I sometimes think this may

be a fortunate way for some to teach – it prevents a teacher’s personal biases from coming forth, although it allows the publisher’s biases to shine through. I did not like it, I felt it cheated the students and me to have to hold and read from a TE, with expected student responses printed in red ink no less. An enforcer often came to check in the classroom to ensure I was actually holding my TE or that it was placed down within my arm’s reach. This is no way of teaching; this is a diatribe against education. We are leading students where we want them to go through the *currere*, the course to be run. Creating knowledgeable, caring whole persons is powerful and is an awesome responsibility that cannot be achieved solely through the use of TE’s. My second year teaching I started work on my doctorate at Georgia Southern University. It was here I realized just how far from myself I was actually removed. After beginning my program at Georgia Southern, I started to realize how much is involved in curriculum theory and teaching holistically. I could no longer sit idly by and allow someone else to tell me what to teach or how to teach it. I cannot open another text of scripted materials and feign knowledge to my students. I felt like an imitation of what I was coming to believe a teacher should be, I wanted to facilitate learning not teach at students who had no say in how their learning took place. I asked for, and received a transfer to a public Montessori school for the next school year. Michel Serres states, “the body will never walk or stand erect as it did when it only knew standing still or walking” (1997, p 6); once you begin to realize things are different than what you had previously thought, you can never go back. We create curricula based on our beliefs and knowledge. To truly understand curriculum, I needed to understand myself. Our curriculum should make learning personally meaningful to the student; this can be done with a holistic and eco-centric curriculum. Holistic education seeks a relationship between the whole and the part. It is inclusive and does not label nor segregate students. Holistic education “encourages the use of a wide range of

teaching and learning strategies in order to reach diverse student populations(Miller, 2006, p. 102). A child that is able to learn holistically through different educational experiences takes that knowledge as part of his/herself.

Chet Bowers (2004) argues that students need an understanding between the social world and the environmental world in which people live. This includes understanding how we are connected and interconnected to the ecology of the world we live in, including how we live and what we do affects the world now and well into the future. Ecology is the study of relationships and Holistic education will help with developing that sense of place and ecological stewardship.

There is a dire need for profound reflection and self-analysis to embark on an understanding of why I do what I do and why I think how I think. Serres (1997,1999) does not believe that a person's philosophies can easily be packaged and filed away, but I feel there must be some understanding of who I am and why I think the way I think before I can continue in good conscious as a teacher. I need to be able to know when I have a thought and when it is merely the thought of someone else that seems like it should be mine. I have been told all throughout my educational career what to think. This has to end. To truly know what it is I am teaching I need to know the reasons behind why I teach it. What is left out? Why am I leaving these things out? Is it really okay for me to have my truth and you to have yours when I am teaching you? Do my morals and beliefs intercede? Do I even have a grasp on what it is I truly believe? What is it that makes me think the way I do? There is a link between self and signifiers. There is a link between things we buy and how we define ourselves. Many people define themselves solely on what material possessions they have. I have doubt as to who I am. Am I what I buy and what is around me? I want to find out who I am beneath the goods. "Doubt: having two movements and two intersections, two goals and two conducts, leaving the branching

there before you, leaving stubble on the stroke, leaving the bifurcation cleft” (Serres, 1999, p 16). I had choices to make. I had to choose a path like Serres alludes to: I had no choice but to begin my journey to discover who I am. “I don’t know the destination; it really is relatively unimportant. I’ll know when I get there. We make the journey by living it” (Reynolds, 2003, p.42). When in my early twenties and beginning coursework on my degree in anthropology, I thought I would easily be able to discover who I was; all I knew was what I was not. I left home and family because I realized that I did not fit in, I was very different; but I was not sure how. I wanted to learn about others to get a better understanding of myself. I always loved mythology and looked to Joseph Campbell as a mentor: I tried relating through myths, but it was not enough. The universal meanings did not always seem to suit me. I decided to study anthropology to better understand people and the reasons why they do what they do. I studied philosophy to understand the thoughts behind the actions.

## **Into My Garden**

Like many others, I grew up eating the occasional Happy Meal™. I relished sinking the beautifully golden fries into oceans of ketchup and I always asked for extra cheese on my burger. I enjoyed the simple pleasure of eating with my hands; it was pure innocence. Where is that innocence in the corporate minds that are willing to fill their products with drugs and chemicals in order to save a few precious pennies? Who was thinking about the innocent farmers and ranchers who lost everything because they could not afford the lakes of pesticides and hormones required to produce the perfect potato, or the juiciest largest breasts on a chicken? Who was thinking about the health of those innocent children and adults who unknowingly imbibe more

and more toxins with each bite? I never used to think about it. I was perfectly content eating whatever was served me without question or concern. Why would anyone cause harm to another through that most necessary of human needs? Who messes with our food?

These questions were not ones I used to ask until I became pregnant. My pregnancy was a complete surprise. I did not plan and take folic acid and prenatal vitamins; conversely I drank more wine than I ate food as was my routine in those days. Suddenly I was responsible for feeding another human being. How could I sustain a healthy pregnancy and deliver a healthy baby? What had I done? My mind was racked with guilt and fear. My sister's first child had been born with Down's syndrome. She was much more responsible than I. My brother's second son had to be delivered by emergency C-section that went awry and Nathan was born dead, resuscitated and now suffers from a severe form of cerebral palsy. My sister in law was always responsible; she planned her pregnancies and she took excellent pre-natal care of her child. What had I done? I was so ill prepared and my body was in no condition to nourish another but no one else could provide for this embryo. Every choice I made suddenly seemed a matter of life and health for this tiny fetus, and I had a lot of making up for lax responsibility to do. I started reading the labels on foods in the supermarket. What is amyl butyrate and what is it doing in my strawberry yogurt? The more I looked, the more I could not find words I could read nor was I able to figure out what they were. I needed to be a chemist to understand these lists of ingredients.

Food used to be so simple; what happened? I decided to go organic and have only found more and more reasons over the years to make me thankful that I made this choice for myself and for my daughter. As statement by author Christopher Cook adds to my reasons "the way we make, market, and eat food today creates rampant illness, hunger, poverty, community

disintegration, and ecological degradation – and threatens our future food supply” (2006, p 4).

We are in a downward food spiral that is causing harm to our minds as well. Nutrition affects our learning, our health, and our behavior, in addition to our bodies, environment and economy. The way food is manufactured, raised and grown today are endangering our ecosystem, or as Bowers (2006) refers to it – the commons, and our health. Bowers teaches us the importance of reconnecting to the environment through what we already have learned in the past – ancestral wisdom. But he focuses on the capitalistic problems and ignores the history of environmental destruction inherent in, among others, traditional farming methods that are depleting our soil of nutrients and in turn decreasing those minerals from what is grown in this manner (Pollan 2008).

### **Meandering Through Meaning**

The purpose of my dissertation is an attempt to inform parents and educators about the risks inherent in our food production and consumption and search for the means to rectify the problems through a change in curriculum to an eco-centric *holistic curriculum* (J.P. Miller, 1998). I realize that I go into this research with a bias towards natural and organic foods – it has been my lifestyle for years. In this study I will clarify the fundamental characteristics of food production within an educational context using a theoretical form of inquiry that is based in ecological criticism. Eco-feminism explores the cultural connections between women & nature to show how female oppression is ideologically linked to environmental destruction. The dichotomy of depictions of women is the same that as earth; either safe (mother/virgin) or dangerous (wilderness/whore). The imagery associated with nature was always dualistic: She is “a kindly beneficent female who provided for the needs of mankind...[she is] wild and

uncontrollable” (Merchant, 1976, p. 2). Mother provides sustenance; virgin provides opportunities to conquer and thus degenerate. Thus the earth is either over-farmed or controlled by cultural forces. The eco-feminism seeks to re-establish an organic metaphor for understanding nature and they propose that both women’s oppression & environmental destruction are the result of Patriarchy. Ynestra King (1995) explores dualism, domination and hierarchy and the relationship between the degradation of women and nature in the western tradition. “The ecological crisis is related to the systems of hatred of all that is natural and female by the white, male western formulators of philosophy, technology, and death inventions. I contend that the systematic denigration of working-class people and people of color, women, and animals are all connected to the basic dualism that lies at the root of western civilization” (p. 353).

I will use the work of ecological theorists Chet Bowers and David Orr and holistic theorist John Miller to help formulate a holistic sustainable change to the curriculum. My curricular focus will be a new recipe with bits of holism with a dash of Montessori simmered with ecological theories. John Miller tells us that “most individuals usually find that 2 or 3 orientations appeal to their way of thinking. It is appropriate, then, to speak of a cluster of orientations which form a meta-orientation” (1983, p. 7). As Bowers states: “The challenge will be to see through the illusions of a consumer-oriented, technologically based existence” (1993, p. 9). Current research on genetically engineered foods is biased (Smith, 2003), by exploring these biases I hope to present a clear picture of the consequences of genetically engineered and overly processed foods. Merchant explains “socialist ecofeminism ...makes the category of reproduction, rather than production, central to the concept of a just, sustainable world” (1995, p. 15) I will explore the Christian fundamentalist group of dominion theologians who believe that they can do whatever they want to the earth as it was created for people to use (Hendricks 2005).

This thought process of the Dominionists may help to explain why some people are unconcerned with food production technologies and their environmental effects on all living things. My family became religious after the birth of the first grandchild – who was born with Down’s Syndrome, and their faith was only intensified after his death. Although my family are not dominion theologians, when I ask them about food choices they too use their religious beliefs to explain or not explain reasons for their actions and beliefs about food consumption. The Bible tells humans that they are made in God’s likeness and so set apart from all other creations. There is a belief that god expects man to hold dominion over the other creatures. There tends to be a lot of nonchalance about food in our society. In 2003 and 2004, surveys of American public opinion indicated a lack of concern or lack of awareness about GMOs. A poll conducted by the Food Policy Institute at Rutgers University in 2003 found that only 12 percent of Americans had heard or read “a great deal” about genetic engineering or biotechnology (Hallman, et. al., 2003). Twenty-seven percent of Americans surveyed by the Pew Center in September 2004 said GM food was unsafe (Pew, November 2004), whereas in Europe, 89 percent in France said GM food was unsafe, 81 percent in Germany, and 74 percent in Italy (Pew, August 2003). The reason for Americans nonchalance is explained by “Mark Hertzgaard, author of *Earth Odyssey* - a book on the global environment ... the principal cause of this resounding silence is political. 'Corporations have a greater control of the debate here,' Mr. Hertzgaard said. 'It's cultural here. Everything is already wrapped in plastic. You take it for granted. It's like the air you breathe.' The links between the GM industry and the government have been carefully cultivated. The dominant corporation in the field, Monsanto, a \$7.5 billion (£5 billion) giant with 25,000 employees, has covered all its bases, making significant financial contributions to both Republicans and Democrats (Borger, 1999). David Orr reiterates that this is true “growth makes

the wealthy more so, but it also gives substantial power to government and corporate elites who manage the economy, its technology, and all of its side effects” (1993, p.10).

### **Statement of Originality**

My work departs from what has already been done in the field because it looks at food as the source of inequity. So much of the food that we consume has a story about how it came to be. Producers of food have come from a legacy of cross-pollinating and fermenting to change our food. Now they are crossing genes, replicating DNA, and using a vast array of chemicals to produce the food we eat today. These are un-natural creations going into our bodies. The bio-accumulation of these chemicals can have lasting - cross-generational effects. There are links to cancers from some of these foods, links to ADHD, precocious puberty, and more. The giant corporations that continuously buy out small suppliers and producers have so much control on what we eat. Their power is felt in Washington D.C., as well with the powerful food industry lobbies like GMA, the Grocery Manufacturers Association, that work to protect the industries profits. Little concern, if any, is given to the health and well-being of the consumers.

Unfortunately, the mighty dollar wins out over public safety. As providers of one of the few actual needs in this capitalistic culture of ours, the food industry is a huge and powerful player in our everyday life. We have limited choice and control over what we ingest. Unknown chemicals, hormones, transgenic mutations, and over processing of food make the seemingly innocuous task of eating risky. Foods are shipped from thousands of miles away causing wastes of fossil fuels and pollution. Science and technology bring us fruits in the midst of winter months encoded with

genes from flounders to help them stave off destruction from the cold. Other plants are encoded with built in pesticides. The main concern of the food industry is profit, not people.

The safety of ourselves, our children, and future generations is traded for money to line a few pockets. School lunches are big money. Title I funding provides free, government proclaimed “nutritious” meals to those below certain economic levels. Schools are also indirectly contributing to the lessening abilities of children to have full and proper use of their brains because they are not always offering or ensuring that students eat the right nutritious foods to ensure proper brain development and functioning.

Few may think to look on food as a means of control, but the effects on learning and physical well-being are too numerous to ignore. Is there a connection between keeping our poorest peoples malnourished and the need for cheap unskilled labor? In Marxist terms, the base determines the superstructure and in their book *Schooling in Capitalist America*, Bowles and Gintis (1977) discuss schools as the stratum of superstructure that is determined by society’s economic base. Apple and Giroux (in Pinar 1996) argue that schools function to reproduce the class structure of the workplace. Could this be happening through food? By not fully developing the brain’s potential through proper nutrition, how far up the hierarchical ladder of corporate and capitalistic success can one be expected to climb? Truly, nutrition, or lack thereof, seems to be a means of keeping the classes separated. Education is the great social equalizer, but to have equal access children must be nutritionally sound in order to learn.

“What people eat (or don’t eat) has always been determined by a complex interplay of social, economic, and technological forces” (Schlosser, 2001, p. 3). In *Schooling in Capitalist America*, “Bowles and Gintis speak of the insuperable difficulty of reconciling the need for “a school system dedicated to greater equality and fuller human development” with the requirement

that the schools be used “to perpetuate the capitalist system and its structure of wealth and power” (Greene, 1978, p. 100). One cannot be equal without proper nutrition – food may indeed be the true opiate of the masses; the great equalizer or the dreaded disabler. Because of the effect nutrition has on learning and the fact that the government (vastly influenced by food lobbies) provides much of the food available at public schools and allows vending machines to be available and accessible to students, one feels the need to ask why. To flourish academically and socially, good nutrition is vital. The brain is powered by glucose, micro-nutrients, and minerals (Morgan, 1987) that are not being provided at school. Or if they are, other high-calorie junk food is available that students prefer out of habit and ignorance. In any given day, 50 percent of children between the ages of two and five do not meet the My Pyramid recommendations for fruit consumption. Seventy eight percent of children in this age group do not eat enough vegetables. Older children fare even worse, with 74.1 percent of children between the ages of six and eleven years not eating the recommended servings of fruits per day and 83.8 percent not consuming the recommended number of servings of vegetables. Compounding this, the vast majority of the vegetables are French fries and the fruits are from juice drinks that are only a small percent of real juice (Lorson, Melgar-Quinonez, & Taylor, 2009)

Nutrition, healthful eating habits, and healthful means of food production should be stressed in the school’s learning environment. Multiple studies done over several years (Berg, 2004) have shown that children with proper nutrition have increased attention, creativity, and ability to learn: they also score higher on tests and are more likely to achieve their full potential academically and socially. The benefit to large food producing corporations are at the detriment of those who either cannot afford healthier alternatives or simply do not know the dangers of overly processed and modified foods. Wendell Berry states “[m]ost of us don’t know how we

live and at what costs, either ecologically or human....For how long can we maintain an industrial superstition that we can beat the world by destroying the world's capacity to produce food?" (Cook, 2006, p. 7). It is through a change in the curriculum that this cycle can come to an end.

## **Influences**

I continuously ran from myself while growing up and have just recently realized it. My mother and my father became religious late in life after a family tragedy. I could not understand how they could turn to something we had never relied on before. I felt betrayed, left out. How could they believe it? I countered my mother on every religious issue. I came home on holidays and debated her endlessly on the fallacies in the bible. She never wavered, but I did. I started doubting what I thought and why I thought it, eventually hiding behind travel and excess to mute my brain. I became defined by the stamps in my passport and the wine in my glass. This lifestyle abruptly ended with my pregnancy and the doubt returned. Like Thoreau's trip to Walden, this is truly a journey into the mind. I rely greatly on the philosophy of Michele Serres to help me figure out why I teach what I teach – I constantly question because of William Pinar:

Subjective and social reconstruction is our professional obligation as educators in this nightmarish moment of anti-intellectualism and political subjugation. Alone and together, let us participate in complicated conversation with ourselves and with colleagues worldwide. Let us construct an increasingly sophisticated and auditory field of education, one worthy of those schoolteachers and students who, each day, nearly everywhere on the

globe, labor to understand themselves and the world they inhabit. May our “complicated conversations” complicate theirs – and yours. (2004, p. 258)

Teachers could be teaching community, interconnectedness and interdependency to help sustain the environment. Without this backbone we may ultimately end up with full blown ecological collapse. There are much needed changes in our curriculum that will encourage both safety and responsibility in not only the production of food, but also the consumption of food. As Apple states, “both the curriculum and the culture of the schools have a profound impact on students’ life chances and can illuminate ties schools have to the surrounding social order” (1982, p. 2). I feel that a more holistic view of education, instead of segmenting knowledge, may help bring forth an understanding of the implications on health and environment to which modern farming techniques contribute. John Miller states that by “[n]ot seeing ourselves as separate, we feel a basic connection to living things, both human and non-human” (2006, p. 19). It is difficult to understand nature’s dynamism when we continue to break learning into smaller and more manageable pieces and it is impossible to feel connected to or a part of anything. Merchant tells us “[e]ach part contributes equal value to the healthy functioning of the whole” (1995, p. 88-89). A sustainable curriculum should have a holistic framework. Until we start looking at the whole picture, we miss the proverbial forest for the trees. We overlook problems and miss connections. Looking at wholes enables us to ask and find out how our new knowledge relates to our experiences and understandings.

## **Introduction to the Chapters**

In Chapter 2, I discuss my journey into beginning to know who I am in order to become a better teacher and discuss the beginning of my own journey into cancer. I realize now that, before cancer, my life had been on hold and I can no longer stop it from happening. Marla Morris writes “[w]hatever illness is, it changes you. Period....I am different because I am chronically ill. One thing illness has done for me is that it has freed me to do what I want” (2008, p. 12). I, too, am freed to do what I want, part of that is to find answers and come to terms with my illness. Virginia Woolf writes “[b]ut with the hook of life still in us we must wriggle” (1930/2002, p. 17), and that inspires me to continue my journey despite my illness. I rely on the works of Michel Serres to guide me through this journey as I delve into research of possible causes of cancer and glean hope and inspiration from other’s pathographies.

In Chapter 3, I discuss the rise of genetically modified and bioengineered foods and the use of chemicals in processing most of the items available for consumption at schools and stores. I explore the types of additives, GRAS (generally regarded as safe) and otherwise, that are put into foods and their effects as well as the actual processing of food to determine what happens to leach foods of their nutritive value. I delve into the use of rBGH (recombinant bovine growth hormone) in animals and its effects on the animal and their human consumers, including links to cancer and precocious puberty. Bruno Latour (1986) writes that scientists construct facts from ideas. Do scientists really look at the whole picture? What is missing from the research? Is knowledge just a social construct? I discuss the effects of processed and bioengineered foods on the health and well-being of consumers, especially children.

In Chapter 4, I argue there are health and environmental issues associated with the consumption and bioaccumulation of the foods discussed in chapter 3. I compare and contrast traditional farming methods, organic farming methods and industrial farming methods to determine which is most viable for our future. I explore food choice availability at schools. Children choose foods to eat based on experience and availability. If schools offered whole foods instead of processed foods, would food-related illnesses decrease? Jonathan Kozol (2005) writes of the disparity in education because of unequal building quality and supplies for those of low socioeconomic status, but could there also be a disparity in education based on what foods students are given to eat. Many ecofeminist thinkers believe whole classes and ethnicities, not exclusively women, are devalued in the public sphere of male power.

In Chapter 5, I discuss the political and economic issues that allow these foods to continue to pervade our food chain, including cultural reproduction, control, and capitalism. “Political theorists tend to view American society as rife with poverty, homelessness, racism, and political oppression... [and] they regard the schools as participating in this general system of injustice and suffering (Pinar, Reynolds, Slattery, Taubman, 1996, p. 244). I discuss the arguments that are given to keep genetic modification and chemical processing viable. Merchant (1995) asserts “[i]deology is a story told by people in power...[w]e realize that all stories can and should be challenged” (p55). By challenging their stories – by complicating the conversation (Pinar 2004) I hope to influence a change in how some think about their relationship with the environment. I discuss a sustainable curriculum that can help educate our children to establish good stewardship of our lands and safe farming practices to ensure healthy lands and bodies. “A political realm is a realm of action that can only be called into being by human beings who feel themselves to be versatile enough, limber enough, and fee enough to bring about differences in

the world” (Greene, 1978, p. 89). Through my studies at Georgia Southern I feel much more prepared to accept food as my realm of change. And to produce these changes, I feel there is a need for a more holistic and sustainable curriculum. Greene points out only individuals “able to take differing vantage points upon the common world, to hold as problematic what is taken for granted, and...to remain cognizant of alternative possibilities” (1978, p. 89) are able to effect changes. What better way to prepare these individuals than with a holistic education? I make use of the works of Chet Bowers, David Orr, and John Miller, with an ecological critical perspective.

## CHAPTER II

### MY JOURNEY

Nobody wants to die on the way  
caught between ghosts of whiteness  
and the real water (Lorde, 1997, p. 16)

As a new teacher, I am still learning what curriculum is. I always considered curriculum to be simply those things you are taught at school. I never really thought about it more than that. I never realized how much of one's self actually goes into the curriculum. I am just beginning to realize, because of the discourse in Georgia Southern's Curriculum Studies program, this has been a mistake and a disservice to myself and my students. In 1979 Elliot Eisner identified the *null curriculum*:

It is my thesis that what schools do not teach may be as important as what they do teach. Ignorance is not simply a neutral void; it has important effects on the kinds of options one is able to consider, the alternatives that one can examine, and the perspectives from which one can view a situation or problems. The absence of a set of considerations or perspectives or the inability to use certain processes for appraising a context biases the evidence one is able to take into account. A parochial perspective or simplistic analysis is the inevitable progeny of ignorance. (2001, p. 97)

We all know what curriculum is: it is a series of structured learning episodes designed to pass along an established body of knowledge and/or wisdom. And we all know that curriculum is contained in textbooks, printed curriculum guides, lesson plans, and teaching that we provide. Eisner points out that this is merely the explicit curriculum, the curriculum that we say we're teaching the curriculum that we deliberately set out to implement. The null curriculum is what we consciously or unconsciously put in or leave out based on our beliefs and our knowledge or

lack thereof. “All education is environmental education...by what is included or excluded we teach the young that they are part of or apart from the natural world” (Orr,1991, p. xi).I believe a lack of understanding and or concern about the interconnectedness of life and learning is the null curriculum affecting education. With a more holistic and sustainable curriculum we may be able to rectify this.

To truly understand curriculum, I need to understand myself. So much internal understanding comes from questioning yourself, something I only recently started to do. Much of curriculum actually goes on inside our heads; it is what we do with what we are given.

Imagination is key to learning. To have imagination one needs to know how to think. If we continuously repeat back what others tell us, we have no legitimate, life-long, self-actuating knowledge. “NOT EVERYONE’S IMAGINATION IS INVITING AND EXPANSIVE. Some individuals create images by refusing to participate, as if they longed to retire from the life of the universe” (Bachelard, 1947/2002, p. 159). John Dewey viewed imagination as the vehicle of learning. He believed in the inherence of imagination in education (Dewey, 1910/1997) as does Michel Serres:

The goal of instruction is the end of instruction, that is to say, invention. Invention is the only true intellectual act, the only act of intelligence. The rest? Copying, cheating, reproduction, laziness, convention, battle, sleep. Only discovery awakens. Only invention proves that one truly thinks what one thinks, whatever that may be. (1997, p. 92-93)

In order for children to be able to harness their imaginations and creativity to learn, the teachers also need to be able to harness their imagination and creativity to teach. Pinar’s “complicated conversations” are a necessary part of learning and key to helping the imagination take flight. We need discourse to break from these molds and to have legitimate knowledge. “The

complicated conversation that is the curriculum requires interdisciplinary intellectuality, erudition, and self-reflexivity” (2004, p. 8). Through the courses taken at Georgia Southern I have learned to engage in these conversations, to have dialogue so that I can truly learn and only then truly be able to teach. Montessori and John Dewey hold views on education that take the child into account, in Montessori this is called following the child which is what I believe Dewey meant in his belief that educators should take into account the unique differences between each student (1959/1938). The goal of traditional education is to prepare the child to be a productive part of the adult world. Most learning is oriented towards socialization and vocational goals – our traditional education systems parallel economic restructuring. Montessori differs from traditional in that it engages the child and provides stimulation and encouragement for self-discovery learning. Traditional education forces a child to remain seated for hours on end while the teacher teaches at them. Montessori teachers present lessons and materials in small groups in ways that enable students to imitate, investigate, and work independently. The students become self-disciplined and are able to move about the classroom freely and use materials without direct supervision. More than in traditional schools, the Montessori teachers follow the child by adjusting their strategies and timetables to the child, not forcing the child to fit in some pre-ordained schedule. The traditional classroom focuses on teaching the basic skills of reading, writing, spelling, and math. In Montessori the basic skills represent enabling skills making it possible for the child to really access learning. With Montessori, students learn to think for themselves; they learn how to learn. Holistic and Montessori education use flexible pacing to help children learn. Not all children learn at the same speed, and no child learns at the same speed all the time. Learning is an inherently creative act, and it requires a system that can move with the individual meaning making of each child. When lessons are too slow, a child gets bored,

and when it is too fast, the child gets lost and then loses interest in the subject. If children are seen and treated as individuals, there is no need to have groups move at some arbitrarily determined learning pace.

There is so much I do not know; there is so much I need to know. The course ahead is very long and winding, but these words from Michel Serres truly inspire me: “No learning can avoid the voyage. Under the supervision of a guide, education pushes one to the outside. Depart: go forth...The voyage of children that is the naked meaning of the Greek word *pedagogy*. Learning launches wandering” (1997, p. 8). The courses I have taken have been an eye-opening adventure back to myself because I have been able to question and have dialogue about my ideas and the ideas of others. Serres believed in a leisurely journey for learning where nothing is left out, to me this journey is synonymous with holistic learning because it takes all aspects into consideration and leaves nothing out,

A teacher will notice when a student is not quite performing or acting as usual. A caring teacher’s first reaction is to gently draw the student aside and find out what is going on. Did something happen at home? Are you feeling O.K.? We show compassion which “is a central value in the perennial philosophy....If we experience interconnectedness and interdependence, a natural sense of compassion for all beings tends to arise. Not seeing ourselves as separate, we feel a basic connection to living beings, both human and non-human” (Miller, 2006, p. 19). However, when a teacher is not quite performing or acting as usual, his or her supervisors and students are not so quick to notice and if they do, no effort is made to find out if something could be happening not associated with the school. Leave your problems at home! I know some students who are truly surprised to learn the teacher does not live at school. On a few occasions I have met my students at the park or a restaurant, and they were too surprised to speak to me!

Teachers exist to teach, nothing else matters. What happens when illness enters? What if it is one of the hidden illnesses? No visible signs, but internal turmoil and pain. For the past few years I have been surrounded by cancer – breast cancer to be more specific.

Just recently, I was diagnosed with breast cancer and this has sent my mind into a whirlwind. One of the things my mind goes to quite frequently is a road trip with my mother a few years ago during which she told me she had considered ending her life. Not by bullet or pill, but by letting cancer ravage and destroy her. My mom is a very practical woman and a very devout Christian. Her life or death crisis and choice took place nine years ago during a time of turmoil and scandal at her church. Although the scandal had absolutely nothing to do with my mother, she found herself wondering if the lump in her breast could be related. She believed it was her fault that somehow “[i]t was a punishment from Heaven because she was so evil. She was a naughty disobedient hateful child, and she deserved her sickness – she deserved all she got” (Sacks, 1990, p. 183). She actually felt as if her god was giving her cancer as a sign of something she had done wrong. She felt a lump in her breast and did nothing, said nothing for a month. She suffered four long weeks of solitary deliberation over whether this was a punishment from above; about whether she deserved this. Thirty days and she told no one: I cannot imagine what she went through in that time. Today I can better relate: I felt the lump in my breast in June and ignored it for more than a month, almost two. It is hard to explain – I did not feel responsible for the lump, I just did not want to acknowledge it.

Acknowledgement meant that years of my belief in choice of food and exercise to protect oneself was flawed. I was not ready to deal with that. I am not sure that I am yet; I still believe that our health is inexorably tied to what we eat. But I did finally go to the doctor; I had an ultrasound in August. Watching the doctor was most surreal: she was not completely certain the

size nor the location of the tumor and when I turned to study the screen, I almost laughed. It was like looking for shapes in the clouds: I saw a clown, a pony; how could one discern a tumor in the mess? My doctor decided I was in stage 2, or 3. My oncologist recommended six courses of chemotherapy after which – assuming the cancer shrinks; I am to have a lumpectomy, followed by radiation.

Before my mother called me to tell me of her cancer – which happened after her surgery – I had never more than a fleeting thought of my own mortality. Suddenly I felt submerged in a sea of uncertainty: Would my mom survive? How long before I get it? Can I prevent getting it? What caused it? No one really knows, not even the professionals. “Medicine’s ground state is uncertainty. And wisdom for both patients and doctors is defined by how one copes with it” (Gawande, 2002, p. 18). I will examine my journey through the uncertainty cancer brings, investigate an environmental perspective of breast cancer, and discuss the curricular impact cancer can have. I chose the journey motif, which is so common in pathographies, because one learns throughout the journey. This experience with cancer and its uncertainties has definitely been a course of learning. The journey begins when we decide to try to understand that which is unknown and uncertain.

### **The First Steps into the Quagmire**

Cancer, carcinogen, carcinoma, from the Greek *karkinos*, "the crab" (Seingraber, 1997, p119)

“Over and over again, the same metaphorical paradigms are repeated in pathographies; the paradigm of regeneration, the idea of illness as battle, the athletic ideal, the journey into a

distant country, and the mythos of healthy-mindedness” (Hawkins, 1999, p. 27). I believe the journey paradigm is so often used because there is so much to be learned from being ill; everyday has the potential to be different and a new challenge or obstacle to overcome. For me, this journey began with a phone call more than nine years ago. My mom pretty much laughed her experience off and told me not to worry. We joked about cancer being caused by power lines and electric blankets, with never a thought that a cause could be the food we eat or the medicines we are prescribed by doctors. As my mom always said, “you just never know what is going to get you in the end” For my mom this meant life as normal; for me it meant a deep look at my lifestyle and habits, especially when a few months later I became pregnant. Already a vegetarian, I felt compelled to eat organic foods and be more critical in the use of pharmaceuticals. I would make up for past indiscretions and my baby could be healthy. This compulsion continues today, and my will to do so has only increased as I learn more of what we are actually putting into our bodies when we eat or follow medical advice. The long term effects are either suppressed, ignored, or unknown. We are ingesting multitudes of chemicals and hormones when we eat. The effects of which are known and unknown yet continue to be manufactured for commercial use.

Most industrialized countries, including Europe and Canada, have banned the use of hormones in cattle because of the ill-effects associated with its ingestion. It is still in widespread use in our country. The United States has a long history of being the last country to ban a product, choosing to keep it on the market because of financial benefits regardless of earth and human health costs. Some of these items include lead-based paint, insecticides with arsenic, and asbestos. I believe this will continue into the future because of the rush to get items approved and the lack of environmental education in our curriculum. “The uncertainty and ambivalence ignorance nurtures is but an occasion to another display of the potency of reason, and so it

breeds, ultimately, reassurance” (Natoli, 1993, p. 21). I believe through education we can stop this rampant abuse of our bodies and our environment by money motivated corporations. They rely on our ignorance to ensure the marketability of their potentially harmful products.

### **Sinking in the Sand**

You will observe with concern how long a useful truth may be known, and exist, before it is generally received and practis'd [sic] on - Benjamin Franklin (Rampton & Stauber, 2001, p. 90).

My interest in foods and the impact of chemicals, drugs, and additives led me down several paths of investigation. Development of biotechnology work done in the 1950s, 1960s, and 1970s has allowed scientists to play with genes. The debate I first researched was over the use of reconstituted bovine growth hormones (rBGH) in cattle to force them to produce more milk. The first reports of studies of effects of rBGH appeared in 1982 (Roberts, 2001, p. 46). But the producer of rBGH, Monsanto, “did not subject rBGH to any of the normally required long-term toxicology experimentation and tests for human safety” (Teitel& Wilson, 1999, p. 34). Nevertheless, it has become a common practice to add rBGH, bovine somatotropin (BST) that was engineered in labs, to dairy cattle to increase their milk supply and body mass. The hormone is passed through the milk and the meat into humans and could possibly have several adverse effects on us, including precocious puberty and cancer.

Levels of estradiol and other hormones in meat and organs are more than triple the levels found in non-implanted controls...The extent to which hormonal meat contributes to

increased breast cancer rates, apart from cancer of the uterus, prostate, and testis, has been virtually ignored. (Epstein, Steinman, & LeVert, 1997, p. 195–196).

These new technologies meant to improve upon the inefficiencies of farming are proving to be cost effective yet destructive. rBGH is a synthesized version of a natural protein hormone created by cows called Bovine Growth Hormone which plays a major role in a cattle's natural growth and development. When injected to cows, this hormone enables them to produce more milk and develop more quickly. With its enhancing effects, many farmers and farm factories that have been injecting this hormone into their cattle gain much more profit compared to the natural way because the faster the cattle reaches its slaughter weight and the more milk it can produce, the greater the profit. There is a lot of controversy over effects of rBGH in humans. Some decry BGH is already in cows so lab-made and extra amounts of BST will not affect anything. Bovine IGF-1 (Insulin-like growth hormone) is identical enough to human IGF-1 to act upon human cells. IGF-1, a polypeptide protein that regulates cell division and growth, is identical in cows and in humans and is essential for puberty. Humans normally produce high levels of this protein from birth until the end of puberty. The use of rBGH increases the amounts of bovine IGF-1 found in dairy and beef products. The more and longer exposure to sex hormones one has, the greater the risk one has for cancer. It has been determined that “women with small increases of IGF-I levels in their blood are up to seven times more likely to develop breast cancer than women with lower levels, and that high levels of IGF-I are also a risk factor for prostate and colon cancer” (Roberts, 2002, p. 47). Some research indicates that because IGF-1 is indigestible, it passes directly into the bloodstream causing “abnormal or premature growth-promoting effects” (Goldstein & Goldstein, 2002, p. 72). This can have effects on children as well as adults and may be responsible for causing early onset puberty and cancers. IGF-1 actually aids cancer

cells in perpetuating through apoptosis, programmed cell death. The cancer cell is unable to die. “Cancer is a rebellion – a gangster outbreak of misplaced cells. Extremely little differentiates a normal cell from a cancer cell” (Gunther, 1998, p. 78). Such a modest difference between cells can occur naturally or they can be caused by extraneous environmental factors.

Although use was banned in the United States in 1972, dichlorodiphenyltrichloroethane, more commonly referred to as DDT, is still affecting our health and may be contributing to cancer. Our bodies easily convert DDT into dichlorodiphenyldichloroethylene (DDE) and it is stored in our bodies. This bioaccumulation of toxins is passed from mother to child during estrus and after birth during lactation. We also continue to ingest DDT from the bioaccumulation in animals and animal products we ingest (Seingraber, 1997). Another industry created environmental factor Seingraber identifies as a cancer causing agent imposed upon us by industry is Methyl chloride. Although it is classified as a probable human carcinogen it is still used in the manufacture of silicone products, fuel additives, and herbicides. By 1981, annual production reached 362 million pounds per year. Domestic consumption expands approximately 6.5 percent per year. Methyl chloride's long-term effects on human health have never been studied directly (1997, p. 109). At the time of publication, full research into the effects of Methyl chloride on human health and safety has not been completed.

This is not the only way we ingest chemicals we are unaware of – artificial flavorings can be made of hundreds of different compounds and they do not have to reveal their ingredients according to the FDA. Over-processing and refinement of foods contributes to obesity, especially in children. They are the fastest growing obese percentage of our population and are suffering from early onset diabetes and other health issues.

Like other chemicals produced and used in our country, research on the full effects on humans has yet to be done. Another industry created environmental factor Seingraber identifies as a cancer causing agent imposed upon us by industry is methyl chloride. Although it is classified as a probable human carcinogen it is still used in the manufacture of silicone products, fuel additives, and herbicides. By 1981, annual production reached 362 million pounds per year. Domestic consumption expands approximately 6.5 percent per year. Methyl chloride's long-term effects on human health have never been studied directly (1997, p. 109). At the time of Steingraber's publication, full research into the effects of Methyl chloride on human health and safety has not been completed.

The FDA approved the hormone diethylstilbestrol (DES), a proven carcinogen, for use as a "cattle growth promoter in 1947" (Epstein, Steinman, and LeVert, 1997, p. 192). It was outlawed but is still used even today to produce more weight in cattle which results in greater profit. DES was also used as a fertility drug in humans and has been linked to cancer in the daughters of mothers who took it (Greene, 1991, p. 125). My maternal grandmother had a very hard time bringing forth her first child. She endured several miscarriages and a stillbirth before she was blessed with the live birth of my Uncle Donnie. My grandmother may well have been given this drug, or a similar fertility drug, by her doctor to boost her chances of bringing a child to term. Could the cancer be passed through genetically? "One theory of the origin of cancer... is that during pregnancy a cell may be displaced in the embryo and may lie dormant for many years in the wrong place. Then it may suddenly get kicked loose, so to speak, and break out with savage violence..." (Gunther, 1998, p. 78). Is cancer always a naturally occurring mishap, as suggested above, or could it be complicated by environmental factors? In my uncertainty, I do feel better thinking there may be some environmental aspect that we could have control over to

stop at least some cancers from occurring. Anatole Broyard professed of his cancer that “I’d much rather think that I brought it on myself than that it was a mere accident of nature” (1992, p. 48). I am not sure that I feel this way. I have tried very hard for years to maintain healthy eating habits and exercise regimes. I want to know what caused this cancer – but if it is linked to diet I will not take it well. What we are doing to the environment and to our bodies through the ingestion of industrial chemicals, pesticides, hormones, and other medications is not an accident of nature. It is an accident of mis-education and the mis-use of public trust by the greed of large corporations like Monsanto and Pfizer, Inc. Corporate profit and politics dominate our government’s perspective on environmental factors (Hendricks, 2005).

A year after my mother’s mastectomy, her sister was diagnosed. Aunt Barbara also chose to have a mastectomy. Shortly after my aunt’s surgery, two of her children were diagnosed and both elected to have a double mastectomy. This question of choice has not always been one we could make. In the not so distant past, the doctor chose what he/she felt best suited you as the patient or him/her as the doctor whether it was full or partial removal (Gawande, 2002). My diagnosis was done so quickly and treatment began within days of diagnosis. I felt as if I did not have much choice. I was in a blur and unable to focus. I truly was in disbelief and almost felt my doctor was talking to me about someone else. When he suggested the rounds of chemotherapy and lumpectomy I mutely agreed. I thought of the cancer, as Morris calls it “as an alien thing that enters into the body like a parasite” (2008, p. 3). I just wanted rid of it, thinking that would be the end of my illness, but Morris reminds me that “[a]lways lurking in the backdrop are relapses, remissions and recurrences” (2008, p.2). I cannot ignore the fact that I have cancer and will always be changed by this disease.

“If the body is cut or disfigured, or if it loses any of its parts, it will remain in a condition of perpetual imbalance” (Fadiman, 1997, p. 33). How would it feel that have a breast, or a part of a breast removed? Will we be unbalanced? Can our bodies be realigned with implants? My mother was reticent to share how she feels about it. I told her about the Amazon warriors of mythology that purposefully removed their left breast in order to have better use of the bow and arrow. She seemed to enjoy the story, but still would share nothing of her feelings about her loss. It is extremely personal, and another unknown in my life. Now that it was me faced with at least partial removal of my breast, the story of the Amazons seems trite. Part of my body will be gone and there is nothing I can do about it, will I be imbalanced? Or will I be able to regain my balance on yet another journey?

To make sure I learn as much about this as possible, it is best to take a slow and deliberate journey. For Mary Aswell Doll, education should not only ‘lead out,’ (*educare*); it should ‘lead in’ (Pinar et al., 1996, p. 542). For Grumet “curriculum is the process of persons coming to form. Autobiography is the method by means of which curriculum can be so employed” (Pinar et al., 1996, p. 548). The beginning of this undertaking was the understanding that I needed to know myself in order to teach. Finding myself with cancer has intensified my need and has focused me on the need to stop waiting to learn: It will not just come to me, I must seek it out. The courses I have taken at Georgia Southern have helped me internalize my thoughts so that I can make sense of what I think, not what someone else tells me to think. Self is not just who you are from being acted upon by outside forces; self is how you internalize those forces and how you act: What choices you make and why.

Like Serres, I do not want to leave anything out. “The philosopher keeps watch over unforeseeable and fragile conditions, his [sic] position is unstable, mobile, suspended, the

philosopher seeks to leave ramifications and bifurcations open, in opposition to the confluences that connect them or close them” (Serres, 1999, p. 23). Learning occurs in places of discomfort and uncertainty. I feel obliged to learn as much as I can about the possible human-made biological factors that are affecting our world and our bodies.

I believe we should challenge the status quo in our schools and teach an environmental curriculum. As Bowers (1993) states:

The challenge will be to see through the illusions of a consumer-oriented, technologically based existence, to alter the premises upon which the belief system of the dominant culture is based, and to retain those aspects of our past cultural achievements that are compatible with a culture in equilibrium with the carrying capacity of the natural systems that make up the biosphere (p. 9-10).

Bowers warns us to take care not to educate the cultural traditions out of people – although he does pick and choose which ones he finds acceptable and although I do not agree with some culture’s traditions, as a curriculum theorist, I feel wrong telling someone else they are wrong for things they have been doing for centuries. It is a hard line of morals to get over judging someone else by your own standards. I think Bowers tries hard not to and wants others not to, but he inflicts his value judgments on others. And I may sound horrible – and I personally do not agree with female circumcision or women not being allowed to work, but I am not a god to anyone and I cannot dictate what they do or how they live. Bowers assumes that certain undesirable cultural traits be left behind and he is the one to decide what is undesirable.

As a teacher, it is my responsibility to learn about myself, to know my shortcomings, and my prejudices so that they do not become a part of my hidden curriculum. We teach who we are, so how can we teach if we do not know? I have come to realize the dangers inherent in an

individual's lack of knowledge of self. "Indeed we have what philosopher Mary Midgley calls a veritable 'cult of intelligence' administered by tribes of experts whose function it to measure it, raise it, write books about it, and make those without it feel bad" (Orr, 2004, p. 48). Without knowing why we act or how we think, we can potentially impair the growth and learning of others. People are more than numbers. It is hard to know why we do some of the things we do. I know that I often act without thinking and rarely think without acting. I now tell my students every day that it is great to have an opinion, but you must know the reasons why you think the way you do. I do not know why I think the way I do, but I insist that my students try. It kills them. They struggle to give me an answer they believe I will like. How do we get out of people pleasing and become ourselves? Beyer and Apple (1998) suggest we develop a self through reflection of our experiences. Connelly and Clandinin maintain "there is no better way to study curriculum than to study ourselves" (Pinar et al., 1996, p. 515).

### **Environmental Implications**

*Skepsis* (Greek) - examination, inquiry, consideration

Scientists often change the manner and the content of their statements when talking to outsiders [this] causes problems both for outsiders' reconstruction of scientific events and for an appreciation of how science is done (Latour, 2007, p. 28-9).

My uncertainty now led me to question our curriculum. Could the necessary change in our culture and its malignant stance towards the environment be affected through education?

This line of questioning led me towards Chet A. Bowers who created an environmental curriculum that endeavors to effect global change to preserve cultures and environments through curricular emphasis in education. Bowers has made a personal commitment to make the environmental crisis central in his writing and to bring about educational reforms that are environmentally oriented. He believes that the educational process reproduces those cultural patterns that perpetuate the environmental crisis. “The primary aim of an eco-justice education is to reduce the human impact on natural systems in ways that ensure their long-term viability” (Bowers, 2003, p. 161). The purpose is to effect long term change and ecological balance through educationally changed cultural practices. Bowers wrote his first book on the connections between education, cultural ways of knowing, and the ecological crisis in 1974. The title of the book was *Cultural Literacy for Freedom*. Since then he has written over 90 article and 16 books that examine how language reproduces pre-ecological ways of thinking, the connections between emancipatory/transformational ways of thinking and the globalization of the West’s industrial culture. Bowers shows that we need education that will revitalize our common areas, our natural resources that were once available to all people. Bowers reduces the global environmental crisis to a problem of western cultural consumption. He suggests those “concerned with the interconnections among environmental justice, political ecology, and critical pedagogy are incapable of supporting traditional knowledge systems” (2005, p.7). Vandana Shiva (2000, 1997) supports the idea that Western consumption is responsible. Genetically modified seed foods and the pesticides needed to support monoculture farms that are taking over small farms around the world. Shiva notes that the use of these GM seeds causes indigenous plants to be unused and leads to the degradation of the natural area. In more recent years, attention has been given to understanding the educational implications of eco-justice for Third World cultures, the prospects

of future generations, and the need to revitalize the commons as sites of resistance to economic globalization and further environmental degradation.

Alan Bloom “believed that the “natural’ elites of the United States stopped listening and interpreting the great minds of the past. Instead, elite students had become relativists, willing to accept any argument presented to them as truth and afraid to offend anyone with whom they disagreed” (Weaver, 2005, p.8). I feel the truth of this statement, published in 1988; the year I graduated from high school. We were not taught; we were preached at. We were led; taken wherever the instructor wanted us to go. The only class that offered any free thought or dialogue was my 12<sup>th</sup> grade AP English class, and we were all scared to even offer an opinion as to what the authors of those Great Books and Poems may have meant, it was too late – we were already indoctrinated as sheep. I still vividly remember the day when Mrs. Patricio read a poem while we were in our poetry circle; our senior AP class had only eight students. I recall neither the title nor the author of this poem; what I do recall is the feeling that I knew what the author was talking about, and the fear to relay that to the teacher. We had never before been encouraged to think outside the box, to think figuratively, to think artistically. How could I really know what this artist was talking about? No one said a word. Finally, I whispered to my classmate what I thought. She said “yeah, that makes sense, tell her”. I needed encouragement yet I stammered when telling her. She smiled – and said “Yes!” It was my first and only victory in her class, and I still savor it. I do not think we can continue to ignore the impact of our corporate, capitalist culture in our schools and our curriculum. Students can be taught to think again and to realize the implications of technology and industry on the environment.

Monsanto and other corporations involved with biotechnology are not considering the ramifications of these technologies on humans. This technology is changing the food that we eat,

whether we grow it from the ground or grow it from a fetus. We are ingesting these chemicals and they are accumulating in our bodies. The full effects are yet to be known, but more and more food items are being recalled and health issues are being raised. Technology changes who we are, even the technology of rBGH. A very scary thought Eugene Thacker puts forth is that “[i]n its ideal guise, biotechnology promises to bypass technology altogether, a biology working upon itself” (2006, p. xix). There must be some way to temper the economic need for the quick fix solution with the long range health effects on people and our world.

Technology is solving problems while at the same time creating new ones. We are treating this technology as neutral: I believe we should be learning the implications of this technology instead. The environmental implications of cancer are rampant. By teaching an environmental curriculum, we may someday be able to curb some of the more pressing issues. I believe that if more people know of the deadly ramifications of ingesting something as innocuous as milk from a hormone injected cow, or if we learn to pay more attention to the corporate greed that drives the pharmaceutical industry we may stop the diagnoses of cancers from children of pregnant mothers trying to boost their chances to give birth, but actually endanger the future of the unborn for how many future generations we have yet to learn..

Joseph Campbell said “[o]ur life evokes our character. You find out more about yourself as you go on. That’s why it’s good to be able to put yourself in situations that will evoke your higher nature rather than your lower” (1988, p. 130). Two years ago I thought I was finally ready to know if I had cancer, I signed up for extra cancer insurance. But I continued to wait for a baseline mammogram for more than a year. My uncertainty continued. “But the journey remains a potent and ancient metaphor for any kind of heroic exploration of the unknown, the dangerous,

and the frightening and is thus especially appropriate to experiences of serious illness” (Hawkins, 1999, p. 78). Thus my journey continues with education.

As Serres states “the body will never walk or stand erect as it did when it knew only standing still or walking” (1997, p. 6). Once you begin to realize things are different that what you had previously thought, you can never go back. There seems to be much harm caused for the sake of monetary profit, learning these implications makes me feel responsible to share and awaken the world. Perhaps I sound accusatory but in my defense there is abundant evidence to support the environmental degradation brought on by corporate greed. Family farms are disappearing and with them go the tradition of stewardship because of large agribusiness habits of monoculture tracts. The use of chemical fertilizers are depleting the soil of its nutrients (Pollan, 2008) and causes the roots to not grow as deep and long contributing to soil erosion.

My mammogram, when I finally had one, was normal: I did not have cancer, yet. “Short of these, this monster, the body, this miracle, its pain, will soon make us taper into mysticism, or rise, with rapid beats of the wings, into the raptures of transcendentalism (Woolf, 2002, p. 6). Do I need to be ill to find the divine aspects of nature to protect? Like the young patient Gawande writes of “I don’t trust that I won’t get anything else that’s strange or we’ve never heard of” (2002, p. 251). The world is no longer a safe place for me; my education has been through the trials of cancer of members of my family and the uncertainty of my own risks. I am realizing my understanding will never be complete and is as subject to variation as is my life. I will continue to grow and change until I die. Self, like curriculum, truly is a river that flows ceaselessly.

The common ground that unites us as equals, in a literal as well as a metaphoric sense, is the very ground under our feet. We are joined as well in a temporal plight: We are all just passing through. We humans face the additional burden of

making sense of our journey. We may choose the means to our end (Krall, 1994, p. 234).

Self-reflection is key to understanding what you are and how you think. I am choosing to try to make sense of the world around me. I am choosing to try to make sense of my own thought processes and try to understand things in my own terms. No, I am still unclear of exactly why I think as I do, but I am beginning to understand that this is part of the learning process. “What nature teaches us is the streaming of the endless flow” (Serres, 1982, p. 117). “The soul is tied in knots, just like the world. And like the world, it is unstable, in a state of disequilibrium” (Serres, 1982, p. 18). This disequilibrium is necessary to begin understanding; it complicates ideas and conversations.

When the journey is over, like Maxine Greene describes in *Teacher as Stranger*, the traveler returns home, but it is not the same. Things once before unnoticed or taken for granted are seen in a new light. Much has happened to the way I think in these courses, but much more is yet to happen. We have to be reflective thinkers and take a “stranger’s vantage point on everyday reality” (1973, p. 267). I have changed since beginning my journey. It is now impossible to ignore those things that happen in my life and around me. I find myself questioning everything and everyone for motives. I refuse to be complacent and compliant any longer.

Serres (Zembylas, 2002) realizes in *Le Parasite* that the journey to self never ends. He discusses the parasite that is the excluded third but insinuates itself into the system; this is the knowledge and experience we gain in our experiences. But once that parasite is comfortable within the self, once it becomes included, another parasite intervenes and the process begins anew (Assad, 2001). The quest for knowledge is a lifelong pursuit. Even the quest to know yourself can never truly end. Daily factors affect and influence what we think and feel. Serres ‘parasite’ infects us once more and we cannot remain satisfied. The passage begins yet

again. Have these few courses lead me to myself? No, I am not quite there. I now realize that for years I have been running from who I was and from those things that could help me understand myself better. I will live exploring my life with my own unknown third until it becomes known again, then I will begin once more to discover what I do not know about myself.

In life we are entangled in the world with our selves. The journey always begins when we decide to make sense of the complications and try to understand that which is unknown. I have re-opened my eyes and am truly looking at things presented to me and am benefiting from conversation. Before I may have absent mindedly and without much thought continued to teach, yes teach, children without really imparting anything to them but the basic ability to follow directions. It is so important to learn how to think. I no longer want to be responsible for releasing sheep into the world. It was exorbitantly difficult to overcome my inability to think on my own. It is far easier to let someone also tell you what to think and how to act; it is far easier not to think about the plight of the impoverished and deprived. It is easy to ignore what is going on the world, I know because I used to do it. I have taken off my rose-tinted glasses and am starting to see the travesty that is our world. I can no longer just sit back and not change. That is my job as a teacher: I can change one life at a time! I need not fear stagnating like a mildewed pond: I surge and change like the river. I look at new information with a new critical eye. I can no longer accept at face value and I find myself constantly asking: why? for whom? I am no longer satisfied, but I continue. As Pinar stated:

Subjective and social reconstruction is our professional obligation as educators in this nightmarish moment of anti-intellectualism and political subjugation. Alone and together, let us participate in complicated conversation with ourselves and with colleagues worldwide. Let us construct an increasingly sophisticated and auditory field of education, one worthy of those schoolteachers and students who, each day, nearly everywhere on the globe, labor to understand themselves and the

world they inhabit. May our “complicated conversation” complicate theirs—and yours. (2004, p. 258).

### CHAPTER III

### FRANKENFOODS

Is there knowledge for which we are unwilling or unable to take responsibility? David Orr (1991, p. 12)

Or has technology become Technology with its own autonomy – runaway like a Frankenstein? Don Ihde (1990, p. 124)

Food, Health, Hope - Monsanto's company slogan (Rajan, 2006, p. 58)

Biotechnology has been in use since the Neolithic era when the practice of farming began with crop selection and cross pollination and later brewing beer and using organisms and their byproducts to reintroduce nutrients to the soils and for pest control. “[H]uman activity from immemorial time and across the diversity of cultures has always been technologically embedded (Ihde, 1990, p. 20). Biotechnology in one form or another has flourished since prehistoric times. When the first human beings realized that they could plant their own crops and breed their own animals, they learned to use biotechnology. The discovery that fruit juices fermented into wine or that milk could be converted into cheese or yogurt, or that beer could be made by fermenting solutions of malt and hops began the study of biotechnology. When the first bakers found that they could make soft, spongy bread rather than a firm, thin cracker, they were acting as fledgling biotechnologists. The first animal breeders, realizing that different physical traits could be manipulated by breeding appropriate pairs of animals, engaged in biotechnology.

Biotechnology took a step, whether forward or backwards is still debated, in the 1930's when France began injecting dairy cattle with growth hormones to increase milk production.

That the hormones were hard to get became a non-issue when with the increase of technology, scientists were able to engineer bovine somatotropin (BST) known as recombinant bovine growth hormone (rBGH). Technology has become “that dumb brute which is to be the ‘mere’ instrument, too or *slave* of science. The versions of Dr. Faustus and the Frankenstein legends all point to some creation of technology from dead or dumb matter, later brought to life through the application of theory, however bizarre or arcane” (Idhe, 1979, p. xix). Just like these fictional scientists, the modern scientist is able to break down foods into their chemical parts and recreate them, but they are either unaware of potential consequences or working for profit despite the knowledge of harm. It has been common practice since 1982 to increase America’s dairy cattle’s milk production with rBGH – with Food and Drug Administration (FDA) approval since 1993. It seems to boil down to this: profit over safety. And who is at risk? Something is happening to the growth and development of young children. Precocious puberty causes a child to sexually develop abnormally early. There is documentation of a five year old girl in Peru who gave birth by cesarean at age five and children in ancient Greece were required to do the work of adults because of their outward adult-like manifestations (Malina & Bouchard, 1991). Since precocious puberty gives pre-pubescent children adult-like features, does it also give greater development of the mind? Unfortunately for the child, no – precocious puberty is somatic. It affects only the body. What normally takes a child over a decade of life to prepare for mentally can happen as early as age three. Incidents of precocious puberty are vastly more common today, so common some doctors are considering lowering the accepted normal ages for pubertal onset. Dr. Paul Kaplowitz, a pediatric endocrinologist writes “the 7- or 8-year-old who is beginning to develop breasts is not as unusual as she would have been thirty years ago” (2004, p. 45). Why are our children achieving secondary sexual characteristics at such young ages? Some believe it to be a

normal occurrence from the more enriched diet and sedentary lifestyle that is available today. Puberty can be activated by increased levels of body fat. Others believe it to be influenced by biotechnology – the creation and ingestion of hormones that upset the natural balance. Hormones used in cattle to increase milk production may affect the endocrine system of preadolescents. In the *Journal of the Puerto Rico Medical Association*, Dr. Carmen Sanz wrote “the premature puberty was the result of consuming local milk, poultry, and beef. Specifically, their symptoms were caused by the growth hormones administered to the animal” (Green, 1991, p. 124). Recombinant bovine growth hormones (rBGH) may be a factor in early onset puberty.

Despite much worldwide debate, with many countries banning rBGH, it is still common practice in the United States of America to genetically alter cows and their milk. It is also the practice of the United States government to supply milk to public schools. The main questions we should have as consumers of rBGH are does milk from cows treated with rBGH differ from other milk and how can it affect us? Monsanto and other corporations involved with biotechnology are not considering the ramifications of these technologies on humans. They see the development of things like rBGH as a means to greater production of milk. “A means is whereby something is effected [sic] and thus attained. Whatever has an effect as its consequence is called a cause. But not only that by means of which something else is effected [sic] is a cause. The end in keeping with which the kind of means to be used is determined is also considered a cause. Wherever ends are pursued and means are employed, wherever instrumentality reigns, there reigns causality” (Heidegger, 1977, p. 6). Recombinant bovine growth hormone may be a contributing cause in the accelerated growth rate of adolescents.

## **Growing Up Stronger and Faster**

I knew well that I risked death; for any drug that so potently controlled and shook the very fortresses of identity, might, by the least scruple of an overdose or at least inopportunity in the moment of exhibition, utterly blot out that immaterial tabernacle which I looked to it to change (Stevenson, 2003/1886, p. 64).

Men [sic] are made of what is made, the meat, the drink, the life, the corn - Edwin Muir (Wirzba, 2002, p. 41).

Food is our fuel: it is one of the few actual needs humans have. What we eat affects our health and our wellbeing. Research has shown that children's brain functioning and performance are negatively affected by insufficient food, insufficient iron, and insufficient micronutrients (Taras, 2005, Grantham-McGregor & Olney, 2006, Malone, 2005). Studies conducted by Berkeley biochemist, "Bruce Ames has found that even subtle micronutrient deficiencies... can cause damages to DNA that may lead to cancer" (Pollen, 2008, p. 123). Many factors are involved in determining what goes into our bodies – unfortunately most are out of our control. C.A. Bowers' efforts to reclaim and preserve cultures and environments are concordant with the goals of my dissertation which will attempt to stop the environmental degradation of the earth and our people through the thoughtless pursuit of monetary gain of those involved in food production. "Overproduction of food grains in our country, which involve the use of techniques damaging to our water supplies and soil, alter the economies in other countries with more marginal soils – forcing them to adopt even more disruptive practices" (Bowers, 1993, p. 16).

Farming practices across the world are destroying habitats, soil, and the health of people. I will examine the chemicals that we thoughtlessly put inside our bodies through the seemingly innocuous eating of food. Pesticides, hormones, and other chemicals are given to the plants and animals that we eat. “The millions of toxic chemicals released into the environment, which are changing the basic chemistry of life itself, represent the less visible yet more potentially lethal and irreversible part of our dilemma of survival” (Bowers, 2000, p. 3). The long term effects are either suppressed, ignored, or unknown. I intend to explore the motives in the corporate minds that are willing to fill their products with drugs and chemicals in order to save a few precious pennies. In addition to greed, Religion has historically been a very strong weapon and continues today to be used as such. It is terrifying that there is made such a dichotomy between god and nature and that can be used to destroy the planet. People live for today and think the Christian god will take care of them and only them because only they are right.

I work in a public school in an area that has a large percentage of students on free or reduced lunch. At this time, school lunches offer foods that are highly processed and use meat and milk products that are produced from animals injected with rBGH and so full of growth hormones. The amounts of refined sugars, flours, and the over-processing of foods is contributing to obesity and other health problems. We have only to look on the best sellers’ lists to see that modern agri-business is producing food with vastly less nutrients than those produces sixty years ago, before the increased and widespread use of chemical fertilizers and pesticides (Pollan, 2008). School lunches offer foods that are highly processed and use milk and meat products chock full of growth hormones. The amounts of refined sugars and flours and the over-processing of foods available are contributing to obesity and many other health problems. In the name of profit – for economy is king, our country and our people are at risk from the foods we

eat. We need a change in the curriculum that supports an awareness of the environment and the methods employed in food production. Without proper nutrition and by ingesting quantities of hormones and chemicals used in food production, children's needs cannot be met and their ability to learn is disadvantaged. Modern, industrial methods of food production have greatly reduced the nutritive value of the foods we eat and this has a detrimental effect on our health, behavior, and learning (Pollan, 2008). Nutrients we need for life are carbohydrates, lipids, proteins, vitamins, minerals, and water: they provide for our growth and maintenance and control and regulate bodily processes. "Sugar consumption is not even necessary, for the body converts starches to sugars" (Heiser, Jr., 1990, p. 29). Many schools opt out of the National program to take advantage of monetary and other incentives offered by corporations, which I explain in detail in the next section titled Pouring Rights. Paul Stitt, MS, the founder of Natural Ovens Bakery speaks on *Super Size Me* about this problem: "There's an awful lot of resistance from the junk food companies that make huge profits off the schools...they want to be there to addict children for life. It boils down to political lobbying and economics without regard to nutrition of children" (2004). Eating habits are learned early and schools are indirectly contributing to the future reserve of fast food restaurants and vending machines by allowing them to sell items in school.

The government is subsidizing the farmers to grow mostly soy and corn (Rapp, 1988). Most of these crops are then fed to livestock or altered by scientists to be used in other foods that we are consuming, especially as high-fructose corn syrup. We are fed foods that cause our bodies to become addicted to the low-nutritional food stuffs that corporations compete to throw down our throats in exchange for our money. Of the 2000 recommended daily calories, corn contributes 554 and soy 257, together with wheat and rice, "these four crops account for two

thirds of the calories we eat” (Pollan, 2008, p. 117). Unfortunately the bulk of what Americans eat of these crops is also genetically modified or grown with chemical fertilizers and pesticides and then so overly processed that almost all nutritional value has been depleted and only some are added back in by chemical means. Over-processing of grains results in the removal of the embryo, the germ, in which the bulk of nutrition is located. The omega-3 fatty acids, the proteins, the vitamins, and the antioxidants are removed in the process and are also depleted in industrial farming methods as farmers use chemical fertilizers and no longer ensure the replenishing of the soil through crop rotation. They rely on the NPK (nitrogen, phosphorus, and potassium) in the chemicals they spread on the nutrient-depleted soil to ensure quick growth of their crops. Indeed it does, but it also ensures that these crops are growing so quickly that their roots are unable to grow long enough to extend deep into the soil to gain valuable nutrients needed by other herbivores and omnivores. Michael Pollan has studied the USDA’s nutritional reports from American crops since the 1950s and has seen a tendency for foods grown with industrial farming methods to lose nutritional value (2008). He quotes Brian Halweil’s research “American agriculture’s single-minded focus on increasing yields created a blind spot...where incremental erosion in the nutritional quality of our food...has largely escaped the notice of scientists, government, and consumers.” (Pollan, 2008, p. 119). I doubt this fact has escaped the notice of corporations such as Monsanto and Con-Agra who depend on more and more food consumption. To get the nutritional value of foods from the 1950s, Americans now have to eat more of the same foods. This flawed logic benefits the makers of foods and patented genetically modified seeds, pesticides, and fertilizers, but may be contributing to our nation’s poor health and obesity. Wendell Berry says this farm production efficiency phenomena has been “made possible by the substitution of energy for knowledge, or methodology for care, of technology for

morality...This “accomplishment [is] a collaboration of corporations, university specialists, and government agencies” (1997, p. 33). We are making more and more food that has less and less nutritional value and we are stuck in this cycle perpetuated by corporate greed.

## **Additives**

Government control over school lunches began during World War I when the nation’s men needed to fight in the war three out of five men recruited were found to be too malnourished to serve. Vast food industry corporations, like Con Agra and Monsanto, through their lobbies have taken over in Washington. But today, there is a new problem that may finally re-interest government officials to look beyond the bribes and take power back from the corrupt and greedy food industry: obesity. “Almost 2/3 – 64.5 percent - of Americans (127 million people) are overweight or obese (Brownell, 2004, p. 41). Ironically our government began funding the National school lunch program to ensure our nation had healthy men to recruit for the military. Now military recruiters are finding that too many of our country’s people are now too fat to serve. Obesity affects children in terrifying numbers and is exacerbated by the kinds of food we feed them, at home and at school. School food is disproportionately important to students from low-income families. Nearly two-thirds of the students participating in the National School Lunch Program qualify for free or reduced-price lunches because of their families’ incomes. According to the House Committee on Education and Labor, “For millions of families, the meals their children receive in school or in child care are their only chance at a healthy meal all day. In 2008, more than 16 million children lived in homes without access to enough nutritious food.”

“Poor diet and physical inactivity are responsible for as many premature deaths as is tobacco.”  
(2010).

Food manufacturers are required neither to label genetically modified foods nor to disclose what flavor additives are used. And how does one account for the pesticides and chemical residues in food? Often nutritive value is the last thing looked at in food consumption choices: price, quantity, taste, and tradition play major roles in our food choices (Vieweg, 2007).

We are still using food colorings and additives despite knowledge of its harm to people’s health. Does the monetary value win over public health? When does the cost of human safety and health outweigh the greed of our corporate controlled government? Coloring agents in food items such as ice cream, candy, steak sauce, canned fruits and vegetables, and cheese crackers have known adverse effects, including suspected carcinogens, but are found in most processed food items. An example is that of tartrazine, usually referred to as yellow dye number 5, “[t]he FDA has estimated that between 47,000 and 94,000 Americans are sensitive to Yellow No. 5” (Jacobson, et al, 1991, p. 155). Some of the potential effects include concentration difficulties, confusion, aggressive behavior, skin rash, and asthma (Statham, 2007). Apparently the health risks of these individuals are inconsequential to the monetary gains to be made by the producers of foods and the pharmaceuticals that must treat the effects of accidental ingestion. The use of aspartame is widely accepted despite scientific concern that it causes altered brain function and behavior changes in users. “And many people ...have reported dizziness, headaches, epileptic seizures, and menstrual problems after ingesting aspartame (Jacobson, et al, 1991, p. 156). The FDA considers the use of BHA (butylatedhydroxyanisole) in foods to be generally recognized as safe (GRAS), despite Japanese research that “found that BHA induced tumors in the forestomachs of rats...[and] the World Health Organization (WHO), considers BHA to be

possibly carcinogenic to humans” (Jacobson, et al, 1991, p. 157). BHA can still be found in commonly eaten foods such as potato chips and cereals. Sodium nitrite and sodium nitrate have been used for centuries to preserve meat. “While nitrate itself is harmless, it is readily converted – by bacterial action in foods, and in the body – to nitrite. When nitrite combines with compounds called secondary amines, it forms nitrosamines, extremely powerful cancer-causing chemicals. The chemical reaction occurs most readily at the high temperatures of frying, but may also occur to some degree in the stomach” (Jacobson, et al, 1991, p. 163-164).

## **Pouring Rights**

*Most of us don't know how we live and at what costs, either ecologically or human - Wendell Berry(Cook, 2006, p. 7).*

The food that we choose to eat plays a vital role in our brain functioning. Children have little choice in what they eat, children of poor income families even less. If it is known what types of food are most nutritious and beneficial to our cognitive and physical well being, why are school lunches full of fats and carbohydrates? And why are sugary sweet drinks and snacks available? The 1992 School Nutrition Dietary Association found that many schools still did not meet the daily dietary guidelines. “The study showed that the average school lunch had 27 percent more calories from fat, twice as much sodium, and 50 percent more calories from saturated fat than the recommendations” (Hiatt & Klerman, 2002, p. 3). The government’s goal is to “reach less than or equal to 30 percent calories from total fat and less than 10 percent calories from saturated fat; maintain calorie, vitamin and mineral content at greater than or equal

to 33 percent of RDA” (recommended daily allowance) by 2005 (Hiatt & Klerman, 2002, p. 7). I have yet to find the evidence that this has been actualized; my daily interaction with school food at one school seems to indicate that it has not.

Big business has made its way into schools and has made it too lucrative to administration to consider the harmful, long- and short-term effects on students. Title I funding provides the schools provide free, nutritious meals to those below certain economic levels. The USDA recommended allowances only applies to these foods, not to a la carte offerings, or vending machines. Many schools opt out of the National program to take advantage of monetary and other incentives offered by corporations. “Today more than 20% of schools offer brand-name foods in their cafeterias. Major corporate players include: McDonald’s, Subway, Papa John’s Pizza, Dunkin’ Donuts, Dairy Queen, and Taco Bell” (Boyles, 2005, p. 2). Eating habits are learned early, schools are indirectly contributing to the future revenue of fast food restaurants and vending machines by allowing them to sell items in schools. Schools are also indirectly contributing to the lessening cognitive abilities of children because they are not always offering nor ensuring that students eat the right nutritious foods that ensure proper cognitive functioning.

Widespread availability of soft drinks through vending machines complements greater prevalence of fast foods in the cafeteria. Currently, more than 20,000 schools have vending machines, offering an assortment of items including juice drinks, carbonated beverages, fruit juices, chocolate bars, cookies, and candies. The first soft-drink contracts with schools were created in 1966 (Boyle, 2005). Pouring rights give a manufacturer sole right to distribute product at a location in return for payment, commissions, or other inducements such as athletic equipment. Despite the clear evidence that vending machine foods were taking over the more

nutritious choices provided by the National school lunch program nothing has been done. Because of the success of the vending machines, school lunches have had to become increasingly more competitive by using more fast food type products. An easier solution would be to ban all vending machines from schools, but lobbyists for the corporations and monetary incentives prevent this healthier alternative. Pouring rights contracts provide schools with too much money and needed supplies. And the companies can prove to give hard-arm tactics to ensure their product meets sales quotas, such as threatening to take away money. These contracts usually involve large lump-sum payments to school districts and additional payments over 5 to 10 years in return for exclusive sales of one company's products in vending machines and at all school events. According to the General Accounting Office, about 200 school districts in the United States were participating in such agreements by 2000 (Nestle, 2002, p. 202).

The monetary benefits of these contracts with fast food chains and soda corporations are extremely short-sighted in terms of actual cost. The resulting health care costs will be enormous and will eventually negate any profits. Childhood diabetes and obesity are already national concerns. These foods are so highly processed that virtually no nutritional value can be gained. Of course, this could not be enough, fast food and soda manufacturers must reach out through marketing and advertising in the schools, in school products, and on school television. Marketing to children has increased over the past few years. We are teaching them in school to be consumers and it is reinforced by marketing tactics. "By the age of 7 or 8, most children are *sophisticated* shoppers; they can shop independently, ask for information about what they want, and show off what they have bought to other children" (Nestle, 2002, p. 177).

In 2001 a study commissioned by the Public Health Institute found: One company held exclusive rights to have its beverages available in any district location and "in the cafeteria lines

of all schools,” including elementary schools, and at all other special events conducted at any location on the campus. The contract stipulated that “campus” meant every school and facility owned or operated by the district, now or in the future, “including all elementary, middle, high, and alternative schools, athletic facilities, concession stands, and, for each building, the grounds, parking lots, dining facilities, athletic facilities and concession stands, food service outlets, and vending areas (Berg, 2004, pp. 121-122.) Frightening how easily corporations take over a school. It emphasizes the control those with power can so easily have over those without power. It is wise to examine the motives of those with power because it is rare that they will act altruistically. In the main money and continuation of power is the motivation. It seemed to Freire that the dreams of the poor were always dreamt for them by distant others who were removed from the daily struggles of the working class and either were unable or unwilling to recognize the dreams that burned in the habitats of the hearts of the oppressed (McLaren, 2000, p. 153).

With carbonated or sweetened beverages so available, it is easy to see that few choose to drink water or milk. “According to the United States Department of Agriculture (USDA) per capita soft-drink consumption has increased almost 500 percent over the past 50 years” (Berg, 2004, p. 122). It was easy for schools with tight budgets to be seduced by the money and incentives brought along with pouring rights contracts and the schools income is based directly on beverage sales. The effects of soda consumption are numerous, including leading to obesity and affecting the intake of minerals and vitamins. It can be part of the “null curriculum” to reproduce societal classes through nutrition, or rather its lack that is provided at school to perpetuate the job market for unskilled labor.

Income is a major factor in children’s nutrition. For example, the Public Health Service’s 2000 review of national health data, *Healthy People 2010*, demonstrates that anemia due

to iron deficiency is almost twice as common among 2-year-old children from families with incomes at barely the poverty level than it is among those from higher-income families. (Nestle, 2002, p. 173)

“The industrialization of the restaurant kitchen has enabled fast food chains to rely upon a low-paid and unskilled work force” (Schlosser, 2001, p. 6). Could the provision of such foods at school be linked to the need for unskilled labor? Workers are now a commodity bought and sold by these corporations. According to Marx: “Labour power was not always a commodity. Labour was not always wage labour that is, *free* labour (Tucker, 1978, p. 205). Capitalism drives the need for this type of labor. Within capitalism there is a need for low paid, unskilled workers and therefore there is a need for the perpetuation of class and its oppression. Vending machines and fast food in schools contribute to this vicious cycle of creating unskilled workers. Without proper nutrition, students may never reach their full potential. Where many of a city’s poorest teenagers go to school there will be an abundance of teenaged fast food workers. Because the parents or single parent must work two or three jobs to make ends meet, children are left on their own at earlier ages learn to be self-sufficient. They feel it necessary to take on a job as soon as possible either to help out at home or to buy consumables. These working students stay at their fast food job late, neglect homework, and come to school utterly exhausted – if they come. High school dropout rates in poor urban areas are very high (Schlosser, 2001, p. 79).

There are toxic chemicals in fish we eat from streams and oceans, foods we grow from the earth, animals we slaughter for meals, and even the water we drink. These toxins are accumulated in our bodies and even passed along to our children. “By one estimate average young Americans carry at least 190 chlorinated organic chemicals in their fatty tissues and blood and another 700 additional contaminants are as yet uncharacterized” (Orr, 2002, p. 280). Some

believe there is a link between these bioaccumulants and many childhood diseases like ADHD and depression (Orr, 2002, Pollan, 2008). We should be asking questions to protect ourselves from the unknown pesticides and chemicals that we are unwittingly ingesting. We should be teaching a curriculum that supports an awareness of the environment and the methods employed in food production. Many children are not getting enough quality nutritious food to power their cognitive abilities. Many children are just getting enough calories to get them through the day. To help maintain health of earth and body we ought to make more of an effort to understand what goes into our bodies by knowing how our food is grown, made, and transported. Education should be reconfigured to teach ecological sustainability in order that we can all become healthy participants in our economy and stewards of the land through direct experience.

In the name of profit, our country and our people are at risk from the foods we eat. Many parents are completely unaware of just how much sugar and junk food their child has access to each day. Many are unaware of what nutrients are necessary for healthy living and many are unaware that the “healthy” fruit and vegetables they may be eating are actually much lower in nutritional value than they were fifty years ago (Pollan, 2008). Research on the effects of iron and B-12 on the brain’s development and functioning are causing more people to examine the effects of their deficit in children. Iron is needed for Myelination of nerves within the brain; low iron results in delayed transmissions and can cause deficiencies in the brain. In pre-school, iron-low children had lower discrimination learning and attention control. Anemic children perform lower on IQ tests and have poorer school performance in math and language (Malone, 2005, Taras, 2005).

There is a disconnect between nature and ourselves that is causing obesity and disease; it boils down to the food chain and our blatant disregard and contemptuous maltreatment of nature

stemming from the Industrial Revolution. The ever increasing use of pesticides and chemical fertilizers and additives created to increase food production are actually depleting the soils of their nutritive value and hence the food grown in those soils (Pollan, 2008). This is a cycle that may continue until utter destruction or it may be on the way to solving itself with sustainable farming methods. More and more farmers are using organic, local, and sustainable methods to produce food. Also, building this knowledge will change the future. The cycle of soil depletion and nutrient-poor foods will continue with the modern agri-industrial methods employed.

Bowers writes in *Educating for Eco-Justice and Community* (2001) that principles of environmental justice should be made into reality for all should be the primary concern for educators. How just is it that the majority of our students have no knowledge and no voice in their choice of foods and its production?

### **Precocious Puberty**

Puberty is a natural occurrence in adolescents. It is a time of growth and maturation initiated by secretions of gonadotropins. It is a process of physical, sexual, and psychological maturation. Older children, typically around age eleven or twelve, gradually begin to secrete more and more growth hormone (GH) and luteinizing hormone (LH) from the pineal gland in the pituitary. This causes other hormones to perk up and begin activating pubertal changes.

Precocious puberty happens when this gonadal maturation or appearance of secondary sexual characteristics appears in children younger than age ten in boys and age nine in girls with menses occurring before age ten. Precocious puberty affects later development, compromising a child's health and psychological well-being. Many doctors recommend psychological counseling to help

young children learn to cope with their advanced rates of sexual maturation and the physical differences from their peers. It also affects adult stature because sex hormones speed up skeletal maturation ending growth. Even though children undergoing precocious puberty are tall for their age, they never achieve their full height potential as adults.

“True precocious puberty is seen in association with increased oestrogen and gonadotrophin levels... There are many causes for incomplete precocious puberty but amongst these, and of relevance to ultrasound scanning, are ovarian tumours or cysts or adrenal tumours” (Bates, 1997, p. 166). Insulin-like growth hormone (IGF-1), a hormone protein that is present in humans, helps cells divide. High levels of cell division and growth are undesirable: “as the *Lancet*, the preeminent British medical journal, reported in May 1998, a high level of IGF-1 is a serious risk factor in the development of breast cancer” (Teitel & Wilson, 1999, p. 33). The more and longer exposure to sex hormones one has, the greater the risk one has for cancer. Bovine IGF-1 is identical enough to human IGF-1 to act upon human cells. In a brochure from 1986 about precocious puberty, the National Institute of Child Health and Development acknowledges that tumors on the brain are a cause. According to the Mayo Clinic it is rare that underlying medical conditions “— such as infections, hormone disorders, tumors, brain abnormalities or injuries — may cause precocious puberty” (Foch & Lerner, 1987, p. 156). Although this disorder has been evident since history began, the increase in cases of precocious puberty are causing pediatricians to lower the standard ages for the onset of puberty. This tumor can activate the early release of Luteinizing-hormone-releasing hormone (LHRH), the hormone that stimulates puberty. Increased levels of IGF-1 from hormone treated beef and dairy products will permit the tumor to become malignant, to continue growing at a faster rate.

Levels of estradiol and other hormones in meat and organs are more than triple the levels found in non-implanted controls. The extent to which hormonal meat contributes to increased breast cancer rates, apart from “cancer of the uterus, prostate, and testis, has been virtually ignored. Hormonal beef may also have other endocrine-disruptive effects, such as hastening menarche” (Epstein, Steinman, & LeVert, 1997, p. 195–196). With puberty comes rapid growth and sexual acceleration. The maturation of the gonads and their secretions direct this growth. The production of growth hormone is increased because of the rise in sex steroid and the arcuate nucleus in the hypothalamus, which used to inhibit production of gonadotropic hormone-releasing factor in childhood, becomes less sensitive to the gonadal hormones.

Because of this, secretion rates of luteinizing hormone (LH) and follicle stimulating hormone (FSH) increase causing the gonads to produce more gonadal hormones which now stimulate the hypothalamus. Normally this change is gradual with levels of LH and FSH beginning to rise in late childhood. The first sign of the onset of puberty is the increase in LH secretion during sleep (Malina & Bouchard, 1991). Is it possible that the increased hormones in the rBGH treated dairy products that are being introduced to embryos in gestation, infants through nursing, and young children through intake are stimulating the arcuate nucleus to become less sensitive to the gonadal hormones, thereby inducing puberty at younger ages? During my pregnancy, I made a concerted effort to only consume rBGH-free dairy products, but bio-accumulation of IGF-1 may still affect my daughter. A 1997 article in *Pediatrics* theorized that

American girls may be entering puberty at younger ages than current standards indicate. Researchers asked 225 pediatricians to evaluate the sexual maturation of 17,077 girls between the ages of 3 and 12 years....The average age of breast development was 8.87

years for African-American girls and 9.96 years for white girls. [G]irls seem to be developing six months to one year earlier than current standards suggest. The list of potential triggers includes growth hormones in meat and milk (Goldstein & Goldstein, 2002, p. 75).

Research undertaken a mere three decades ago determined the age of pubertal onset to be older than it is today. The American Academy of Pediatrics Practice-Based Research Network recently completed research that caused new, younger ages to be set about the normal age of onset puberty (Larson, 2003).

## **rBGH**

Chemistry is that branch of natural philosophy in which the greatest improvements have been made and may be made: it is on that account that I have made it my particular study; but at the same time I have not neglected the other branches of science. A man would make a very sorry chemist if he attended to that department of human science alone (Shelley, 1818/1991, p. 40).

Bovine somatotropin (BST), also known as bovine growth hormone (BGH), is a protein made in the pituitary gland of the cow. French and Russian scientists started giving cattle BST in the 1920s to increase milk production. An untreated cow can provide milk for about four people, while a cow infused with hormones can provide milk for about eleven people. An impressive difference, but a tedious and expensive process had to be undertaken to obtain the hormone. That

is, until scientific techniques advanced in the 1970s and scientists became able to engineer somatotropin in labs.

In the late 1980s, several companies including Monsanto developed a way to produce recombinant bovine somatotropin (rBST) in bacteria using genetic engineering and recombinant DNA techniques. Bacteria with a gene for rBST are grown in large numbers in a fermentation tank and rBST purified from the bacteria can then be injected into cows to increase cows to increase their milk production. Monsanto's version of rBST has one extra amino acid at the end of the protein (Schacter, 1999, p. 64). The effects of this extra amino acid have non-conclusive results as Monsanto seems to have Washington in its pocket. "Even longtime Washington hands said that the control this nascent industry [Monsanto] exerted over its own regulatory destiny – through the Environmental Protection Agency, the Agriculture Department, and ultimately the Food and Drug Administration – was astonishing" (Eichenwald, 2005, p. 32).

There is a great deal of controversy over the effects of rBGH in humans. Some decry protest over the hormone because BGH is already present in cows. They believe the addition of extra, laboratory made amounts of BGH, rBGH, in cows will not affect anything in the cow or the human ingesting its product. The National Institutes of Health stated "[t]here are no data to suggest that BST present in milk will survive digestion or produce unique peptide fragments that might have biological effects" (Krimsky & Wrubel, 1996, p. 175). This ignores the additional acid that is used to make rBGH, it could make a difference. The use of rBGH increases the amounts of IGF-1 found in dairy and beef products. The pasteurization of milk increases levels of IGF-1 even more. IGF-1 is a polypeptide hormone that plays an important role in childhood growth. It is the most important factor for fetal growth affecting somatic growth and organ differentiation. Understanding its vital role in growth and development, it seems hard to imagine

that increased amounts of IGF-1 cannot affect us. The FDA ignored results of a study that showed adverse effects of rBGH found by their Canadian counterparts. The Center for Food Safety and Applied Nutrition, one of the six centers of the FDA, offers this assurance for the safety of increased amounts of IGF-1: “IGF-1 is also present in human saliva and the average person consumes IGF-1 from this source each day that is equivalent to the amount consumed from any source of milk” (Goldstein & Goldstein, 2002, p. 70). Is this really supposed to quell fears about the ingestion of too much IGF-1? If it is present in our saliva, then it is meant to be present in our saliva, and we get as much as we need. We are getting that amount doubled in rBGH treated milk. Some research indicates that because IGF-1 is indigestible, it passes directly into the bloodstream causing “abnormal or premature growth-promoting effects” (Goldstein & Goldstein, 2002, p. 72). This can have effects on children as well as adults and may be responsible for causing early onset puberty and cancers. IGF-1 actually aids cancer cells in perpetuating through apoptosis: The cancer cell is unable to die.

There are several deleterious effects of rBGH including that it increases fat concentrations in milk. Higher fat contents of children have also been cited as a possible reason for the early onset of puberty. For the cows, rBGH causes udder infections (mastitis) that contaminate milk with pus, bacteria, and the antibiotics used for treatment. Dairy farmers are expected to throw away several days of milk after treatment for mastitis and then send in a sample of milk to be tested for any remaining antibodies. This makes any cost effectiveness of using rBGH negate itself. Is a farmer really willing to give up profits? Historically, this has not been the case. The FDA approved the hormone diethylstilbestrol (DES), a proven carcinogen, for use as a “cattle growth promoter in 1947” (Epstein, Steinman, and LeVert, 1997, p. 192). It was outlawed but is still used even today to produce more weight in cattle i.e., profit. DES was also

used as a fertility drug in humans and has been linked to cancer in the daughters of mothers who took it (Green, 1991, p. 125). My grandmother may well have been given this drug by her doctor because she had several miscarriages before she was able to finally bring her first child to term. My mother, my Aunt Barbara, and two of her children are breast cancer survivors, and now I am battling cancer myself.

Cows injected with rBGH produce milk with high concentrations of IGF-1. IGF-1 levels in milk are further increased by pasteurization. IGF-1 is indigestible so passes into the bloodstream where it can produce abnormal or premature growth-promoting effects. The production of IGF-1 is stimulated by growth hormone (GH) and activates the AKT signaling pathway. AKT blocks apoptosis – programmed cell death (PCD) thereby promoting cell survival and so is a major factor in many types of cancer. Hormones delivered through cow's milk can affect the same way hormones delivered through the human mother's milk to the infant can. Some studies have shown up to a 70% increase in IGF-1 in the milk and meat rBGH treated cattle. IGF-1 has been determined to play a role in breast, prostate, and colon cancers. It may well play a part in early onset puberty, but there has yet to be enough research.

Monsanto employees were part of the Food and Drug Administration (FDA) study to demonstrate the safety of rBGH, furthermore actual milk from cows injected with rBGH went into the public seven years before FDA approval in 1993 (Tietel & Wilson, 1999).

Is it a coincidence that USDA Secretary Veneman chose Dale Moore, former chief lobbyist for the National Cattlemen's Beef Association, as her chief of staff? Or that Veneman chose Alisa Harrison, former director of public relations for the Cattlemen's Association, as her official spokesperson? Or that one of the new Mad Cow committee appointees she chose is William Hueston, who was paid by the beef industry to testify

against Oprah Winfrey in hopes of convicting her of beef "disparagement"? (Gregor, 2004, p. 18).

The FDA inherited its practice of giving permission based on presumed safety which was determined by absence of complaint or problematic consequence that was previously practiced by the United States Department of Agriculture (USDA). Scientists have come to a point in research where it becomes a choice between money and altruism. Maria Mies tells us the separation of politics and science has never existed: there is no "value-free, disinterested pure science, devoted only to the infinite search for truth, which is legally protected as scientific freedom in our constitutions" (2001, p. 46). All research needs to be funded. U.S. governmental agencies have decided that BST poses no risk to humans, cattle, or the environment. In the United States, BST continues to be widely used, while countries around the world have banned its use. Scientific research is biased on the effects, and it does seem to matter whose payroll the scientists are on.

Recent studies in Munich, Germany demonstrate that cattle treated with rBGH had significantly increased the number of inner cell mass (ICM) and trophectoderm cells in bovine expanded blastocysts (Kölle, *et al*, 2002). The study did not delve into possible early maturation of these bovine embryos, but it is interesting to note that the GH is affecting the ICM that will eventually give rise to the fetus. It may indicate that it also affects early onset puberty. Another study showed several negative effects in transgenic pigs that sustained long-term increases of rBGH, including gastric ulcers, arthritis, cardiomegaly, dermatitis, and renal disease (Hallberg, 1992). Another study, conducted in 1990 by the FDA, assures consumers that rBGH has not effect in humans or rats because it is not biologically active. These scientists do admit the increase of IGF-1 in rBGH treated milk, but since oral toxicity studies have shown that bovine

IGF-I lacks oral activity in rats, we humans have no need to worry (Juskevich&Guyer, 1990). Some believe the U.S. government is deliberately covering up findings that show the harmful effects of rBGH. According to the Cancer Prevention Coalition website:

A 1990 study by Monsanto, the leading maker of rBGH, explicitly revealed statistically significant evidence of growth promoting effects. Feeding relatively low doses of IGF-1 to mature rats for only two weeks results in statistically significant and biologically highly significant systemic effects: increased body weight; increased liver weight; increased bone length; and decreased epiphyseal width (Goldstein & Goldstein, 2002, p. 73).

Gonadotropin-releasing hormone 1 (GNRH1) is the stimulator that releases LH and FSH from the pituitary gland. These hormones are directly involved with sexual maturation of preadolescents. Estrogens, on the other hand, will inhibit milk secretion, but progesterones, like LH and FSH do not. There have been very few BST studies done that measure reproductive hormones. It has been found that LH is secreted more frequently in cows treated with rBGH. (Schemm, et al, 1990) reported that the average progesterone concentration was higher in BST-treated cows, but that BST had no influence on estradiol (estrogen) concentrations, and the length of the cows' reproductive cycles were unchanged. Gallo and Block (1990) also found a higher peak progesterone output during the first two estrous cycles and during pregnancy in BST-treated cows (Halberg, 1992, p. 107). More scientific study is needed to determine if this increase in LH secretions can actually affect humans. It is worthy to note the importance of LH in the onset of puberty, which has been occurring with greater frequency at younger ages since the treatment of cattle with hormones began. It seems to be an interesting coincidence. Is the cost of human health worth the milk surplus, and who is benefiting from this?

## **Milk: It Does a Body Politic?**

“And now,” said he, “to settle what remains. Will you be wise? will you be guided? will you suffer me to take this glass in my hand and to go forth from your house without further parley? or has the greed of curiosity too much command of you?”

Robert Lewis Stevenson, 2003/1886, p. 59

Scientific activity is just one social arena in which knowledge is constructed.

Bruno Latour, 2007, p.31

School milk programs were started in 1940 and continue today giving school children free and reduced priced milk. How tied are the FDA and the USDA with this policy? Who benefits? The USDA purchases surplus milk from Dairy farms and distributes it to public schools. The USDA, by law, has to purchase surplus milk from dairy farmers using at least some of the millions of dollars that taxpayers have been paying. Why is there a need to produce more milk when subsidies were being used to encourage farmers to decrease milk supply? Someone stands to gain from this dichotomy. It is not being done to feed the starving it is done to fatten someone’s purse. Scientists have come to a point where they sell out to the large corporations who can afford to buy their morals: “They could choose to live a comfortable but not luxurious life in academia, hoping to do cutting-edge research, or they could ‘sell out’ to industry” (Angell, 2004, p. 6).

“Fifty years ago an average cow produced 2,000 pounds of milk per year. Today the top producers give 50,000 pounds! How was this accomplished? Drugs, antibiotics, hormones, forced feeding plans and specialized breeding; that's how” (Kradjian, ND). “Experiments with

growth hormones have shown yield increases of 10-40 percent in dairy and hog production” (McClelland, Kuchler, & Reilly, p. 5). There are differing quantities of the actual amount of milk an rBGH treated cow can produce, but there is no doubt that the amount of milk has greatly increased. Certainly, there is surplus and a strong media campaign to increase dairy intake and dairy intake has increased over the past thirty years. Alarmingly the same time frame for the introduction of rBGH and increased accounts of early onset puberty. What fueled the fire? Did increase consumption fuel increased production? Or did the increase in production spur the need to increase consumption? Monsanto was pushing rBGH to the farmer as a means to produce more at a lower cost. However, the use of rBGH can be quite costly. The Cancer Prevention Coalition Web site determined that feeding IGF-1 to rats for a short period of time does affect growth, yet the “FDA has failed to investigate the effects of long-term feeding of IGF-1 and treated milk on growth” (Goldstein & Goldstein, 2002, p. 73).

The Asilomar Conference of 1975 was organized by scientists to discuss the risks involved in the new technology developed through working with genes. They wanted to set guidelines for working with recombinant DNA. The National Institutes of Health (NIH), an agency of the United States government, set these guidelines. The NIH can approve any work done based solely on perceived risks. Dairy farms began using rBGH in their cattle before the official approval came from the FDA in 1993, and until 1997, it was illegal for manufacturers to place labels on their products distinguishing them from rBGH treated cattle. Even the University of Wisconsin, home to one of the discoverers of BST now advertises that their dairy products are BST free (Schacter, 1999). This seems to say volumes for the safety of genetically engineered foods. If the creators will not use it, why should we? The European Union and Canada have

banned rBGH and refuse to import products from the United States that contain the recombinant hormone.

The studies performed by Monsanto to obtain FDA approval demonstrated that the nutritional composition and content of milk (fat, protein, lactose, calcium and phosphorous) were not changed by treatment with BST, at doses at, below and above the recommended dose of 500mg (Schacter, 1990, p. 701). A study sponsored by the United States Department of Agriculture stated “the suggestion that technology be regulated because the perceived economic effects are unfavorable toward certain groups raises serious questions... With no known, or likely, negative human health effects, the more serious ramifications of failure to approve growth hormones may be the stifling of biotechnology and similar research (McClelland, Kuchler, & Reilly, p. 16). Does the multi-million dollar corporation Monsanto, who had sales of \$10.7 billion in 1997, whose history of production includes PCBs and Agent Orange, have the United States government and news media in its pocket? I believe the following case shows that it does: A Fox News documentary set to air revealing dangers of rBGH was suddenly cancelled and its producers fired with intervention of Monsanto’s lawyers. The four-part news story was to reveal how Monsanto’s BST was not properly tested before being allowed on the market. Just like the big Pharma Marcia discusses, corporations involved in biotechnology are putting the drive for profit ahead of the need for safety. “As they [sponsors] became richer, more powerful, and more profit driven, drug companies became less willing to sit back and wait for academic researchers to produce their results” (2004, p. 100). Somehow, the company got away with testing rBGH on 30 rats for only ninety days when standard cancer testing requires two years of testing with several hundred rats. The news team found out that Monsanto and their researchers withheld information that cattle were becoming sick and dying from rBGH treatment. The series was also

set to discuss concerns of scientists of potential cancer risks in humans due to the increased levels of IGF-1 in rBGH treated milk (Rampton & Stauber, 2001, Wilson, 2000). Women with small increases of IGF-1 in their blood levels are up to seven times more likely to develop premenopausal breast cancer than women with lower levels.

Monsanto has threatened to sue school boards if they ban rBGH milk from cafeterias. They sponsored aggressive lobbying campaigns against labeling of items containing rBGH going as far as to file suit against dairies for labeling their product as rBGH-free, and they have fired scientists for voicing concern about rBGH. There are claims that Monsanto influenced and manipulated federal agencies to ensure approval of their bovine somatotropin. An employee of Monsanto actually wrote most of the FDA's position on BST with the aid of Monsanto's safety summary that left out results of any study that did not favor their product (Roberts, 2001).

American cattle farmers have been using BST for over thirty years. According to the National Cattlemen's Beef Association "approximately 63 percent of all cattle and about 90 percent of the fed cattle in the United States are implanted" (Goldstein & Goldstein, 2002, p. 65). These hormone pellets are supposed to be implanted in the cow's ear, which allows for a gradual, slow release of hormone into the cow's bloodstream. A U.S. control system ensures that animals taken to slaughter have normal hormone levels. But what control exists over dairy cows? A survey in 1986 found illegally implanted pellets in muscle tissue. The placement of the pellet in muscle tissue causes a higher level of absorption which the FDA says could have adverse effects. According to the USDA six hormones are permitted for beef implantation. Estradiol, progesterone, and testosterone "are naturally occurring hormones produced by all humans and food animals." Trenbolone acetate [a steroid], zeranol, and melengestrol acetate (MGA) are synthetic hormones: trenbolone acetate mimics testosterone, zeranol mimics estradiol, and MGA

mimics progesterone (Goldstein & Goldstein, 2002, p. 67). These naturally occurring hormones are normally regulated by the hypothalamus and the pituitary gland and are now being introduced into the bodies of humans through their intake of dairy and hormone injected proteins. Despite studies carried out by Monsanto and the USDA that claim these hormones have no effect on humans, there are changes in humans that coincide with the use of hormones in cattle. Children are entering puberty at much younger ages than just thirty years ago. They are not mentally prepared for these changes and consequently experience more difficulties, socially and mentally. Despite the U.S. government's avowed statements of safety, the European Union has banned the use of rBGH since the late 1980s.

In 1999 the Scientific Committee on Veterinary Measures Relating to Public Health, a European Commission group, concluded that growth hormones present a variety of risks for consumers, ranging from developmental to neurobiological estradiol was deemed to be carcinogenic (cancer causing). Children were considered to be at greatest risk (Goldstein & Goldstein, 2002). The fact that in the 1990s Monsanto put a new brand of rBGH onto the market with a new name, POSILAC<sup>®</sup>, indicates the nation's reserve. In marketing the new drug, Monsanto dropped the word hormone from the descriptor, calling this new farm-acuetical wonder a bovine somatotropin (BST). Their website claims supplementing BST "safely enhances milk production" and that the "level of BST in milk remains the same" (Monsanto Company, 2007). However, Monsanto is, like any other drug producer, required to list the harmful effects of POSILAC<sup>®</sup> on the label. That list contains twenty-one health problems including increased risks of mastitis and cystic ovaries.

Teachers be aware; students approaching puberty at such young ages have socio-emotional risk factors that must be dealt with in the school setting. It may be there are problems

dealing with somatic changes while so immature rather than just assume the child needs medication. Using medication to force children to do what is expected in a factory model school is a control issue we need to deal with. Foucault uses the example of a soldier in the seventeenth century to illustrate the ways control is used to create docility. “The classical age discovered the body as object and target of power. It is easy enough to find signs of the attention then paid to the body – so the body is manipulated, shaped, trained, which obeys, responds, becomes skillful and increases its forces” (1997, p. 136). Modern day enforcers (teachers, psychiatrists, doctors, pharmacies, etc.) can create this docility with medication.

Pubertal changes cause enough angst in children who are older and more mentally prepared for these transformations. Behavior problems and moodiness associated with precocious puberty are to be expected. Children may experience social difficulties including peer rejection, early initiation to sex, depression, and aggression. A Child Behavior Profile (CBP) measures problem scales with internalizing or externalizing scales. A child internalizes by such activities as nail biting and withdrawal. A child externalizes by disruptive outburst such as lying or fighting. Many girls with precocious puberty tested above the 98<sup>th</sup> percentile for behavior problems. They also showed greater occurrences of depression, social withdrawal, somatic complaints, schizoid/obsessive, hyperactive, and aggressive behaviors (Foch & Lerner, 1987)

Researching this dissertation has indeed opened my eyes to the dangers of playing with nature. I had not realized there could be connections between rBGH and cancer. rBGH is linked to tumors and does increase IGF-1 in milk. Tumors can affect the onset of puberty. IGF-1 causes benign tumors to grow. Malignant tumors are cancers. There is a plethora of research done that indicates rBGH has absolutely no effect on humans or cows. There is also loads of evidence to the contrary. Some scientists and government agencies insist it is merely public ignorance that leads

some to reject the advents of science and technology. Is technology making our lives simpler? I agree with Heidegger (1977) that technology is solving problems while at the same time creating new ones. Heidegger uses peasant farming as an example of traditional technology because the relationship between the peasant and the land is one of respect. They are stewards of the land and work within the constraints of nature to grow crops. In contrast, modern technology exploits the land as a resource. Seeing everything as a resource dominates the consciousness of humanity making it impossible to live in harmony with the earth. Modern science and technology produces tools to exploit the earth as resources. The solution Heidegger suggests is to change the way we relate to the world, to see the symbiotic nature of our relationship with the world. This exemplifies holistic education. Bowers talks of the same issue:

Given the reduced ecological margin for human error, the general public must replace the current assumption that equated technological innovation with progress with an assumption that any new form of technology may bring unintended ecological and cultural problems. (2000, p. 182)

We are treating this technology with food as a neutral and the new technologies seem to be causing new problems with health of land and animals. It is true that the American public is far removed from food production. Most of our population live in urban areas and know that milk comes from the store and think nothing beyond price per gallon. Perhaps that is the case in the United States more than anywhere. Perhaps that is why so many other countries in the world refuse to use transgenic dairy products. Perhaps that is why America chooses to continue infusing cattle with laboratory made hormones. We just go into a store and buy whatever is cheapest; we do not place the value on food that it deserves. Are we also denying the value of our children? “Everywhere we remain unfree and chained to technology, whether we

passionately affirm or deny it. But we are delivered over to it in the worst possible way when we regard it as something neutral; for this conception of it, to which we particularly like to do homage, makes us utterly blind to the essence of technology” (Heidegger, 1977, p. 4). We cannot remain blind to the ways technology are changing not only the way foods are produced what their chemical makeup is as well. The introduction of hormones from rBGH treated cows is changing our bodies and thrusting our children into adult bodies with innocent minds. We are creating the posthuman child by what we feed him/her. I will continue buying organic milk and cheese imported from the EU or Canada in hopes that neither my child nor I will not become a monster like that of Frankenstein’s or Dr. Jekyll’s creation

When food producers and manufacturers can increase their yield for the same amount of investment, then the risks seem to be less of a concern. I say this because of the rates in which biotechnology has increased, not just in agriculture but medicine as well. Parts of our bodies can be bought and sold. Thacker (2006) argues that these parts rendered from our bodies are no longer alive. And this started with the court precedent of patenting a genetically-modified organism in 1980 in the case of *Diamond v. Chakrabarty*, “in which the Supreme Court held that a live, man-made microorganism is patentable subject matter under Section 101 of the US Patent Act” (Robinson & Medlock, 2005, p.12). While working for General Electric, Ananda Mohan Chakrabarty developed a bacterium derived from the *Pseudomonas* genus that could break down crude oil. His request for a patent was rejected on the grounds that living things could not be patented. A Supreme Court ruling decided that “anything under the sun that is made by man” may be patented leading to a “revolution in biotechnology that has resulted in the issuance of thousands of patents, the formation of hundreds of new companies, and the development of thousands of bioengineered plants and food products” (Robinson & Medlock, 2005, p. 12).

Ilde explores technology as an extension of science in his book, *Technics and Praxis* and formalized a series of relations: “science → technology → social effect” (1979,p. 6), which I feel is clearly visible in the food production industry. This is the perspective my dissertation takes on the rise of biosciences and biotechnology and their impact on young people and education. The food we are eating, which is being created in some part or another in labs, is having a deleterious effect on the health and cognitive abilities of all people, but children are the most affected as their immune systems have not yet matured.

The adverse effects of biotechnology in food production on humans are becoming more apparent. Our mental functions are directly related to what we eat. Are children getting enough quality nutritious food to power thinking skills to their fullest potential? Or are they getting just enough calories to get them through the day, without any thought to the effects? “Nutrition hinges upon the special relationship between our body and the environment that we inhabit...nutrients...are chemicals that are used by our body for energy or other human processes” (Wildman, 2002, p. 1). People rarely reflect on where food comes from, how it is made, or even what it does to the community. Large corporations like ConAgra dominate commodity markets causing farmers and cattle ranchers to become employees. “Rural communities are losing their middle class and becoming socially stratified, divided between a small, wealthy elite and large numbers of the working poor” (Schlosser, 2001, p. 8). “Changes in the nation’s economy during the 1980s have hurt millions of people who were once members of the middle class – displaced farm families and former blue-collar workers forced out of manufacturing” (Boyle & Morris, 1999, p. 349).

“Although there is a long history of selective animal breeding, food preparation (e.g., fermentation), and agricultural techniques (e.g., ecological optimization of crops), the Boyer-

Cohen experiments were the first such instances effectively to combine modern life science research with an engineering perspective, a paradigmatic look toward the technological control over the body as nature” (Thacker, 2006,p. 174). After farther advances in biology and recombining DNA, scientists can now combine the genetic elements of different living things. “[G]enetic engineering is based on the premise that the DNA of an organism can be reshuffled and engineered; the tools of genetic engineering are the organism’s own biology” (Thacker, 2006, p. 173). Therefore, according to Thacker, biotechnology is merely life itself rearranged: A reconfiguration of biology, but altogether natural. What is not natural are the effects we are experiencing due to previously unseen amounts of toxins and chemicals which are accumulated in our fatty tissue. Increased rates of cancer, increased diagnosis of Attention-deficit/hyperactivity disorder (ADHD)and Autism Spectrum Disorders, as well as yet undiagnosed illnesses and unknown specters loom in our future from this ‘natural’ reconfiguration of life. The new forms of biotechnology, as practiced by large corporations like Monsanto, do not follow the rules of nature; they ignore the relationship of nature and culture in plants and animals. Darwin’s rule of variability has changed. “For the first time, breeders can bring qualities at will from anywhere in nature into the genome of a plant: from fireflies (the quality of luminescence), from flounders (frost tolerance), from viruses (disease resistance), and...from the soil bacterium known as *Bacillus thuringiensis*” (Pollan, 2001 p. 196).We do not yet fully comprehend the effects on biotechnology on our ecosystems, yet we continue to venture into its depths for the monetary gain of our elite. I agree with Thacker in that it is currently impossible to separate biology from economics and science from commerce: “*In the biotech industry, we see the continual transformation of biological value and medical value into economic value*” (2006, p. 85). Perhaps, one hope looms ahead in the work of Orr and Bowers

and the promise of what a sustainable curriculum may be able to effect. Looking at science, politics, the economy, and all aspects of our culture as a system wide interrelated whole, instead of fragmented pieces run by specialists, we may be able to view the whole picture and learn to control the effects of science and technology on our ecosystem.

This technology is changing the food that we eat, whether we grow it from the ground or splice it from a gene. We are ingesting these chemicals and they are accumulating in our bodies. The full effects are yet to be known, but more and more food items are being recalled and health issues are being raised. “There’s still a lot we don’t understand about gene expression” (Pollan, 2001, p. 209). Scientists are selling out to corporations who in turn are selling out humanity for a profit. Modern bio-sciences teach competition and reproduce a race for the prize ethic. Donna Haraway writes that “much of our dis-ease with modern science comes from appreciation of the inadequacy of the old view of progressive, control-oriented, objective descriptions of nature (1976, p. 2). Biotech corporations, the elites that profit, believe that genetically modified and chemically altered foods only do what nature does – there is no inherent danger, but Thacker (2006) reminds us that this point of view is constructed and dictates what ethics and politics develop. Bruno Latour (1986) writes about the construction of facts by scientists, extrapolated from ideas. Experiments typically produce only inconclusive data and that a large part of laboratory method involves taking the subjective decision of what data to keep and what to throw out. Because of this, according to Latour, experiments are a way of constructing facts. I agree with this, especially in the realm of biotechnology research. Because of modern food making processes, more and more chemicals and hormones are being introduced to our bodies, starting in uteri. The full effects of these chemical intrusions has not been fully explored nor explained and the causes and effects volley back and forth between pro-biotechnology and anti-biotechnology,

each stating and qualifying facts that seem opposing. Scientists can be using data from their experiments to construct what the people funding them want them to find. Dr. Arpad Pusztai writes of the dearth of research on genetically modified foods. The industry prefers “to use compositional comparisons between GM and non-GM crops. When they are not significantly different the two are regarded as “substantially equivalent”, and therefore the GM food crop is regarded as safe as its conventional counterpart. This ensures that GM crops can be patented without animal testing. However, substantial equivalence is an unscientific concept that has never been properly defined and there are no legally binding rules on how to establish it” (2001).

Latour discusses how fabrication of scientific facts can occur by fragmenting facts and using them in new more complex statements. “Depending on which sentence we believe, we, the readers, are again induced to go in opposite directions” (1986, p. 23). Getting to the source, or reconstructing the information to the base facts is leading to much of the controversy around genetically modified and chemically enhanced foods. As Ricoeur noted “a *structural* semantics is being constituted as well, characterized, among other things, by a change of level and a change of unit, by the passage from molar units of communication, such as words and the *a fortiori* texts, to molecular units, considered to be the basic structures of signification. (2007, 62-63).

Ihde (1979) is adamant that it is a mere romantic notion that technology is a threat to nature, but we should not discount the travesties that have happened to nature because of the misuse of technologies. Changes in classroom culture that view “the classroom an ecology that is part of the larger ecology of cultures and natural environment [will teach that] the definitive relationships in the universe are...not competitive but interdependent” (Bowers & Flinders, 1990, p. 249). Meaning is being constructed for us by the use of certain words, the omission of other words and the order in which they are being presented to us. The hermeneutics of research

from the scientific study and manufacture of foods with technology is crucial. How do we know what to believe? There are so many contrasting reports and recommendations and research studies. J.R. Ravetz wrote in 1973 “that the nature of scientific activity is thoroughly misrepresented by the form of presentation which is used in the reporting of science” (Latour & Woolgar 1986, p. 28).

Don Ihde writes of humans inextricable ties to technology so much that we take for granted technology in our day to day lives. “In so far as I use technology, I am also used by technology” (2002, p. 137). The student is awoken by an alarm clock, takes a hot shower with water heated by a machine s/he does not even have to see. Clothing procured at a store conceals the technological origins of clothing as does foods eaten that have been procured from the supermarket. Once at school, being conveyed their most commonly by some un-natural means such as a bus or a bike, the student is inundated by technology, including computers. Chet Bowers believes that the use of the computer is actually detrimental to a student’s ability to learn – since we tend to take that technology for granted as neutral (which Ihde reminds us again and again we should not do).

Science, especially biology, is becoming increasingly informational (Thacker, 2006). Life is now considered as numbers and codes to be patented and then sold and used as needed, for profit, of course. Thacker uses Marxist arguments to condone this use of life, or non-life, since the labor of one’s production are not considered to be alive. Therefore the codes one produces, despite they be from one’s body or cells, are non-living commodities. Rajan (2006) shows this through how recombinant DNA technology has allowed science to become technical and therefore increasingly informatic.

## **The Not So Purity of Plants**

“They penetrate into the recesses of nature, and show how she works in her hiding places” (Shelley, 1818/1991, p. 47).

Monsanto, a corporation that during the Vietnam War produced Agent Orange, now makes chemicals: hormones, fertilizers, and pesticides to improve the quantity of our food. The NewLeaf™ potato was built at the Monsanto laboratory in St. Louis, MO. It “has been genetically engineered to produce its own insecticide. This it does in every cell of every leaf, stem, flower, root, and – this is the unsettling part – every spud” (Pollan, 2001, p. 187). [G]enetic engineering is based on the premise that the DNA of an organism can be reshuffled and engineered; the tools of genetic engineering are the organism’s own biology” (Thacker, 2006, p. 173) Monsanto used the potato’s biology and mixed it with the biology of another species to let the spud produce its own insecticide. This potato was launched in 1995 and taken off the market in 2001. Dave Starck, one of Monsanto’s employees acknowledged when the potato was launched: “There’s still a lot we don’t understand about gene expression” (Pollan, p 209). Scientists are selling out to corporations who in turn are selling out humanity for a profit. The full effects of these genetically modified potatoes were unknown, yet they were let loose in nature.

The majority of these potatoes were grown for fast food restaurants who seek conformity and perfection in every fry. That quest for the perfect fry has introduced something new into the environment and the food chains. For eight years we may have unwittingly been eating this genetically engineered Bt toxin, which is

produced by a bacterium in the soil [and] is generally thought to be safe for humans, yet the Bt in genetically modified crops is behaving a little differently from the ordinary Bt...instead of quickly breaking down in nature...genetically modified Bt toxin seems to be building up in the soil. This may be insignificant; we don't know". (Pollan, 2002, p. 211)

No studies have been done to show the transfer of Bt-toxin from corn and cotton to humans, but animal studies show stunted growth, impaired immune system, bleeding stomachs, abnormal cell growth, less developed brains and testicles (Smith, 2007). What we don't know seems an awful risk to be taking with our planet and our lives. What could it be doing to our nervous systems? Is it better or worse than the nervous system damaging organophosphates currently used to kill insects on crops? Margaret Melton, a molecular biologist at the Union of Concerned Scientists in Washington, D.C., when asked if NewLeafs were safe to eat stated "the research simply hasn't been done" (Pollan, p. 236).

Through our digestion of these genetically altered foods are we merging with chemicals and biotechnology to become some new sort of being? Katherine Hayles tells us that "[t]he posthuman subject is an amalgam, a collection of heterogeneous components, a material-informational entity whose boundaries undergo continuous construction and reconstruction (1999, p. 3). Are we not creating that collection in our bodies as we eat foods drenched in chemicals or even genetically changed to produce something that we do not really know if we should be consuming? Will we be more or less resistant to new strains of bacteria, fungi, and viruses that are being manufactured? Chemicals such as sodium nitrate which "is used as an antioxidant and antimicrobial agent in various foodstuffs... The authorized and widely accepted

daily dose is 0.2 mg/kg. Daily consumption commonly exceeds this figure, particularly in children” (Branen, Davidson, Salminen, &Thorngate, 2002, p. 48). Will the bioaccumulation of these chemicals and poisons eventually cause us to be impervious or imperiled? Sodium nitrite accumulation has links to lung cancer. How many other compounds are we consuming that have such deadly and dangerous links?

Food and the choices we have about food consumption and availability are necessary to sustain life and well-being. Advents in technology have truly changed the landscape of our world and the means of producing food. No longer do we rely on locally grown food from small farms, instead we have food flown in from around the world that has been chemically altered and/or overly processed. This has lasting effects on health and proper functioning of the brain.

Processed foods are leached of almost all nutritional value. Sugar is added to almost every food available at schools to make them more palatable and appealing to students. Obesity is on the rise, cancer rates are increasing, children suffer mentally and physically from precocious puberty, ADHD, and Autism. All of these illnesses and more are directly linked to the foods we have available to us. Low socio-economic families are the worst off because the major distribution centers of food choose to locate outside of the inner cities, leaving corner stores and gas stations to readily supply snack foods and other processed items in lieu of fresh fruits and vegetables. Our schools are supplied food from USDA contracts with the meat packing industry and dairy industry. Frozen, reconstituted, re-heatable meals are shipped to schools and fed to our children. Growth hormone infested meat and milk is fed to them daily. Some students eat meals at school two times a day and greatly rely on them for their nutrition; which is dearly lacking.

## **The Island of Dr. McDonald**

This is no fairy story and no joke; the meat would be shovelled [sic] into carts, and the man who did the shovelling [sic] would not trouble to lift out a rat even when he saw one – there were things that went into the sausage in comparison with which a poisoned rat was a tidbit. (Sinclair, 1906/2006, p. 167)

Scary images from the early twentieth century, scarier yet that things like this continue today. The power of the meat packing industry still affects our food today. The United States Department of Agriculture is powerless to order a recall of meat. All meat recalls are done voluntarily, or not done at all. Tainted meat was being distributed to public schools in America even in the 1990s. Outbreaks of e coli and salmonella poisoning are far too common occurrences in this age of technology and progress. How did the meat packing industry become so powerful?

Is it a coincidence that USDA Secretary Veneman chose Dale Moore, former chief lobbyist for the National Cattlemen’s Beef Association, as her chief of staff? Or that Veneman chose Alisa Harrison, former director of public relations for the Cattlemen’s Association, as her official spokesperson? Or that one of the new Mad Cow committee appointees she chose is William Hueston, who was paid by the beef industry to testify against Oprah Winfrey in hopes of convicting her of beef "disparagement"? (Gregor, 2004, p. 18).

Herbert Boyer and Stanley Cohen developed the processing for recombining DNA, which led to Monsanto’s manufacture of recombinant bovine growth hormone. Thacker writes that “[r]ecombinat DNA can not only surpass nature by providing the molecules nature does not, but

also forms a novel technological infrastructure in which the body's 'natural' processes...can be recontextualized in a kind of upgraded, biomolecular black box (2006, p. 175). The new forms of biotechnology, as practiced by large corporations like Monsanto, do not follow the rules of nature; they ignore the relationship of nature and culture in plants and animals. Darwin's rule of variability has changed. "For the first time, breeders can bring qualities at will from anywhere in nature into the genome of a plant: from fireflies (the quality of luminescence), from flounders (frost tolerance), from viruses (disease resistance), and...from the soil bacterium known as *Bacillus thuringiensis*" (Pollan, 2002, p. 196).

Are not the dangers in this apparent with the use of BST? Cows are growing larger faster and producing massive quantities of milk that affect their quality of life. Not only does such large production of milk inflame the udders and cause mastitis, but the cows are only guaranteed four years of life because a cow can only produce milk for the first four years of life. Usually the cow is then considered useless except for slaughter. The hormone is passed through the milk and the meat into humans and has several adverse effects on us, including precocious puberty and cancer. These new technologies meant to improve upon the inefficiencies of farming are proving to be cost effective yet destructive.

But then what would the manufacturers of the chemicals and pesticides do for a living if we relied on technologies that promote organic farming? There are critics, like Dennis Avery, who argue that organic farming "is an environmental disaster, an imminent danger to wildlife, and a hazard to the health of its own consumers" (Nestle, 2006, p. 44). Does it make any difference in his opinions that Avery is employed by the "Hudson Institute, a conservative Washington, D.C., think tank that receives funding from, among other sources, agribusiness corporations like Archer Daniels Midland, Cargill, ConAgra, Monsanto, and the National

Agricultural Chemicals Association” (Nestle, 2006, p. 44). We cannot doubt the power of the food industry’s lobby. The American Meat Institute, national Livestock and Meat Board, American Dairy Association, National Dairy Council, What Foods Association, What Flour Institute, Cereal Institute, and Sugar Research Foundation, Inc. are all funded by large corporations like Monsanto and ConAgra and almost all of them are involved in research to publicize the health and safety of each food it represents. Normally research that finds anything that is unfavorable to its sponsor is suppressed. The use of propaganda is as effective today as it has been throughout history.

To ensure the success of the chicken McNugget™ the corporation needed an inexpensive solution. “[T]he Keystone lab developed new technology for the manufacture of McNuggets – small pieces of reconstituted chicken ... to guarantee an adequate supply ... Tyson ... developed a new breed of chicken... dubbed ‘Mr. McDonald,’ the new breed had unusually large breasts” (Schlosser, 2001, p. 139-140). The addition of growth hormones in animals that are raised for consumption and dairy has indeed increased the size and output of a single animal. McDonald’s funded research for the “McChicken” whose breasts are genetically engineered to be so large, the beast cannot walk. France began the use of hormones in cattle to increase milk production in the 1930’s. One of the debated effects of these chemically enhanced growth hormones into our bodies is the rise of precocious puberty. Diagnoses have increased in the last thirty years as have diagnoses of autism and ADHD. These all have severe psychological repercussions for children which may be contributing to some of the behaviors. The increase has been attributed by some (DAN doctors, Orr, Carson, Statham) to bioaccumulation of hormones and chemicals in the foods we eat.

It is reminiscent of tales of science fiction and horror, as if Dr. Frankenstein is back in the lab secretly recombining parts into new monstrous creations and we are eating them! “I have pursued nature to her hiding places. Who shall conceive the horrors of my secret toil, as I dabbled among the unhallowed grave, or tortured the living animal to animate the lifeless clay?” (Shelley, 1818/1991, p. 54). John Weaver asks what happened to the monster after it leapt from the ship. Did it die? “My contention is it did indeed survive and continues to live...it is exacting revenge by living a reconstructed life of luxury and excess (2010, p. 35). Weaver sees this as a “model for what medicine and science can do to help certain individuals overcome the ‘flaws’ of nature and the martyrdom of time” (2010, p. 35). I see the monster more represented in large corporations, like Monsanto, trying to make money by genetically altering foods to increase their profusion and size with little or no regard for the long term effects. Margaret Atwood wrote of this sort of genetic engineering for food and body parts in a frightfully prophetic novel written in 2003:

What they were looking at was a large bulblike object that seemed to be covered with stippled whitish-yellowish skin. Out of it came twenty fleshy tubes, and at the end of each tube another bulb was growing.

“What the hell is it?” said Jimmy.

“Those are chickens,” said Crake. “Chicken parts. Just the breasts, on this one. They’ve got ones that specialize in drumsticks too, twelve to a growth unit.”

“But there aren’t any heads,” said Jimmy (p. 202).

The extraneous, inedible parts of the chicken had been genetically engineered out of the animal in order to maximize profit. Hello, Mr. McDonald: how much longer until scientists figure out how to turn you into a mere collection of breasts.

Chicken is not the only animal being disfigured by scientists to facilitate inexpensive consumption. Cattle are injected with recombinant bovine growth hormones to increase body mass and milk production. The full effects on humans through consumption of this lab made product are not fully understood. “See, the steaks you buy in a grocery store come from penned up steer. Then they feed ‘em [sic] antibiotics and little bits of other cows and that makes ‘em[sic] unhappy...It makes them taste terrible” (Corrigan & Walsh, 2007). The reason a cow has four stomachs is to aid in the digestion of its herbivore diet. A cow was not born to be a carnivore. In order to save money, farmers are feeding their cattle waste meat and products from other animals. The United States Cattle industry finds money saving ways to get around such bans. Since 1996, the World Health Organization has recommended that all countries stop feeding any remains of cows to cows, yet the U.S. government still allows dairy farmers to feed calves gallons worth of cow blood and fat collected at the slaughterhouse.

About 74 percent of the cattle in the United States were routinely fed livestock wastes – the rendered remains of dead sheep and dead cattle – until August of 1997. They were also fed millions of dead cats and dead dogs every year, purchased from animal shelters. The FDA banned such practices after evidence from Great Britain suggested that they were responsible for a widespread outbreak of bovine spongiform encephalopathy (BSE), also known as “mad cow disease.” (Schlosser, 2001, p. 202)

Industry representatives continue to actively support this practice. “In 2002, the USDA requested feedback on a number of options for further preventive measures, including a total ban on allowing the brains and spinal cords from donor cattle into the human food supply. The spokesperson for the American Meat Institute explained that the meatpacking industry would take a "significant hit" financially if the USDA enacted such a proposal” (Gregor, 2004,p. 22).

## Recombining Nature

“...of all the miracles of chemistry which they performed, giving to any sort of meat, fresh or slated, whole or chopped, any color and any flavor and any odor they chose.”

(Sinclar, 1906/2005 p. 166)

The flavoring of foods probably originated in France with the use of sauces and gravies to disguise the smell and flavor of turned meat. Science has come a long way from the culinary successes of a few good chefs. Chemistry has made many advances from disguising the soured and rotted meat that could then be sold to unsuspecting consumers. “There was never the least attention paid to what was cut up for sausage; there would come all the way back from Europe old sausage that had been rejected, and that was mouldy [sic]and white – it would be dosed with borax and glycerine [sic], and dumped into the hoppers, and made over again for home consumption”(Sinclar, 1906/2006, p. 167). There are so few actually natural foods that are available for purchase in the grocery store today. In the lists of ingredients on any given package, the words ‘natural flavors’, ‘additives’, ‘color’, and ‘to preserve’ are found last in the list, indicating that this is the least amount of ingredient used. “According to the federal Food, Drug and Cosmetics Act, there are five broad categories of compounds associated with human food. These include generally recognized as safe (GRAS), which represents approximately 1600 substances, pesticide residues, unavoidable contaminants, color additives, prohibited substances, and intentional food additives” (Maga, 1994, p. 1).

As long as chemical additives are considered GRAS, the ingredients of added flavors do not have to be disclosed. This is done more to ensure the profit of the manufacturers than the

safety of the consumer. “In establishing its GRAS affirmation procedure, the agency (the FDA) deliberately and explicitly adopted a policy that industry had the legal right to market a new food substance following a self-determination of GRAS” (Branen, Davidson, Salminen, &Thorngate, 2002, p. 208). Since the 1970s these corporations have had the legal right to put accumulations of chemicals into our foods. By themselves or in the restricted quantities in a particular food perhaps they may be generally safe – but when combined with other chemicals or taken in quantities regarded as above the safe limit. Who is keeping track of what each individual eats and determining if the combination of chemicals are still GRAS? Who knows what sort of chemical monster we are building inside our bowels. Why do we so blindly put our trust in corporations that have these governmental agencies in their pockets? “This lack of public disclosure enables the companies to maintain the secrecy of their formulas. It also hides the fact that flavor compounds sometimes contain more ingredients than the foods being given their taste” (Branen, Davidson, Salminen, &Thorngate, 2002, p. 125). Can it be generally regarded as safe if I combine several unknown compounds and chemicals? It never was safe in my chemistry class, why should it be O.K. in my stomach and throughout my body.

Advances in biotechnology are leaping to the aid of corporations who may fear the new labeling craze of today and larger numbers of organic and conscientious shoppers. “Complex flavors are being made through fermentation, enzyme reactions, fungal cultures, and tissue cultures. All...are considered natural flavors by the FDA” (Branen, Davidson, Salminen, &Thorngate, 2002, p. 128). We may be eating popcorn flavored with buttery tasting bacteria or drinking sodas with added tissue cultures that will enhance our enjoyment of its taste.

“Man,” I cried, “how ignorant art though in thy pride of wisdom!” (Shelley, 1818/1991, p. 201).

We need not be at the mercy of giant food processing plants and chemical manufacturers. We do

not have to feed ourselves and our children overly processed, hormone injected, and chemically treated foods. Decisions can be made to affect the home and the school. I learned from the film *Super Size Me* (Morley, 2004) that it is possible to provide fresh food with high nutritive values, that students will eat, to schools at about the same cost other schools are procuring precooked bags of chow from the government. The test school, in fact, was an alternative high school for troubled teens that were unable to cope, for one reason or another, at the regular school. These teens were low achievers and trouble makers. Natural Ovens, a bakery in Wisconsin, was commissioned to provide school food. The school removed the vending machines that were filled with highly processed foods and began offering fresh fruit, vegetables, whole grains, and alternatives to fried, high fat, and overly processed food. The results were astounding: the students were able to learn and succeed. It seems there is a benefit to large American corporations and their lobbies in Washington, D.C. to continue its practice of endangering lives with added chemicals. It is a benefit that is at the detriment of those who cannot afford healthier alternatives. Uncomfortable reactions to foods are not mere allergies and bouts of indigestion. They are most likely reactions to the artificial chemicals added to foods or the residues of pesticide on the food. Babies and children suffer the most from ingestion of pesticide residue in foods. Because they tend to eat more fruits and vegetables than adults, “[t]hey are exposed to proportionately greater amounts of chemicals that act as neurotoxins, endocrine disrupters, and carcinogens” (Nestle, 2006, p. 464).

Certainly there can be huge benefits to biotechnology, but there are also severe detriments that are being ignored and suppressed because the financial factor is greater than the trouble deems worthy. New technologies are forced on the public because the corporations who invested in the creation of these new technologies do not like to sit on them and wait for testing

that may show the product to be unsafe. Biotechnology has lasting effects on everything it touches. Certainly there can be huge benefits to biotechnology, but there are also severe detriments that are being ignored and suppressed because the financial factor is greater than the trouble deems worthy. What Marcia Angell tells us about big Pharma is true for other corporations involved with biotechnology. “As they [sponsors] became richer, more powerful, and more profit driven, drug companies became less willing to sit back and wait for academic researchers to produce their results” (p. 100). Examples are rampant throughout history of thoroughly tested safe materials being suddenly found to be hazardous, and I feel this will continue into the future because of the rush to get items approved (Seingraber, 1997, Epstein, Steinman, & LeVert, 1997, Roberts, 2001, Teitel & Wilson, 1999, Angell, 2004). One example is dichlorodiphenyltrichloroethane (DDT), a synthetic pesticide, finally banned in the 1970s with the help of Rachel Carson’s 1962 book *Silent Spring*, which brought a greater awareness to the public of the dangers of pesticides. We are still suffering from the bioaccumulation of this poison in all animals and DDT is now classified as a possible human carcinogen (Epstein, Steinman, & LeVert, 1997). Another, Lead Arsenate was used as an insecticide until its official ban in 1988 despite thousands of poisonings. The FDA refused to ban it “on the unproved theory that arsenic in small quantities is not injurious to your health” (Kallet & Schlink, 1933, p. 48). Orr’s research (2002a) found that “[n]early a million children under the age of five still suffer from low-level lead poisoning [and] [h]alf of all children living in the United States have lead levels that impair reading abilities (p. 281). Tests done in the past on DDT showed it to be perfectly safe, yet time has shown us the lethal effects of its use. It is still affecting plant and animal life today.

The United States is currently violating the concrete recommendations set by the World Health Organization to prevent the spread of Bovine Spongiform Encephalopathy (BSE) also

known as Mad Cow Disease. “The United States seems to be the only country that still legally allows prion infected animals to be fed to other animals, including to those animals destined for the dinner plate” (Gregor, 2004, p. 2). Are we so enticed by the mighty dollar that we cannot see the dangers of restructuring nature? Our society meekly accepts whatever corporations deem to feed us: literal baloney or figurative. “[C]urrent FDA regulations allow dead pigs and dead horses to be rendered into cattle feed, along with dead poultry ...cattle blood is still put into the feed given to American cattle...The waste products from poultry plants, including the sawdust and old newspapers used a litter, are also being fed to cattle (Gregor, 2004, p. 202). This waste is used a cheap food alternative. Cows are biologically made to eat grass, not meat! What kind of monster is being made and what new disease will have to come about in order for us to see what we are doing? Why does the meat lobby work so diligently to prevent tainted beef from being taken off grocery shelves and school freezers? It is time to use education to help pull our heads from the sand and emphasizing change for our health, for our lives, and for our children.

The eventual answer to the problems created by new technologies is even newer technologies, but must we suffer the consequences of trying out the new technologies before the full effects are known? Don Ihde suggests “[w]hile I am far short of advising that high-tech solutions automatically solve the problems, I am suggesting that retroactive romantic returns to previous low-tech or simpler solutions sounds to me like a Bob Dole form of environmentalism” (2002, p. 121). Technology changes who we are, even the technology of rBGH.

## Science in Education

We can no longer assume that nature will be either bountiful or stable or that earth will remain hospitable to civilization as we know it (Orr, 1992, p.3).

How does the global interplay of bioscience, technology, and ethics affect students and their education? The role of science in education became an important facet in the 1950s with the Soviet Union's successful launching of Sputnik. The U.S. government and corporations began funding science programs in public schools that have only increased in recent years as the belief is nurtured that technoscience is the key to the future (Haraway). "Biotechnology corporations not only fund textbooks, they also fund high school science labs and experiments" (Haraway, 1997, p 105). This inevitably leads to a one sided perspective of the abilities of biotechnology and their effects on our lives and our planet. "Science and technology have become sanctified in Western culture. Research, adding to society's total inventory of undigested bits of knowledge, is now perhaps, as holy a calling as saving the heathens was in other times" (Orr, 1991, p13). Haraway admits that the methods of modern science "systematically suppress history, and a person sees basically only his [sic] own world and its possibilities" (1976, p 11).

This admits to the fallacy of biosciences that methodically fragment knowledge and understanding, this is sustaining unsustainability. We are being educated to compete and consume. Chet Bowers believes that the current educational process reproduces cultural patterns through metaphors that perpetuate the environmental crisis. "[T]he root metaphor of anthropocentrism leads to viewing the environment as a resource – which means it is moral to exploit it to the fullest. And this root metaphor of progress leads to recognizing all technological innovations, regardless of the traditions they undermine, as the expression of moral behavior"

(Bowers, 2009, p 33). This is teaching us to better and more efficiently exploit nature. “The primary aim of an eco-justice education is to reduce the human impact on natural systems in ways that ensure their long-term viability” (Bowers, 2003, p161). We do need science and technology, it permeates our very lives, but I agree with Orr, we need controls of scientific inquiry and technology to enable research that will promote humanity’s survival, health, and peace. Bruno Latour (2007) talks of actor-network-theory (ant) in which all members of society are actors in all parts of society –including sciences- by active choice and willing participation or not. As part of the food chain, imbibing the efforts of biotechnology we are all actors, albeit unwilling or unknowing, and our fates are yet to be ascertained.

I believe it to be in the insidious nature of biotechnology efforts in food production, from genetically modified foods, often referred to as ‘Frankenfoods’, a term coined in 1992 by Paul Lewis, after Mary Shelley’s Frankenstein, in popular culture, to in the manufacture of chemical fertilizers and pesticides used in food production, to the over-processing and addition of chemical additives to the foods commonly available. We are experiencing the long-term costs of technology and biosciences in our bodies, while the corporations trade this for their short-term gains. Donna Haraway seems to agree with this in stating that “[w]e pay dearly for living with the chronotope of ultimate threats and promises” (1997, p 41). The time and place in which we live are deeply embedded in the promise of science and technology to rescue us. It seems to matter little that current methods employed in science and technology are destroying our bodies and our lands, depleting our natural resources, and corrupting our economy. The public has faith in science such as religious zealots: thy will be done, we will be saved. How? When? Well, we can leave that up to future generations to figure out.

The bio-accumulation of these chemicals from the seemingly innocuous imbibing of necessary fuel for our bodies may be causing serious health risks to us as consumers. The use of rBGH in cattle to increase muscle mass and milk output, has been linked to cancer, precocious puberty, ADHD, autism, and countless other illnesses we may soon learn of in the future. The effects are compounded on children whose immune system is not yet mature. The effect of biosciences on students is affecting their ability to function properly cognitively and live healthily. The effects of precocious puberty, beside somatic changes, are causing debilitating mental and behavior issues in children arising from their immature inability to cope with the more mature changes in their bodies. The increase of chemicals, hormones, and food additives has also been attributed to increased diagnoses of ADHD and Autism. Research has shown that children's cognitive functioning and performance are negatively affected by insufficient food, insufficient iron, and insufficient micronutrients (Taras, 2005, Grantham-McGregor & Olney, 2006, Malone, 2005). Modern biotechnological methods of farming are depleting nutrients from our food, and therefore children are unable to get the full nutrition needed for proper cognition. Another problem of modern education, according to Bowers, because we see the world through perpetuated metaphors that degrade the value of nature. "The mechanism root metaphor brings into focus what can be observed...and in the area of agriculture, it leads to an industrial approach that requires calculating costs in relationship to profits (but ignores the long-term damage to local ecosystems)" (2006, pp 33-34) and, I feel compelled to add, to the human body's growth and development.

We are changing our bodies from the inside through the practice of eating foods contaminated with human-made chemicals and hormones. To be posthuman is more than just interacting with human made technologies outside our body; we are posthuman by ingesting

human made technologies in our foods. Through efforts of striving toward a sustainable world through the induction of sustainable curriculums (Orr, Bowers, Sterling) we should also be looking at how we, our bodies, are affected by technologies and how we can change this as well.

“[B]iological exchanges take place all the time within the healthcare and biotechnology sectors...The dual biological and economic meanings of the term biological exchange reflect the dual nature of such practices” (Thacker, 2006, p 3). The influence of large corporations over technology and biology affects every aspect of our lives down to the food we eat every day. Money has a way of winning out over safety. It is wise to examine the motives of those with power because it is rare that they will act altruistically. In the main money and continuation of power is the motivation. Eugene Thacker states that “[b]iological exchange is the ability to render the biological not only as information, but as mobile, distributive, networked information (2006, p 7). If there is any doubt that there is biological exchange in agriculture and food production, merely look for evidence in Monsanto’s NewLeaf™ potatoes, Mr. McDonald, the large breasted chicken, and new natural biological entities that can be added to food to give flavor and aromas. This exchange is not for the betterment of society, it is for the enrichment of a few purses. Scientists have come to a point in research where it becomes a choice between money and altruism. “They could choose to live a comfortable but not luxurious life in academia, hoping to do cutting-edge research, or they could ‘sell out’ to industry” (Angell, 2004,p. 6). Herbert Boyer and Stanley Cohen developed the processing for recombining DNA, which led to Monsanto’s manufacture of recombinant bovine growth hormone.

Martin Heidegger, Carolyn Merchant, William Leiss, Moris Berman, Jacques Ellul, and “nearly all critics of technology...argue that modern science has fundamentally misconceived the world by fragmenting reality, separating observer from observed, portraying the world as a

mechanism, and dismissing nonobjective factors, all in the service of the domination of nature. The result is a distortion of reality under the guise of objectivity” (Orr 1991, p 12). Orr sees technology as our declaration of independence from nature, I disagree because we daily interact and experience nature through technologies. Ihde tells us that scientific perception is bodily perceptual (1991). We are letting some of our technologies exploit parts of nature through economic greed. I feel that a change in education that looks at whole systems, instead of segmenting them, will be a start to lead our future away from this destructive path. Rachel Carson wrote more than fifty years ago that we will only find solutions by “piercing together [the] many seemingly distinct and unrelated facts developed through vast amounts of research in widely separated fields” (1962, p. 189).

In science, everything is interrelated, everything connected, even beyond the scopes of science. Wendell Berry wrote “in a natural system whatever affects one thing ultimately affects everything” (1977, p 46). Science cannot remain a disconnected field, when it is studied with its connectivity to all systems, we may be able to effect changes and use technologies with better care and consideration of life. We need, according to Orr, to learn how to think broadly in these times of specialization. “Show me the hamburger stands, neon ticky-tack strips leading toward every city in America, and the shopping malls, and I’ll show you devastated rain forests, a decaying countryside, a politically dependent population, and toxic waste dumps. It is all of a fabric” (Orr, 1991, p 88). Science has become over specialized. David Orr suggests the study of place to prevent this – to allow us to “widen our focus and see interrelationships” (Orr, 1991, p129). Science has branched into so many separate studies, debates over whether technology is part of science or science happens because of technology (Ihde) focus on small parts of the big picture. Modern science disconnects knowledge from the person. Biology is considered

informatics (Thacker), life is numbers and data and reproducible and sellable. It is small wonder we are, as a nation educated in this method of fractured knowledge, unable to see the interrelationships of biotechnology, food production, health, and sustainability.

The eventual answer to the problems created by new technologies is even newer technologies, but must we suffer the consequences of trying out the new technologies before the full effects are known? I do not believe that Orr and Bowers are suggesting such simplistic returns, in fact their discussions of sustainability embrace technologies and the hopes that they new and old technologies will be used in manners that consider effects on the biosphere and in ways to perpetuate life, not harm it. Technology changes who we are, even the technology of rBGH. There must be some way to temper the economic need for the quick fix solution with the long range health effects on people and our world. We are becoming like one of Donna Haraway's cyborg's – but the technology we are merging with is changing our systems internally, affecting our health, and brains ability to function to its best capabilities.

## CHAPTER IV

### ARE WE BIO-ENGINEERING OUR CHILDREN?

#### **Medea's Robe**

“No witchcraft, no enemy action had silenced the rebirth of new life in this stricken world. The people had done it themselves” Rachael Carson (1962 p. 3).

“These are chemicals with extraordinary properties which are used to convert plants or animals into a sort of Medea's robe by making them actually poisonous” Rachael Carson (1962, p. 32).

As a teacher at a public elementary school, I have been noticing an odd occurrence with some of the students. Developed breasts are on five year old girls, younger boys and girls are nearing five feet in height, more young children are exuding a mature body odor, and voice fluctuations are happening to seven year old boys. From conversations with other teachers at my school, I learned that all saw some evidence of early onset puberty in their students. Is Dr. Jekyll back in the laboratory brewing a new elixir that changes these innocent children into pubescent creatures? These are auxiliary and sexual changes that I recall happening to myself and my friends in sixth and seventh grade, at the earliest, and eighth and ninth grade for the norm. Teachers also told me they are experiencing an increase in behavior problems. As servants to the antiquated factory model of teaching, teachers can be prone to over diagnose behavior problems in hopes of medicating the problem and controlling the child. “Nationwide, 17% of children are

on Ritalin” (Orr, 2002, p. 279). The factory model bears part of the responsibility for this difficulty. Not all children are suited to sit quietly for hours on end listening.

With all children ushered through the system in lockstep, personal interests cannot drive learning: they would take the class in too many different directions, and it must go one place, all together. The factory-like daily schedule in traditional schools also precludes interest driving learning. A child cannot arrive in the morning and decide whether to work on a report on butterflies or to work on a math problem encountered at home, whichever seems more interesting at the moment. The child must do what is on the schedule. The factory model has a specific mold for the child; the child is expected to behave only in certain ways. When a child does not fit this mold, teachers rush to start Student Support Team (SST) paperwork and hopefully get the child placed in special education or put on medication so they no longer have to deal with the problem. More and more teachers are rushing to start the SST without knowing why a child is having problems. It may be that the teaching method we still use from the turn of the century is a bad fit; it may be that behavior problems are increasing. As an elementary school teacher, I talk to many teachers that blame many children’s behaviors on the parents: Children no longer have to do anything for themselves; children are spoiled; children have no consequences for behaviors. I feel that there could be more to behavioral issues than the use of antiquated teaching methods and parents, although the resolution of these could increase a student’s growth and potential; not all students are suited to sit quietly for hours on end listening to teachers droning and not being able to move freely and make choices. It may be the teaching method we still use from the turn of the century is a bad fit; it may be that behavior problems are increasing. It may be the need to control behaviors. The factory model does not treat students as individuals, rather giving all students the same assignment regardless of interest or prior knowledge. Considering the

teaching methods, I prefer a Montessori education which “is designed to awaken interest and to allow children to pursue learning about issues that already personally interest them. This is a natural corollary to a system of education based on choice: one chooses to do what one is interested in doing” (Lillard, 2005, p. 114). Montessori education “is like basic training for life; it engages the senses, acknowledges physical mobility, and respects the need to manage time. It follows the individual intellect, while providing an adequate dose of reality and Practical Life skills” (p. 216). I feel this passage embodies what students get out of a Montessori education: a passion for learning and for life and an ability to participate fully in society by identifying problems and working towards solutions.

Something is happening to the growth and development of young children. Like Dr. Jekyll, they are “seized with one of those maladies that both torture and deform the sufferer” (Stevenson, p. 45). Some scientists and doctors believe the occurrence of puberty at younger ages to be a natural end result of the increased amounts of food and their nutritive values available today. Others disagree. It seems to depend on whose payroll the scientists belong: Scientists funded by the meat industry find no harmful effects from the increased hormone intake associated with rBGH. But evidence is abundant, as I discussed in Chapter Three, that changes are happening due to the intake of rBGH treated dairy products and meat. These ingested hormones and chemicals from food are acting as Medea’s robe damaging those who come in contact. Medea, a sorceress in Greek mythology, used her magic to make a poisonous robe to exact vengeance. How normal is it for a five year old girl to menstruate? Since the beginning of recorded history there have been rare incidents documented of children who sustain puberty at obscenely early ages. This precocious puberty used to be a matter for public observation, exploitation, and ridicule. Normal ages for the onset of puberty have typically been around age

eleven and around age twelve for boys. Precocious puberty has severe psychological repercussions for children which may be contributing to outward behaviors. How can young children be expected to deal with sexual changes? Children as young as four and five who are developing breasts and body odor will most likely be teased by their peers. That can lead to low self-esteem and depression that could be expressed as behavior problems at school.

A girl so young entering puberty is not mentally prepared for this event and there must be consequences for her because of this. A fourth grade girl that has a sexually mature body cannot mentally deal with the promiscuous older boys who think to take advantage of her innocent mind and adult body. How prepared is a second grade boy or girl to deal with body odor and bodily changes that may be different from the other children in their class? Even Dr. Frankenstein was afraid to create a female monster for if he did “[s]he might become ten thousand times more malignant than her mate, and delight, for its own sake, in murder and wretchedness” (Shelley, p.165). All the ramifications and long term effects on the absorption of these hormones are not yet known, the child may become a monstrous mess of hormones unable to think clearly of right and wrong and deal with emotions. Are we ignoring biologically engineered factors in the early onset of puberty?

Does the milk from cows treated with rBGH affect us? Hormones used in cattle to increase milk production may affect the endocrine system of preadolescents. In the Journal of the Puerto Rico Medical Association, Dr Carmen Sanz wrote “the premature puberty was the result of consuming local milk, poultry, and beef. Specifically, their symptoms were caused by the growth hormones administered to the animal” (Green, 1991, p. 124). Precocious puberty affects later development, compromising a child’s health and psychological well-being. Foch and Lerner studied the effects of early onset puberty and its negative effects on the behavioral and

psychological well-being of children. Behavior problems and moodiness associated with precocious puberty are to be expected. Children may experience social difficulties including peer rejection, early initiation to sex, depression, and aggression. A Child Behavior Profile (CBP) measures problem scales with internalizing or externalizing scales. A child internalizes by such activities as nail biting and withdrawal. A child externalizes by disruptive outburst such as lying or fighting. Many girls with precocious puberty tested above the 98<sup>th</sup> percentile for behavior problems. They also showed greater occurrences of depression, social withdrawal, somatic complaints, schizoid/obsessive, hyperactive, and aggressive behaviors (Foch & Lerner, 1987). These problems of biotechnologies acting upon our bodies can disrupt a student's ability to learn and function within a school setting. Evolution occurs over millions of years. Science is challenging our bodies to evolve to handle this corruption from foreign, synthetic chemicals in a matter of decades. So many are not up to the demands of this invasion and are becoming ill or dying. Has "natural selection", a term coined by Charles Darwin to indicate an organisms adaptation to local environment, come to mean those who can handle the bioaccumulation of this chemical warfare instead of natural evolutions? Do "we the people" still have a choice for what happens to our environment? Can we take control back? I believe through a sustainable education, more will come to realize the impact of decisions being made and actions taken upon the earth and change will begin. Many do not know what they are consuming, what dangers they inflict upon the earth with the nonchalant use of chemical fertilizers and pesticides, by ingesting foods laden with hormones and chemical additives. Others do. French biologist, Jean Rostand stated "The obligation to endure gives us the right to know" (Carson, 1962, p.13). We can take knowledge back and not reserve it only to the elite who tend to use it for monetary gain, despite human or environmental casualty. Modern educational practices are causing us to lose the

capacity for social criticism. Professor of Urban & Environmental Policy at Tufts University, Sheldon Krimsky acknowledges “the greatest loss to society is the disappearance of a critical mass of elite, independent, and commercially unaffiliated scientists” (Haraway, 1997, pp. 93-94).

### **What Does It Do?**

The chemicals to which life is asked to make its adjustments ... are the synthetic creations of man’s [sic] inventive mind, brewed in his [sic] laboratories, and having no counterparts in nature. Rachel Carson (1962, p.7)

As recently as 1999, researcher Julie Stauffer in *The Water Crisis* describes the problems facing the Great Lakes in terms of pollution. Persistent organic pollutants such as PCBs, mercury, dioxins, dieldrin, furans, benzopyrene, hexachlorobenzene, DDT, alkylated lead – the International Joint Commission (IJC) on Great Lakes Water Quality has expressed concern based on the persistence of these chemicals in the environment, their toxicity to wildlife, and their potential effects on human health.

Greta Gaard (2007, p. 19)

When European settlers first started farming in this country, they took lands from the natives and mimicked their farming methods. Natives used various sustainable methods to grow crops and practiced genetic engineering by cross-pollinating varieties with desired traits (Hurt, 1994). With the implementation of new farming technologies such as plows, fewer farmers could provide more crops and they were able to sell their produce in a market system. Thus commercial agriculture was born. One-crop agriculture was best for commercial gain “as it was

easiest to exploit the soil and labor supply with this type of farming...by the late twentieth century, independent subsistence agriculture had been left in the distant past. Farmers produced for a market economy, usually by specializing or emphasizing a mix of one or two crops and livestock (Hurt, 1994, p. 74-75). This practice of specialization encouraged soil erosion, depleted soil fertility and financially compromised farmers to bankers, railroads, and businessmen.

Much as the US government's involvement in the school lunch program began with war, so did their involvement in agriculture. During World War I, with Europe's agriculture in shambles, farm prices in America rose and the government urged farmers to raise large amounts crops and livestock to aid the war effort. With European recovery and high American surplus, those prices fell and many farmers lost their farms only to be worsened by the Great Depression. "In 1933...Congress and the White House entered the commodity market directly. Out of the New Deal came a system of price supports and production controls for farmers (Rapp, 1988, p.11). Today the government continues to pay farmers for surplus crops and pays to make up the difference from low market prices. The Agricultural lobby is powerful in Washington D.C. Technology has indeed progressed farming methods, but not all of them are beneficial to the earth, famers, nor the end-consumers. The total cost is ignored for the immediate benefit. Since the 1930s, there has been an awareness of a need to preserve our natural resources. Some called for an enforceable new ethic that took into account the costs to our natural resources the answer was ecology. "Coined in 1966 by the German zoologist Ernst Haeckel...[ecology] has been defined over the years as the science dealing with the interrelations between life-forms and the interactions between the life forms and their environments" (Beeman & Protchard, 2001, p. 37).

“Technological optimism, economic growth, and national power are deeply embedded in the modern psyche” (Orr, 1991, p. 4). Because of this it is difficult for people to see the need for change due to waning resources, so much so that we are failing to see the connections inherent in our waning resources and our health. There is a need to get people to see the misuses of nature and technology. We have an overabundance of food – one farm can grow enough food to feed over one hundred people yet millions of dollars are being spent to increase technologies to procure more food from less. These technologies are not fully investigated as to their effects and accumulated effects on humans. Rachael Carson wrote of the dangers of genetic engineering and bioaccumulation more than half a century ago. “The chemicals to which life is asked to make its adjustments are no longer merely the calcium and silica and copper and all the rest of the minerals washed out of the rocks and carried in rivers to the sea; they are the synthetic creations of man’s inventive mind, brewed in his laboratories, and having no counterparts in nature” (1962, p. 7). What is wrong with our nation, when other countries around the world try some new technology and discover adverse effects upon its peoples or lands, they are quick to recall and disuse the technologies. Not so in the United States, where the almighty dollar seems to have more value than a human life. It is difficult to get people to see the waning resources at all and indeed, the misuse of nature. “[I]n this mass consumption society we have all become better consumers than citizens, which is to say, willing participants in our own undoing” (Orr, 2005, p. 51). Biotechnology is indifferent to public welfare, Orr explains “economic growth does not take place because people demand it, but because elites do...economics is, in turn, a part of a larger enterprise to dominate nature through science and technology” (1992, p.10-11). Ecofeminism sees a connection between the domination of women and the domination of nature. In a socioeconomic sense, “women are located in the spheres of reproduction, child raising, food

preparation, spinning and weaving, cleaning of clothes and houses, that are devalued in relation to the public sphere of male power and culture” (Ruether, 2005, p. 91). The earliest practitioners of science and our Judeo/Christian religions give reasons to dominate nature. It is difficult to go around centuries of belief in a world created for our use, a mechanical world, a world to be dominated. Francis Bacon believed “that nature can be managed by understanding and manipulating natural processes” (Orr, 2002, p. 25) and we still live under that belief. “[T]he root metaphor of anthropocentrism leads to viewing the environment as a resource – which means it is moral to exploit it to the fullest” (Bowers, 2006, p. 33). Feminist and theologian Rosemary Ruether claims that “[i]n the last decades of the twentieth century the major world religions each began to grapple with the possible harm that their traditions may have caused to the environment and to search for the positive elements in their traditions for an ecologically affirming spirituality and practice” (2005, p. ix). I find this not to be the case for many religions and some, like the dominion theologians, “take the Genesis passage to mean...that Man has the right to rule over the natural world and use it (or use it up) as he sees fit” (Hendricks, 2000, p. 49). These groups believe that “man has the right to rule over the natural world and use it (or use it up) as he sees fit...combined with the belief that the End Times are near, leads some to believe that there is no need to take care of the environment (Hendricks, 2000, p. 49). It is a lingering belief from 1693 when John Locke stated “[Man, created by God, was] put into possession of the whole world” (Arneil, 1998, p. 37) that people can do whatever they wish to nature. Carson avers that “ ‘[t]he control of nature’ is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man [sic]” (1962, p. 297). Unfortunately, many still believe that nature exists for our convenience. Individuals have difficulty seeing beyond themselves and their own small world. “According to the ecological

viewpoint, the fundamental problem that links the crises we now face is one of inadequate perception” (Sterling, 2001, p. 16). We have faith in technology much as we have faith in religions. Heidigger, Carloyn Merchant, William Leiss, Morris Berman, Jacques Ellul “and nearly all critics of technology...argue that modern science has fundamentally misconceived the world by fragmenting reality, separating observer from observed, portraying the world as a mechanism, and dismissing nonobjective factors, all in the service of the domination of nature. The result is a radical miscarriage of human purposes and a distortion of reality under the guise of objectivity” (Orr, 2002, p. 12). Economic pressure and technological opportunities are the impetus for much of the way the earth is treated today. We want the most for as little as possible and relinquish thoughts of consequence. Our government spends “millions of federal research dollars to develop genetically derived ways to increase milk production at the same time that the U.S. Department of Agriculture is spending millions to slaughter dairy herds because of milk glut” (Orr, 2002, p. 14). We should be searching for a balance, research needs to be done that will promote our survival, health and peace. Some scientists, such as USDA researchers Martin Rogoff and Stephen Rawlins, are searching for ways to make even today’s industrial farms obsolete by making edible products in a lab. They believe that “vast corporations using high technology can turn practically anything into synthetic foods that meet minimal FDA requirements for nutrition for as long as it is profitable” (Orr, 2002, p. 171). Wendell Berry points out “that food is a cultural product: it cannot be produced by technology alone” (1977, p. 43).

Industrial farming methods have effectively leached the micronutrients and vitamins needed for proper health and maintenance of our bodies. Wendell Berry has been writing for years about the detrimental effects of industrial farming to the soil (Wirzba, 2002). Michael

Pollan (2008) compares USDA nutritional reports from the 1950s and today that show the decreasing nutritional value of our plant food. We need not be at the mercy of giant food processing plants and chemical manufacturers. We do not have to feed ourselves and our children overly processed, hormone injected, and chemically treated foods. Decisions can be made to affect the home and the school. I learned from the film *Super Size Me* (Morley, 2004) that it is possible to provide fresh food with high nutritive values to schools at about the same cost other schools are procuring precooked bags of chow from the government. The test school, in fact, was an alternative high school for troubled teens that were unable to cope, for one reason or another, at the regular school. These teens were low achievers and trouble makers. Natural Ovens, a bakery in Wisconsin, was commissioned to provide school food. The school removed the vending machines that were filled with highly processed foods and began offering fresh fruit, vegetables, whole grains, and alternatives to fried, high fat, and overly processed food. The results were astounding: the students were able to learn and succeed.

### **Growing Up Faster**

I knew well that I risked death; for any drug that so potently controlled and shook the very fortresses of identity, might, by the least scruple of an overdose or at least inopportunity in the moment of exhibition, utterly blot out that immaterial tabernacle which I looked to it to change. (Stevenson, p. 64)

There appears to be a connection between increased amounts of GH and insulin-like growth hormone (IGF-1) and tumors and cancers. It has been determined that women with small

increases of IGF-I levels in their blood are up to seven times more likely to develop breast cancer than women with lower levels, and that high levels of IGF-I are also a risk factor for prostate and colon cancer (Roberts, 2002, Teitel & Wilson, 1999).

Since the early 1970s when scientists discovered how to manipulate the genetic blueprint that is DNA, a revolution in genetic engineering has taken place. This revolution has spawned thousands of new applications of the technology and endless imaginings for future applications. Genetically engineered vaccines and antibiotics, human insulin, research into gene therapy and stem cells, in vitro fertilization – all are applications of medical biotechnology. In agriculture and food production, biotech crops, or genetically modified organisms (GMOs), are transgenic, meaning that the crop bears a gene from a different species or that it over-expresses or under-expresses one of its own genes. GMOs have created crops that are disease and insect resistant, delayed-ripening fruits that stay fresh longer, and hormone supplements that stimulate milk production in dairy cows.

Americans have been consuming food with GM ingredients since the early 1990s. The first GM food product to appear on the market was cheese, which is made with a bioengineered enzyme called chymosin, used to curdle milk. More than 70 percent of the cheese on the U.S. market has been made with chymosin (Agricultural Biotechnology, 2003). The product's introduction went largely uncontested. Biotech opponents gave the bio-engineered chymosin tacit approval as it replaced an animal-derived enzyme. The first controversial GM food product to be sold in U.S. grocery stores was milk made from dairy cows treated with rBST, a controversial animal drug manufactured by Monsanto to stimulate milk production by as much as 20 percent in dairy cows. The drug, known more commonly as bovine growth hormone or BGH, was approved by the Food and Drug Administration in 1993 and was available to

consumers in 1994. The notion that milk could be tampered with technologically raised consumers' concerns. Protesters dumped milk into the streets in San Francisco, and in a spoof of the dairy industry's "Got Milk?" campaign, the Humane Farming Association ran an anti-BGH campaign, which showed a glass of milk and asked "Got Hormone?" The drug was banned in Europe and in Canada. We are also affected by the streams of antibodies industrially farmed animals are subject to. "Seventy-eight percent of all of our beef comes from feed lots, where the cattle eat grain, mostly corn and wheat. So do most of our hogs and chickens. The cattle spend their adult lives packed shoulder to shoulder in a space not much bigger than their bodies, up to their knees in shit, being stuffed with grain and a constant stream of antibiotics to prevent the disease this sort of confinement invariably engenders" (Manning, 2004, p.45).

In 1995, the United States approved the world's first commercially significant bio-engineered crop—Monsanto's "Roundup Ready" soybean, which is genetically engineered to withstand the spraying of Monsanto's Roundup Ready herbicide. The crop was first introduced on the market in 1996. Since then, the percentage of genetically modified (GM) crops grown around the world has increased dramatically. In 2003, it was estimated that 60 to 70 percent of processed foods in U. S. supermarkets contained a GM ingredient, especially soy, corn or canola (Pew, August 2003). The acreage of GM crops grown worldwide has increased rapidly since the early 1990s (Pew, August 2004). In 1996, 4.2 million acres in six countries were planted with GM crops. By 2003, the numbers had grown to 167.2 million acres in 18 countries on six continents – a 40-fold increase in acreage in eight years. The adoption of GM crops has been the most rapid in the United States, where there has been a 27-fold increase in the area of GM crops planted from 1996 to 2003. The complex system Monsanto has built makes it nearly impossible for farmers to switch back from GM seed. They have spent years buying up seed companies and

making non-GM seeds difficult to obtain, and cornering the market on pesticides and herbicides and the research that goes into them, most farmers simply have no choice but to continue planting GM crops. Two-thirds of all GM crops in the world are planted in the United States. In 2004, about 85% of soybeans, 76% of cotton, and 45% of corn grown in United States were genetically modified (Pew, August 2004). Monsanto, now the world's largest manufacturer of GM seeds, said in 2004 that the average number of Monsanto traits per acre of crop is 1.5 for cotton and 1.2 for corn in the United States, with its GM corn at nearly full market penetration (Thatcher, 2004). Journalist Peter Pringle claims "[b]iotech agriculture is another step in the evolution of human food, a process of change that began slowly and now, in evolutionary terms, moves at mach speed. The changes are not inherently safe, nor are the companies that produce them inherently evil" (2003, p.202). I, for one, feel that if a company knowingly supports a product or a change despite its potential to cause harm, then that company is inherently evil and merely working for profit. To have less regard for human health and safety than for the bottom line is evil.

While many farmers have adopted various biotech practices, other farmers and local environmental activists have sought to take a more cautious approach with the technology. Some farmers who don't use GM products contend that they contaminate their non-GM fields. Activists and some politicians in California, North Dakota, Ohio, Oregon, and Vermont have campaigned for anti-GM initiatives, such as banning the planting of GMOs, the right of farmers to save seeds, and laws requiring labeling of food, seeds, and rBST milk. The technology has also been fought at the federal level; in 2004, Sen. Dick Durbin from Illinois introduced legislation for greater federal oversight of GM foods. Yet, if farmers choose not to use GM products, some have reported pressure from Monsanto to adopt their use. Still others have fought

Monsanto in the courts for what they say is their right to save seed (Roberts, 2004). Since 1996, Monsanto has sold crop seeds containing a patented gene that protects the growing plant from the effects of herbicides, like Roundup Ready, which Monsanto also sells. Using such Roundup Ready seed allows farmers to spray their fields with the herbicide, eradicating the weeds but not the crop. Seed retailers must collect a technology fee for the manufacturer on each bag of the seed they sell, and then farmers are required to sign a release saying they will not save the seed from one season to another or give it to others. In 2004 in both Ohio and Missouri, state legislation was introduced to allow farmers to save seeds with patented technologies from one year to the next. “Conveniently for biotech corporations, while a GMO is deemed to be ‘substantially equivalent’ to its non-modified cousin when it comes to testing and regulation, it is somehow deemed to be substantially different when it comes to patenting rights” (Norberg-Hodge, Goering, & Page, 2001, p. xxi). In this way, seeds are conveniently patentable and controllable while the products, i.e. the food we eat are not and are not regulated. According to the American Academy of Environmental Medicine (AAEM), before the FDA decided to allow GMOs into food without labeling, FDA scientists had repeatedly warned that GM foods can create unpredictable, hard-to-detect side effects, including allergies, toxins, new diseases, and nutritional problems. They urged long-term safety studies, but were ignored (Dean & Armstrong, 2009). Vandana Shiva in *Stolen Harvest* (2000) illustrates how corporate greed is impoverishing third world farmers and hoarding the world’s variety of seed crops. All is done in the name of profit and is affecting smaller family farms in our country as well.

At all levels of education, there is a disassociation between farming and food supply. Many educational systems are developing school gardens, indoors and out, to prevent this disconnect and offer experiential learning (Waters, 2008). “Environment-based education such as

school gardens have become an important hands-on tool for helping children develop important life skills such as problem solving and critical thinking, and improve test performance, attention, and enthusiasm in the classroom” (Graham, et al, p. 147). To foster sustainable living, a curriculum needs to have interdisciplinary instructional methods that are age appropriate, actively engage students learning in and out of the classroom, involve students in long term projects, create an atmosphere of purposeful conversation and reflection. Alice Waters (2008) integrates academic subjects with growing, cooking and sharing healthy food influenced by Montessori’s idea of nourishing the whole child and encouraging students to do things hands on. When a child gets to hands on experience something and is encouraged to make connections, it is in its own way integrating the curriculum which “has to do with keeping things in place, nested in the deep communities of relations that makes them whole, healthy, and sane” (Jardine, et al, 2003, p. 198). This ties directly with Bowers commons and Montessori education. Montessori education looks at the whole in a more realistic way than most didactic styles used today, which are in a constant state of trying to keep up with all the pieces education has been broken into. This affects the way we react to nature as we are unable to see the connections between our actions and any damage to the environment or ourselves.

Bowers and Flinders tell us “we need to provide an alternative to the Cartesian way of thinking about the nature of knowledge, language, and the individual. If we do not revise our thinking about these basic questions, we will simply end up with another in the long series of teaching techniques that have perpetuated the cultural dominance of the Western mindset (with its masculine gender orientation) and contributed to the disruption of the ecosystem” (1990, 92-93). The Cartesian way emphasizes the individual as a rational being, autonomous from all outside influences and views language as a conduit for ideas from one person to another. A non-

Cartesian method for teaching involves the teacher being responsible for the language that is in the classroom as the basis of what they are to think about.

We should be thinking about the interconnectedness of mind and nature. I teach in a Montessori school and there are few opportunities for participation in the ecology that are not pulled into our curriculum. Recently the classroom pet of a co-teacher died. She called upon the resources of the middle school science teacher to help her. Together they gave their students a lesson on and the experience of the circle of life, by burying the dead pet and sowing seeds upon its burial spot. These children will see first-hand how nature replenishes herself without the need of technologies.

Experiential learning allows students to apply their knowledge and experiences to real world situations and helps to prepare students to address complex problems in the real world. The concept of experiential learning came from John Dewey (1959/1938) when he observed that students had difficulty retaining abstract knowledge because they could not connect it to experiences in their own lives. The goal is for students to gain meaning from experience. A study in the inner city of Los Angeles, CA proved the benefits of experiential learning (Mabie & Baker 1996). In this ten week series of experimental activities, students were divided into three groups. Group one participated in a long-term gardening project, group two participated in several short, hands-on, in class projects, such as germinating seeds, while group three was the control, they did no gardening projects. Before starting the project, the students were assessed for prior knowledge of agriculture and the food system. Few could sufficiently define agricultural terms or name crops grown in the area. After the project, 91% of the children in group one, 83% in group two, and 43% in the control were able to define agriculture. These environmental-based

experiential educational opportunities can be important tools for helping children develop important life skills such as problem solving and critical thinking.

## **Farming Change**

First do no harm

From the Hippocratic Oath (Pollan, 2008, p. 49)

In the past women farmed and men hunted. Now men farm and are very aggressive towards nature. David Orr writes “[g]ood small farms are known to be as productive as any agribusiness or more so, but without the ecological and social costs” (2005, p. 121). Many of these small farms are being driven out of business by large industrial farms. We need small farms using sustainable methods to ensure can eat healthful foods. Bowers writes in *Educating for Eco-Justice and Community* (2001) that principles of environmental justice should be made into reality for all should be the primary concern for educators. I agree, but Bowers tends to reduce the global environmental crisis to simply a problem of Western cultural consumption. We should look at the cultural roots of the ecological crisis and how we can solve this through sustainable education. All too often, history assimilates cultures. “[B]y the late twentieth century, independent subsistence agriculture had been left in the distant past. Farmers produced for a market economy, usually by specializing or emphasizing a mix of one or two crops and livestock. They purchased their food in town at supermarkets like everyone else. ...now they were businessmen who produced for sale and purchased a host of goods” (Hurt, 1994, p. 75). Farm production efficiency has been “made possible by the substitution of energy for knowledge, of methodology for care, of technology for morality....This ‘accomplishment’ [is] a

collaboration of corporations, university specialists, and government agencies” (Berry, 1997, p. 33). Berry is speaking of American history and the tradition of displacement and destruction continues with the use of industrial agricultural products and the use of biotechnology from corporations such as Monsanto whose main goal is capital.

Industrial farming is assimilating local farmers, destroying sustainable practices, and reducing our food choices and their nutritive value, but there are other issues affecting the choices we have. Children with working parents are often left at home to fend for their own meals and so the use of highly processed convenience foods and the frequency of eating away from the home are increased. Little control is taken in elementary schools to ensure students are eating healthy, but none is taken in most middle schools or high schools. Here students are left on their own to decide what to eat. When I was in high school, my social studies teacher kept a closet of sodas and snack foods. This was before vending machines were rampant in schools. She made a tidy sum to supplement her low wages, and I got to eat processed cheese foods, candy bars, and sodas for lunch every day. Food habits are harder to change the older we get. For this reason it is important to start teaching about nutrition at an early age and providing healthy foods in schools. With most children eating at least one meal a day in school for twelve years, the potential for food education is vast. Food availability is often an issue in low income, inner city areas. Nordhal refers to these areas as “food deserts”. In the food deserts there are few options to purchase healthy, affordable foods because of the dearth of markets and grocers. This allows for an overabundance of fast food outlets and convenient stores. The diet sourced from these available foods result in increases in obesity, hypertension, heart disease and diabetes. People in these deserts are buying the short-term caloric gain of the double-cheeseburger, to the detriment of their long-term health mainly for convenience and habit (2009). This type of diet is a main

contributor to obesity and “is most apparent among children from lower-class homes. The junk diet of fat-laden fast foods represents a kind of class warfare in which corporations prey on the gullible, the poor, and the defenseless” (Orr, 2002, p. 281-282). It would be so beneficial if everyone could have access to a neighborhood plot to grow some fruits and vegetables. Benefits of having a garden at or near home include the reduction of food miles traveled, improvement in food security, access to highly nutritious fruits and vegetables, and control over the use of chemicals in food production. Many educational institutions are developing school gardens, student run farms (Bethesda here in Savannah has a student run organic farm), and sustainable agriculture curriculums (Delate, 2006; Markhart, 2006; Parmer et al., 2009) to prevent the disconnect between farming and food supply with experiential, hands on learning.

How do we eat? What do we eat? Michael Pollan says we should “[e]at food. Not too much. Mostly plants” (2008, p.1). I would like to add organic, sustainable and local to his advice. This may solve many of our current farming issues. At the present rate of growth, farmers produce an overabundance of plant food. They are growing, in America, mostly soy and corn. The government is subsidizing the farmers to grow these crops (Rapp, 1988). Most of these crops are then fed to livestock or altered by scientists to be used in other foods that we are consuming, especially as high-fructose corn syrup. We are fed foods that cause our bodies to become addicted to the low-nutritional food stuffs that corporations compete to throw down our throats in exchange for our money. Of the 2000 recommended daily calories, corn contributes 554 and soy 257, together with wheat and rice, “these four crops account for two thirds of the calories we eat” (Pollan, 2008, p. 117). Unfortunately the bulk of what Americans eat of these crops is genetically modified or grown with chemical fertilizers and pesticides and then so overly processed that almost all nutritional value has been depleted and only some are added back in by

chemical means. Over-processing of grains results in the removal of the embryo, the germ, in which the bulk of nutrition is located. The omega-3 fatty acids, the proteins, the vitamins, and the antioxidants are removed in the process and are also depleted in industrial farming methods as farmers use chemical fertilizers and no longer ensure the replenishing of the soil through crop rotation. They rely on the NPK (nitrogen, phosphorus, and potassium) in the chemicals they spread on the nutrient-depleted soil to ensure quick growth of their crops. Indeed it does, but it also ensures that these crops are growing so quickly that their roots are unable to grow long enough to extend deep into the soil to gain valuable nutrients needed by other herbivores and omnivores. Industrial farming methods have effectively leached the micronutrients and vitamins needed for proper health and maintenance of our bodies.

Wendell Berry has been writing for years about the detrimental effects of industrial farming to the soil (Wirzba, 2002). Michael Pollan (2008) compares USDA nutritional reports from the 1950s and today that show the decreasing nutritional value of our plant food due to modern agribusiness techniques. He quotes Brian Halweil research “American agriculture’s single-minded focus on increasing yields created a blind spot...where incremental erosion in the nutritional quality of our food...has largely escaped the notice of scientists, government, and consumers.” (Pollan, 2008, p. 119). Studies done by Obrien, *et al* in Maine schools (2010) reinforce the need for higher quality nutritive foods and exercise to maintain healthy and balanced students. I doubt these facts have escaped the notice of corporations such as Monsanto and Con-Agra who depend on more and more food consumption. To get the nutritional value of foods from the 1950s, Americans now have to eat more of the same foods. This flawed logic benefits the makers of foods and patented genetically modified seeds, pesticides, and fertilizers, but may also be contributing to our nation’s poor health and obesity. Wendell Berry says this

farm production efficiency phenomena has been “made possible by the substitution of energy for knowledge, or methodology for care, of technology for morality... This “accomplishment” [is] a collaboration of corporations, university specialists, and government agencies” (1997, p. 33). We are making more and more food that has less and less nutritional value and we are stuck in this cycle perpetuated by corporate greed. “Over a seventy year period the American farm population has been reduced from just over seven million family-run farms to just under two million – even as the U.S. population has more than doubled... The side effects of this drive to achieve greater efficiencies include the loss of rural communities, the contamination of groundwater with fertilizers and pesticides that are the mainstay of industrial agriculture, the exploitation of migrant foreign workers, and the expenditure of vast amounts of public resources for the purpose of subsidizing agribusiness” (Bowers, 2006, p.10).

The beginnings of agriculture were associated with the Mother goddess and women’s fertility. Man’s influence was first represented by the plow – a phallic symbol that brought fertility to the earth mother (Heiser, Jr., 1990). The belief continued that the Earth was the mother and she might be raped and pillaged by mankind and the same raping and pillaging seems to be done today through genetic modifications of plant and animal life.

One of the first industrializers of American agriculture was botanist Peter Henderson, a Scottish immigrant, in the mid-Nineteenth century. Among new technologies incorporated by Henderson was the purchase of seed. This practice quickly displaced saved seed. Henderson was also a pioneer in new plant growing technologies that made available fruits and vegetables preciously tied to seasonality. He experimented with fertilizers, greenhouses, and plant variations. The abundance of fresh fruits and vegetables helped improve the urban diet. His creations “[o]ften cultivated under glass, enriched by

industrial waste, and protected by chemicals...provided a glimpse of America's future"

(Lanman, 2004, p. 40).

Humans have long been bioengineers in the gardens of history. Since the beginning of agriculture, around 10,000 years ago, we have been able to increase variation by importing stock from somewhere else or breeding mutations. We decrease variation through inbreeding, and have controlled selection by choosing which individuals mate and which do not. Historically farmers had to rely on the organism itself to handle inheritance, but now genetic engineering allows this to be done far from the farm.

### **Bovine Growth Hormone**

Perhaps, given time and enough work with mutating genes, we may even be able to have a genetically made cow that wants to be eaten such as the transgenic bovine creation that sells its meaty bits in *The Restaurant at the End of the Universe*:

A large dairy animal approached... "Good evening," it lowed and sat back heavily on its haunches. "I am the main Dish of the Day. May I interest you in parts of my body?"

...[I]t was eventually decided...to breed an animal that actually wanted to be eaten and was capable of saying so clearly and distinctly. (Adams, 1996, pp.224-225)

Day after day as I walk my class through the lunch line helping them build their disposable tray with at least three items from the line (one item can be milk) I wonder about the food they eat. As I sit with them, watching them not eat the items I encouraged them to choose, like the vegetable medley, I ask myself why these items are on the lunch menu anyway and just how nutritious is this food? Are the children getting enough quality nutritious food? So much of a child's eating can be unsupervised. Not all teachers walk their students through the line nor do

they sit with them, at my previous school the cafeteria attendants were more concerned with moving the children like cattle through the line than in what they actually chose to put on their plates. This school had vending machines and some teachers would allow their students to purchase sodas and junk food from them. A school at which I previously taught had a candy concession at the end of the each day. My social studies teacher in high school sold high calorie, overly processed snacks and sodas out of her closet: My lunch from grades nine to twelve consisted of a Snickers bar and a Coke. Many parents are completely unaware of just how much sugar and junk food their child has access to each day. There are alternatives available that could be more widely known and used through a curriculum that encouraged sustainability. I was introduced via email to a teacher, now principal, of an elementary school in San Francisco that started providing fresh, organic, and sustainable meals at lunchtime. The program is implemented through the Parent Teacher Group.

In addition to the fundraising dollars and the convenience for the parents, the program offers further benefits for the school environment and the students. The lunch is served to the students in a plastic container with a snap-lock lid that they bring to school each day. This and the fact that the food is not wrapped and packaged result in less garbage. Furthermore, students dump the raw fruits and vegetables, which they did not finish consuming, in compost buckets, the contents of which are added to the compost pile in the school garden. Since they are eating what I call "real" food, the students seem to take more time to eat and finish their lunches. Teachers have noticed more student alertness in the afternoons and less trips to the restrooms and drinking fountains than when there was the previous program of chicken nuggets and other highly processed foods.

I have given you the positives of the program. There are some drawbacks such as the number of volunteer hours that it requires foods that don't appeal to some students, etc. but all in all, the program is a very good addition to our school.

Many are unaware of what nutrients are necessary for healthy living and many are unaware that the so called healthy foods they may be eating are actually much lower in nutritional value than they were fifty years ago (Pollan, 2008). Research on the effects of iron and B-12 on the brain's development and functioning are causing more people to examine the effects of their deficit in children's cognitive functioning. Iron is needed for myelination of nerves within the brain; low iron results in delayed transmissions and can cause deficiencies in the brain. In pre-school iron-low children had lower discrimination learning and attention control. Anemic children perform lower on IQ tests and have poorer school performance in math and language (Malone, 2005, Taras, 2005). The information is available so that all can be proactive about choices made for eating and have some input for how our foods are grown and made. Many adults I speak with seem unconcerned about the decline of our food and the effects of additives and pesticides. They tell me: "Oh, well, we're all going to die of something". I believe that if we bring this information to schools and teach children from a young age about appropriate food choices and sustainable farming methods we will be able to make a difference. Social influences can change food acceptance: Children who observe parents and peers consuming a food are more likely to try the food. David Orr declares "what we lack is the mindset to see connections between things" (2005, p. 96). Producers of food are crossing genes, replicating DNA, and using a vast array of chemicals to produce the food we eat today. Dr. Samuel S. Epstein, David Steinman and Suzanne Levert, (1997) report that hormonal meat increases cancer rates but significant studies have yet to be undertaken to determine the extent. Research by health educator Bill Statham

(2007) found that some genetically modified additives “could cause or exacerbate health problems such as asthma, dermatitis...gastric upsets, behavioral problems, hyperactivity, learning difficulties...[and] some are found to be toxic to body organs and systems” (p. xi). There are links to cancers from some of these foods, links to ADHD, precocious puberty, and more. I believe it is most important for our children because they have the least choice when it comes to what foods they have and their bodies are more susceptible to the effects of additives and pesticides than are adults.

Among the conclusions from the School Health Policies and Programs Study 2000: only eight of twenty-two food preparation practices recommended by dieticians to reduce fat, saturated fat, sodium, and added sugar are used in schools in any regular way [and] more than 40 percent of elementary schools allow students to buy food and beverages through vending machines, school stores, snack bars, or canteens, even though “young children may lack the maturity to make healthy and safe food choices.” (Brownell, 2004, p. 101)

With the evidence out there on the effects of healthy eating (Taras, 2005, Winter & Winter, 1999, Pusztai, 2001, Pringle, 2003, Odabas, et al., 2005, O'Brien, et al., 2010, Morgan & Morgan, 1987, Grantham-McGregor & Olney, 2006), why are not all school systems changing their lunch programs to serve fresh healthy meals? By looking at the history of the lunch program in American public schools and the history of American agriculture, I hope to gain an understanding of the political quagmire of food in which our nation is intrinsically linked today. I think it is important to gain perspective by looking at the history of American schools and school feedings and the role of government involvement.

## **The First Schools**

Protestants had thoughts to educate their children from the moment they arrived in the new country, but schools could not be started until the communities grew more stable. Education was mostly handed down by the church and the family. The first school for public education seems to have come about in 1635 when a Virginia planter bequeathed land and funding to educate the nearby children (Cremin, 1970). Some other privately funded schools followed suite. Then in 1642, the general court of New Haven, CT ordered the establishment of a free school to be funded with monies from the town. Public education was slowly creeping into the forefront of the American educational scene, although many towns in the first half of the 17<sup>th</sup> Century still preferred to leave the children's education to family and church. Because of the Puritan's strong moral values, they began to feel the need to move education away from families and into schools to ensure their children would not grow up stubborn or rebellious. They created schools like those they left behind in England in fear that if they did not their children would become barbarous in the wilds of the new world (Tyack, 1967). "By 1650, schooling as an institution had been firmly transplanted to the North American continent" (Cremin, 1970 p. 182). The Industrial Revolution changed the landscape of the American society and changed schools as well. The household, before the economic center, became more a room to sleep in when not working at the factory. Parents were no longer at home to feed their children. Combined with the waves of immigration, the Industrial age overcrowded urban areas increasing urban problems – especially poverty. The schools were believed to hold the solution to social ills by teaching children new behaviors and keeping them off of the streets. John Dewey felt the school should provide social

services to solve the problems of the industrial society (Spring, 2001). One of the greatest services societies need is to be fed. Slowly, schools began to fill this social need.

## **Feed the Children**

The battle to feed hungry children began with an American named Benjamin Thompson, an ex-patriot who left the United States after the Revolutionary War to settle in Munich, Germany. Here he was known as Count Rumford and he initiated a program to feed vagrant children and adults. Women's societies and charities were established throughout Europe to help feed hungry children. From these organizations evolved to give free and reduced lunches at schools (Gunderson, n.d.).

One of the first agencies to feed hungry children in the United States was the Children's Aid Society of New York. In 1853, they began serving lunches to students in vocational schools. Charities and Women's' Societies fed children at schools in Philadelphia, Boston, and several other cities in the United States. Mrs. Ellen H. Richards is credited for starting feeding school children in Boston in 1894. She managed the preparation and packaging of foods to be delivered until 1907 when the Women's Educational and Industrial Union took over. Lunches, that were sold to students at cost, were prepared off-site and delivered which quite increased the cost. In 1910 one Boston school experimented to alleviate this expense which seemed to work quite well and was copied by other schools. Students in the school's cooking classes prepared hot meals for the school three days a week, sandwiches were served the other two days (Cronan, 1962).

Programs for school lunch started in New York just two months after they were initiated in Boston. The goal was to provide 1/3 of the daily nutrition to each student; these rates were

based on volume of food rather than today's nutritional content standards. Lunch cost students three cents and those who could not afford to pay were subsidized by outside, private donations. Many children still did not or would not eat the lunches (Cronan, 1962). There was always some stigma attached to taking charity and the children were unused to meats and vegetables, having lived for so long on plain bread and coffee or tea (Spargo, 1906/1969). Children had to learn how to eat and they had to have some anonymity to receive free lunch. Spargo (1906/1969) cites numerous examples of children lying about eating breakfast and lunch because of the stigma attached to poverty. He even tells of one student who despite not having eaten in two days refused to accept a free meal from the Salvation Army because of this stigma.

As early as 1900, sociologist and Hull House resident, Robert Hunter decried the pitiable situation of children in the United States especially in regard to malnutrition. In his book *Poverty* (1904/1970), Hunter noted the physical and mental limitations of children in poverty. He said "hungry stomachs and languid bodies and thin blood are not able to feed the brain" (p. 216). He numbered the hungry children in New York City alone to be around 60,000. Unbelievably, many did not take heed to this crisis of health and safety of the nation's children. Joel Spring writes about using education as a method of social control (2001), but truly the means to keeping the classes separated is hunger. It is impossible for a child to overcome his/her social position when he/she cannot learn. Education is the great social equalizer, but children must be nutritionally sound in order to learn. Teachers were some of the true pioneers in feeding children. Hunter believed the decay of the home life left the responsibility of poor children to the school "it is parental selfishness that is throwing the burden, and the righteous burden, of the home upon the school" (p.209). Teachers saw students daily and often spent their own meager salaries to help, especially in rural areas where it was difficult, if not impossible, for students to return home for

an afternoon meal. Teachers often cooked meals at school to share or they brought in already prepared dishes that merely needed to be heated and served. Some other options were not always so healthy.

Some schools operated lunch counters that offered items the students would want to buy regardless of nutritional value, like pickles, ice-cream, and plain bread. Profit then, as it so often is now, was the motivating factor. At other schools, students were allowed to venture to the closest stores at lunch to procure their nourishment, unsupervised. Not that this was different than the lunch counters, students still preferred to buy tasty treats over healthy choices. Another option to students was the vendor that would peddle food at recess, akin to our snack machines in schools today.

The first lunchroom opened in a school in Lower Marion, Pennsylvania in 1913. Parent-Teacher Organizations were especially helpful in getting hot food and even the beginnings of lunch service in the schools. Volunteers brought hot soup and cocoa to the schools in winter months and donations of cooking equipment and eating utensils helped get many lunchrooms started. The Board of Education in Cleveland, OH was distinctive because they provided the lunchrooms and the equipment. Food and labor costs were still privately funded, however. In 1911 the school board of St. Louis, MO decided it was illegal to purchase food for students with public funds. Programs in Los Angeles in 1921 were still relying on funding from the PTA to help students who could not afford to buy their lunches in elementary school, high school students who could not afford to pay were put to work somewhere in the school. In 1918, New York decided a lunch program was essential, not for nutrition, but because some students lived too far from home to return for lunch (Gunderson, n.d.).

Because most schools had no facilities, often women would volunteer to cook meals in their homes that would be packaged and delivered to the schools. In 1910, the county board in Milwaukee, WI refused to pay for school feeding programs because they felt this would encourage parental neglect and shift responsibility of the child to the state (Gunderson, n.d.). I feel that the state assumed the responsibility of the child when public schools became funded by the government. A child cannot be educated that does not have the basic necessities of life; a child cannot concentrate on lessons when her/his belly is rumbling from hunger. I think Dewey would agree for he believes “what the best and wisest parent wants for his [sic] own child, that must the community want for all of its children” (1900/1990). I believe that all parents want the best for their children whether they can provide it or not. Parents then, as today, struggle to provide for their families.

A typical poor child’s day in the nineteenth and early twentieth century consisted of waking up to find parents already gone to work, maybe there is a little bread or cold coffee for breakfast, maybe nothing to eat. Sometimes a few pennies would be on the table to buy lunch, but not always. Children often spent those pennies on something to make them feel better, like hot coffee on a cold day, or candy. There was no one to tell them what to eat. The effects were devastating. One teacher reported of a child “she is not a very bright child...and what to do with her is a problem. She is very nervous, irritable, and excitable. She seems to get exhausted very soon, and it is impossible for her to apply herself to her work. I think very likely that she is underfed, for she comes from a very poor home” (Spargo, 1906/1969 p. 75). “For them there is little or no hope of escape from the blight and curse of pauperism unless the nation, pursuing a policy of enlightened self-interest and protection, decides to save them” (Spargo, p. 118).

National recognition for a school lunch program came eleven years later with the failure of the American government to recruit eligible men for war.

## CHAPTER V

### Appetite For Pro-Action

#### Government Intervention

War was the wakeup call in the United States, and England, that children were being malnourished. Three out of five men recruited for World War I in the United States were found to be unfit. Nutrition, rather its lack, was to blame. Dr. Thomas Payne, at the time the Surgeon General stated:

We are wasting money trying to educate children with half-starved bodies. They cannot absorb teaching. They hold back classes, require extra time of teachers, and repeat grades. This is an expensive stupidity, but its immediate cost to our educational system is nothing compared to the ultimate cost to the nation. Something like nine million school children do not have an adequate diet for health and well-being. Malnutrition is our greatest producer of ill health. Like nearly fresh fish, a nearly adequate diet is not enough. A plan to feed these children properly would pay incalculable dividends (Cronan, p.19).

How fitting that political outcry begins with political need. The government easily ignored the cries of hungry children when Hunter (1904) And Spargo (1904) published books on poverty and the deplorable condition of children in the country. Something must be done when men are physically unfit to go to war, it did not matter when they were children and dying from starvation or being held back year after year because of their inability to learn. This did not change programs in all states, some states became involved in feeding school children, some did not.

Most lunch programs were still supported by charities, school associations, school district boards, and individuals.

The Depression of the early 1930s instigated government involvement in school lunch. 1933 saw the first Federal aid given to communities in Missouri to help pay labor costs involved in cooking and serving school lunches. This type of aid extended to 39 states by the end of 1934. In an effort to aid farmers, the government bought surplus farm goods the farmers could not sell. Millions of school children during the Depression were unable to pay for school lunches and many families were unable to provide nutritious meals at home. Once again, malnutrition was brought to the forefront of national concern. This food was given to schools to use, whether they had a lunch program established or not. This Public Law 321 of the 74<sup>th</sup> Congress in August, 1935 allowed the government to give additional assistance to school lunch programs with donated supplies. In 1937, 3,839 schools were receiving government commodities, this number increased in 1939 to 14,075 schools participating in the program serving 892,259 students. In 1939 and 1940, the government placed a representative in each state to work with State and local school authorities, PTA's, and mothers clubs to expand the national lunch program. This success is seen in the numbers; from 1939 to 1942 there were 78,841 more participating schools serving 5,272,540 students (Gunderson). Schools and clubs could only receive government surplus by entering into a contract. The USDA established guidelines to determine how much food each school could receive. Labor in the lunchrooms was provided by the Work Projects Administration, giving jobs to the countless needy women across America. This free labor source kept the price of the lunch down considerably thus encouraging and expanding participation by students. Success was seen in increased attendance and teachers noted increased mental alertness. "In March 1941, W.P.A. school lunch programs were in

operation in all States, the District of Columbia and Puerto Rico, providing help in 23,160 schools serving an average of nearly 2 million lunches daily, and employing 64,298 persons” (Gunderson, p. 17).

In 1943, the W.P.A. project that had provided labor and management for lunchrooms ended because of the financial requirements of World War II. School boards generally accepted the responsibility of continuing the lunch programs, but during the War the lunch program suffered. Yearly Public Laws in 1943, 1944, and 1945 authorized and renewed funds to continue the school lunch program and begin school milk programs. The non-permanence of this support was regarded as risky and seen as potentially harmful to growth of the program, the 79<sup>th</sup> Congress saw the need for permanence (Gunderson) The National School Lunch Act of 1946 provided permanent grant-in-aid to schools for the continuation of lunch programs. “Section 2 of the act states: It is hereby declared to be the policy of Congress, as a measure of national security, to safeguard the health and well-being of the Nation’s children and to encourage the domestic consumption of nutritious agricultural commodities and other food, by assisting the States, through grants-in-aid and other means, in providing adequate supply of foods and other facilities for the establishment, maintenance, operation, and expansion of non-profit school lunch programs” (as quoted in Cronan p. 22-23). In 1966 it was recognized that the nutritional aspect of the school lunch was important. The Child Nutrition Act was passed

in recognition of the demonstrated relationship between food and good nutrition and the capacity of children to develop and learn, based on the years of cumulative successful experience under the National School Lunch Program with its significant contributions in the field of applied nutrition research, it is hereby declared to be the policy of Congress that these efforts shall be extended,

expanded, and strengthened under the authority of the Secretary of Agriculture as a measure to encourage the domestic consumption of agricultural and other foods, by assisting States, through grants-in-aid and other means, to meet more effectively the nutritional needs of our children. (Gunderson, ND, p. 23-24)

As of November, 2005 government funding for school lunch programs goes to 100,000 public and nonprofit private schools, serving 28 million students daily (Honawar, 2005).

### **Intermingling of School and Politics**

To serve in a Deweyan manner, the schools had to partner with the government to provide adequate social services to the children in America. It is interesting to me that the government only started to become involved when it would gain benefit. I mean, increasing the number of eligible soldiers for war by ensuring good nutrition as children, but especially during the great Depression, the government found an outlet for surplus goods. I wonder if the development of a national school program would have developed so rapidly after the Depression, had the government another viable economic recourse for farm surplus.

It is easy to see the choice of school lunches still comes from farm surplus bought by the government. I believe there is an inextricable link between farm subsidies and what is provided students at school lunches. An even further link to what the government is willing to subsidize and how science and technology has manipulated these things for commercial benefit. I am speaking mostly of dairy products, corn and soy. Perhaps this historical perspective will also allow us to glean an understanding of the roles of food and politics in the lunchroom today.

The Industrial Revolution changed the landscape of the American society and changed schools as well. The household, before the economic center, became more a room to sleep in when not working at the factory. Parents were no longer at home to feed their children. Combined with the waves of immigration, the Industrial age overcrowded urban areas increasing urban problems – especially poverty. The schools were believed to hold the solution to social ills by teaching children new behaviors and keeping them off of the streets. John Dewey felt the school should provide social services to solve the problems of the industrial society (Spring, 2001). One of the greatest services societies need is to be fed. Slowly, schools began to fill this social need. At first this need was filled by teachers and charitable organizations but when the American government realized that its citizens were too malnourished to fight in World War I, they began to intercede in the school lunch program (Cronan, 1962). Government control became even more entrenched during the Great Depression when the government began buying surplus farm products and distributing them to schools.

Are we really concerned with what is best for the child? How much of a role do economics and politics play? Our school lunch program today is funded by the National government. It is with understanding of the history and examination of the present policies that will hopefully lead to changes in our lunch policies in the future. Government policies decree healthy and nutritional food should be served in schools, but they are not. While it is true that those in need are being fed, what cost in physical and mental health are we forced to pay? There is a disconnect between nature and ourselves that is causing obesity and disease; it boils down to the food chain and our blatant disregard and contemptuous maltreatment of nature. Rachel Carson warned of this in 1962: “The chemicals to which life is asked to make its adjustments are no longer merely the calcium and silica and copper and all the rest of the

minerals washed out of the rocks and carried in rivers to the sea; they are the synthetic creations of man's [sic] creative mind, brewed in his [sic] laboratories, and having no counterparts in nature" (p. 7). Perhaps her writing was too poetic because few took heed and the problem has been exacerbated over time. The ever increasing use of pesticides and chemical fertilizers and additives that were created to increase food production for our escalating population since the Industrial Age are actually depleting the soils and therefore the foods grown from and that rely on them for sustenance of need vitamins and nutrients. This is a cycle that may continue until utter destruction or it may be on the way to solving itself with sustainable farming methods. Technology changes how we are, even the technology of rBGH. We cannot fully reject technology because to do so is to reject who we are and our place in the world today. There must be some way to temper the economic need for the quick fix solution with the long range health effects on people and our world. "You seek for knowledge and, wisdom, as I once did; and I ardently hope that the gratification of your wishes may not be a serpent to sting you, as mine has been" (Shelley, p. 29-30). These words from nearly two hundred years ago warn scientists about the illicit use of technology. In the pursuit of monetary gain: the perfect potato, the meatiest cow, the greatest quantities of milk, the breastiest chicken, all are monstrous unnatural serpents waiting to sting us. Through the misuse of biosciences and biotechnology we are contributing to our own demise. "Critics of the new biotechnology often disparage it as 'unnatural.'" While its proponents cite cases of 'natural' unnatural occurrences in nature that scientists are attempting to code in the lab, such as "wide-cross hybrid[s] made possible solely by the availability of embryo-rescue and chromosome-doubling techniques" (Miller, Conko, 2004, p.5). One of the most well-known opponents of biotechnology is Arpad Pusztai, a Scottish microbiologist who worked with gm potatoes in the 1990s. His research showed the gm potato to have adverse effects on

laboratory rats. Pusztai found that rats developed immune system defects and stunted growth after a time period corresponding to 10 years of human life. He lost his job. Many scientists reviewed his work; some found it sound while others claimed his methodology was flawed (Miller, Conko). “It was maintained that the results reported by Dr Pusztai were misleading because he had mixed up the results of different studies. In that context it was pointed out that he was old (68), giving the impression of a senile and confused person. It was also said that the research had not been done on GE potatoes but on a mixture of natural potatoes and Lectin. It was indicated in a humiliating way that the quality of Dr Pusztai’s research was deficient (PRAST, n.d.).

### **Ecological Critical Inquiry**

They penetrate into the recesses of nature, and show how she works in her hiding places (Shelley, 1818/1991, p. 47).

Early in the journey, I suddenly realized that walking at my side was a modern-day Artemis, goddess of wild animals, forest, and the hunt and patroness of childbirth (Krall p. 117).

Ecology has become a term we banter about almost carelessly. Equating sustainable development with the progressive adaptation of science and technology is a goal of ecological critical inquiry. Ecological Critical theory developed out of need because we overexploit our natural resources and seemingly effortless, thoughtlessly destroy species, our lands, waters, and

atmosphere. We are destroying our planet – we are destroying ourselves. It is a call to reorient ourselves and our values and how we respond to technology. It is a wakeup call. Theorists within the field on Ecological Critical Inquiry endeavor to effect global change to preserve cultures and environments through curricular emphasis in education. With the publication of *Game Management* by Aldo Leopold in 1933, a philosophy was born creating a new science that intertwined forestry, agriculture, biology, zoology, ecology, education and communication. This led some to become more ecologically aware and live in harmony with our surroundings. Leopold believed “[i]t is at least not impossible to regard the earth’s parts—soil, mountains, rivers, atmosphere, etc.—as organs or part of organs, of a *coordinated whole*, each part with a definite function. And if [only] we could see *this whole as a whole*... [and] *respect it collectively* not only as a useful servant but as a living being” (Callicott, 1989, p. 88). Leopold’s idea that we must balance human needs with ecological needs contrasted with the antiquated colonialism of John Locke that held only by laboring on the land could we claim ownership. Like nature, Indians were passive and exploitable. Europeans could claim Indian land honorably, they thought, because natives were not doing anything to bring the land up to its full productive potential. All that colonists had to do to own land was to till it.

The movement expanded with biologist, writer and ecologist Rachel Carson and her shocking environmental expose *Silent Spring* in 1962 written in response to our country’s destructive use of chemicals in nature. Her writing resulted in a ban on the domestic production of DDT and the creation of a grass-roots movement that demanded state and federal regulation to protect the environment. The ensuing decades have brought ecological ideas to the forefront of education with numerous curricular explorations all aiming to protect the world and her people through educational reform with an ecological approach.

David Orr is the leading theorist in the field of Progressive ecology, which is about starting an ecological design revolution to change how we use the earth and its resources. This field combines theory with action to design new ways to live with nature and change the ways we provide our wants and needs to be more environmentally viable.

We need to discover and sometimes rediscover the knowledge of things such as how the earth works, how to build sustainable and sustaining communities that fit their regions, how to raise and educate children to be decent people, and how to provision ourselves justly and within ecological limits (Orr, 2002, p. 41).

The survival of the planet depends on whether future generations can be educated in ecological literacy - an awareness of the interconnectedness of all life. Such an education requires changes in many of our present assumptions about schooling. David Orr (1989). Beginning in the early 1990s, David Orr envisioned the ongoing global ecological crisis and called for the need for educational reform to prepare people for the world we are now inheriting (1991, 1992, 1994). David Orr's following words sound like a verdict: "Finally, it is time to establish national goals for ecological literacy and make these a vital part of the curriculum of public schools and colleges" (Orr, 1994). It is a requirement of our time that ecological or sustainability literacy, and environmental or sustainability education must become a part of any professional curriculum in education because today's students are tomorrow's decision makers and the key-players at local, national and international levels, who will define further development on this planet

But what is ecological literacy? The notion of eco-literacy or sustainability education is still vague and indistinct due to its broad, multi- and interdisciplinary nature. On the one hand, as I have realized through my discussions with others, people are frustrated by information regarding the ongoing and accelerating ecological crisis and often feel hopeless about their and

their children's uncertain future; they are not sure and often do not believe that each individual can make a difference and contribute to a positive change. And "our goal as educators," as Orr has remarked, "is to present a sense of hopefulness to students, and the competence to act on that hope" (Janas, 1998). A common methodological and pedagogical approach to teaching sustainability does not exist. The importance of education for a sustainable future has been recognized by the global community and emphasized by the United Nations since the Earth Summit in Rio de Janeiro (1992) that, with 30,000 people and more than 100 heads of state participating was the largest international environmental conference ever held. Ever since, there has been a consensus that education is the driving force to bring about a shift to sustainable development. Practitioners fully understand the importance of sustainability education and are passionate about promoting it, but they do not know "what" to teach and "how" to teach it. They are lost and need a conceptual model to become effective. There are multiple and variable approaches to sustainability education, but the common approach to the concept of sustainability as well as the methodology and pedagogy of teaching it are missing. David Orr, the author of the concept of eco-literacy, argues that no student should graduate from any educational institution without basic knowledge of subjects such as "the laws of thermodynamics, the basic principles of ecology, carrying capacity, energetics, least-cost, end-use analysis, limits of technology, appropriate scale, sustainable agriculture and forestry, steady-state economics, and environmental ethics" (Orr, 1994, p. 14). Orr emphasizes the importance of ethics and spirituality for achieving the aims of sustainable development (1992, 1994).

Currently Adjunct Professor of Environmental Studies at the University of Oregon, C.A. Bowers has made a personal commitment to make the environmental crisis central in his writing and to bring about educational reforms that are environmentally oriented. In recent years,

attention has been given to understanding the educational implications of eco-justice for Third World cultures, the prospects of future generations, and the need to revitalize the commons as sites of resistance to economic globalization and further environmental degradation. *In Education, Cultural Myths, and the Ecological Crisis*, Bowers provides guidelines on how to sort out the issues and relationships of environment and education. “[T]he condition of our planetary habitat is the concern that should frame how we think about all other reform efforts” (1993, p. 2). Bowers discusses the spiritual and political aspects of the environmental crisis and offers educational reform as a pathway to the solution. The challenge will be to see through the illusions of a consumer-oriented, technologically based existence, to alter the premises upon which the belief system of the dominant culture is based, and to retain those aspects of our past cultural achievements that are compatible with a culture in equilibrium with the carrying capacity of the natural systems that make up the biosphere (Bowers, 1993, p. 9-10). With the advances in biosciences and scientists now easily splicing and recombining genes to create new entities of foods and food producing mechanisms, it is increasingly important to temper our feelings of progress with technology and learn to use technology in more sustainable methods.

Education with a curriculum that embraces sustainability can transform modern day education into a more viable and enduring experience, leading to a more viable and enduring future. Education for Sustainability involves a radical de-emphasis on consumerism and corporate greed and economy as well as a focus on the non-commoditized features that include place-making, community building, aesthetic inquiry, and earth-based stewardship. The shift in these features lead to a restoration of equilibrium in a currently non-sustainable and consumption oriented social structure. The changes Bowers and Orr strive for through sustainable education include changes in modern agro-industrial farming practices. Through this we look holistically at

these practices, what they are doing to our lands and our health and our economy. We also need to look holistically at the biosciences and changes in technology that are creating foods imbedded with more chemicals than our bodies can process. We should be looking for technologies that lead to sustainability of our bodies and our minds through better means of food production. The spiritual and ethical side of ecological literacy is vitally important because the ecological crisis we are facing now is in fact a crisis of our whole culture. Nevertheless, even knowledge, ethics and spirituality are not sufficient to ensure a much needed change in people's lifestyles and behaviors moving towards a more sustainable future. People need to have concrete knowledge about, and often practical training with, the tools and skills that would allow them to practice a sustainable way of life. In general, people are not very certain about what sustainability is and they associate it with numerous things, processes, and tools that range from energy-safe bulbs to organic agriculture, but often they do not see a big interactive picture and their individual place in it. However, even all of these factors are not sufficient for developing ecological literacy if they are not given in the context of the idea of the wholeness of the existing world: its interconnectedness, interrelatedness, and interdependence. Knowledge of these elements of culture must be transformed into a real, integral picture of the world, which should be kept in mind and pointed out to the students by instructors each time when an appropriate case is presented. In other words, a holistic vision of our reality should be the context of all educational activity.

## **Paradigm Shift**

The dialogue about sustainability is about a change in the human trajectory that will require us to rethink old assumptions and enlarge the questions of the human condition that some presume to have been solved once and for all.

David Orr (2005, p. 82)

“A political realm is a realm of action that can only be called into being by human beings who feel themselves to be versatile enough, limber enough, and free enough to bring about differences in the world” (Greene, 1978, p. 89). Through my studies at Georgia Southern I feel much more prepared to accept food as my realm of change. And to produce these changes, I feel there is a need for a more holistic and sustainable curriculum. I think Greene agrees with holistic education when she encourages others to “take differing vantage points” (p.89) when looking at the world and to not accept what many take for granted. These are the people who can make changes in our world. What better way to prepare these individuals than with a holistic education? Holistic education is based on the premise that each person finds identity, meaning, and purpose in life through connections to the community, to the natural world, and to spiritual values such as compassion and peace. The Montessori Cosmic lessons teach the basics about the earth and the universe and how it works to give even the youngest of children a beginning understanding of what our world is made up and how interconnected we are with life. These lessons help the person feel part of the wholeness of the universe, and learning will naturally be enchanted and inviting. There is no one best way to accomplish this goal, there are many paths of learning and holism embraces them all; what is appropriate for some may not be best for others.

The art of holistic education lies in its responsiveness to the diverse learning styles and needs of evolving human beings. We have to ask about the consequences of our actions to be connected to our community and our world. Today's curriculums fail to include ecological perspectives in any number of subjects. "If a child is to keep alive his [sic] inborn sense of wonder he [sic] needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in (Carson, 1956 p, 55.) The Montessori method is an education that does this, it helps a child think broadly and holistically. David Orr tells us that this can be threatening to the status quo of our economic and political systems (2002). This is why education and science and technology have been able to continue as it is. An environmental, holistic curriculum should be able to change the way people live.

John Dewey was a proponent of the lived experience (1916, 1938, 1902). He believed the child's experience should be the basis of the curriculum and that curriculum could affect societal betterment. Learning best occurs in response to real needs and the real life situation of the learner. Montessori offers what David Orr calls "real learning". [It] is participatory and experiential, not just didactic. The flow can be two ways between teachers, who best function as facilitators, and students who are expected to be active agents in defining what is learned and how" (2002, p. 91). Modern education has split knowledge into manageable bits and has managed to disconnect from the person. It has been doing this for years. Rachael Carson took note of it in 1962: "This is an era of specialists, each of whom sees his [sic] own problem and is unaware of or intolerant of the larger frame into which it fits" (p. 13).

"A new kind of dialogue with the past may be needed, the kind of dialogue that clarifies vision and pushes back the boundaries of thought (Greene, 1978, p. 117). Through the work of Chet Bowers, we can see the importance of reconnecting to our environment. He stresses the

importance of drawing from the wisdom of yore instead of the construction of new knowledge that is so common today in education. The wisdom of our ancestors can also lead us back to more sustainable methods of living in sync with the earth instead of destroying the resources as we have been doing. Organic, sustainable farmers are looking back. The intercropping and multiple cropping methods used by Native Americans are resurrected to achieve maximum yields and preserve soil fecundity. David Orr agrees that we need to “restore and preserve traditional knowledge of land and its functions” (2002, p. 32) to have eco-sustainability. Bowers maintains that “we should think about the interconnectedness of mind and nature, the person and the larger aggregate” (Bowers & Flinders 1990, p. 94). Serres advises that “we bring up our children in the shame of reason, so that they experience its modesty” (2000, p. 121). To me, this means that we must ask why, must make connections, and must ask what next so that eyes can be opened to the destruction of not doing so.

The curriculum – the flow of education – should be changed to incorporate sustainability to help our students and our future generations take charge and control of our environment, our government, our technologies, our economies, our health and our world, Our teaching methods today are too specialized and so we lose the ability to think broadly. I know this first hand from my schooling experience; it was a rare moment that a teacher gave us a moment to be reflexive and to try to issue answers from our own experience, David Orr writes that “[t]o see things in their wholeness is politically threatening (1991, p. 88). This is true and it threatens our economy as well. Imagine being allowed to see the connections between obesity, fast food, and deforestation or between ADHD, cancer, biotechnology, farming, soil erosion, unemployment, etc. The connections are immense. Our economy looks at one thing – it is too specialized and does not account for soil erosion or illness costs from pesticides. David Orr tells us that

“[e]nvironmental education ought to change the way people live, not just how they talk” (1991, p. 91). Stephen Sterling reminds us that at this time we are being educated mainly to compete in a capitalistic world we are not being educated to care about our biome and be good stewards (2001). There is a national eating disorder fostered by the corporations that feed us, students across America are exposed to deliberate commercialism during school time thanks to Channel One and many students must use text books that are developed by corporations with definite slants extolling capitalism (Orr, 2002). This does little but to foster the sense of need in individuals, which is the primary mission of the advertising industry and corporations. It also leads to further exploitation of the environment. We are doing students a grievous disservice when we educate for a test and neglect to teach creatively and critically. Sustainable education can teach the virtues of our culture without ignoring its vices, it is a democratic education seeking to place “ownership and determination with educators, learners and communities rather than government and corporations, and upholds the fundamental value and right of equality for all” (Sterling, 2001, p. 26-27). This paradigm recognizes the interdependence of social, economic and ecological welfare. Sustainable education is a recipe that has a good blend of humanistic, holistic and progressive education drawn from multiple influences and contributors including Montessori, Dewey and Friere. Skills such as interdisciplinary thinking, problem solving, team working, and holistic thinking are often mentioned. These skills are encompassed by the pedagogy of problem-based learning (PBL), which provides students with opportunities to learn to think, specifically “how to think” rather than “what to think,” and potentially within the framework of sustainability (Sterling, 2001). John Dewey told us nearly a century ago that learning occurs best in response to real needs and real life situations of the learner. Maria Montessori knew this when she taught the poor children in Italy whom none thought were able to

learn.

Holistic education is inclusive – it rejects labeling and segregating of students and encourages wide range of teaching and learning strategies to reach diverse student populations. Like Montessori education, holistic education includes learning through transmission (1-way movement of information from teacher or text to student), transaction (students constructs meaning & understanding, knowledge is fluid, students involved in inquiry learning and problem solving) and transformation (acknowledges the inner life of the student – allows student to transform self and world in positive ways) “There is no one model of holistic education; each form should be organically connected to its content” (Miller, 2006, p. 102) Holistic education seeks to develop community within the classrooms and schools and also connect students to the community that surrounds the schools and the global community as well. “Slow education” (Maurice Holt) “encourages students to pursue questions in depth and not skip quickly through a curriculum of unrelated facts” (Miller, 2006, p. 108). This slow approach that uses experiential, value-oriented practices with participation at its core is not new nor is it the exclusive domain of slow schools – Montessori has been doing this for a long time. “When our approach to teaching and learning slows down, then students can actually have moments where time stops and they experience timeless learning” (Miller, 2006, p. 108).

“Holistic education is an approach aimed at teaching the whole person” “school curricula have broken knowledge into courses, units, and lessons that are often filled with unrelated factual material. There is often little effort made to connect the material within the course or between courses. Math and science are seen as totally separate and unrelated to history. In contrast, holistic education cultivates a curriculum of connections” (Miller, 2006, p.101). Holistic education seeks to reconnect to the context within which meaning arises: the physical world; the

biosphere, the family, local community, culture and cosmos. Standard-focus of education gives no understanding of the world but gives technocrats data to sort and evaluate objectively. This increasing standardization of learning prepares students to act aggressively, cleverly, and resourcefully in the job market and the competitive corporate worlds. “[M]ost mainstream education sustains unsustainability through uncritically reproducing norms, by fragmenting understanding, by sieving winners and losers, by recognizing only a narrow part of the spectrum of human ability and need, by an inability to explore alternatives, by rewarding dependency and conformity, and by serving the consumerist machine” (Sterling, 2001, p. 14-15). This is in accordance with Bowers, who sees education driven by the marketplace, undermining students’ ability to become environmentally alert. A sustainable curriculum that is systematic and integrative so that it recognizes the wholeness of the world would work to change this.

“When the actions of educated people ‘ruin the world,’ for whatever cause, it is time to ask what went wrong in their education. One answer suggested by Elie Wiesel, is that modern education has too often emphasized theories, not values, abstractions rather than lived reality, answers instead of questions, and know-how rather than know-why (cited in Orr, 1992, p. 4) “We have come to define education as intellectual mastery of fragmented and isolated subjects, most of which are far removed from daily experience. Consequently, for students the world of ideas has become increasingly abstract and remote from the reality of everyday life” (Orr, 1992, p.5). Wendell Berry wrote “[t]he disease of the modern character is specialization” (1977, p. 19).

From a public point of view, the specialist system is a failure because, though everything is done by an expert, very little is done well....society becomes more and more intricate, it has less and less structure...The community disintegrates because it loses the necessary understanding, forms, and enactments of the relations among the materials and processes,

principles and actions, ideals and realities, past and present, present and future, men and women, body and spirit, city and country, civilization and wilderness, growth and decay, life and death – just as the individual character loses the sense of a responsible involvement in these relations (Berry, 1977, p. 21).

“as attention concentrates on the technical and the behavioral, the so-called “hidden curriculum” will become more potent, because its component precepts and values will be more effectively excluded from what is taken to be acceptable classroom talk” (Greene, 1978, p. 170). Bowers writes that “educators [get] students to ask the questions for which they already have the answers...[and so] the boundaries of the curriculum become the boundaries of the student’s imagination” (1974, p. 7). “The teacher can facilitate the student’s liberation through dialogue, as it involves genuine encounter between the individuals who are open to personal change and a world that is viewed in creative terms rather than as something that must be dominated and controlled” (Bowers, 1974, p. 11). “What passes for education has become highly technical and specialized” (Orr, 2005, p. 50). There is a need to look at whole pictures to be able to see and understand change. We need “a curriculum organized around the study of the relationships between energy, environment, and economics and how these apply across various scales of knowledge” (Orr, 2005, p. 85). The organization of our knowledge is the real reason for our troubles with technology (Vicente, Bowers, Orr, Sterling). Our educational systems teach a reductionist approach wherein knowledge is broken into its smallest parts, and each part studied individually, as if the parts do not belong together to make a whole. “[O]ur traditional ways of thinking have ignored – and virtually made invisible – the relationship between people and technology (Vicente, 2006, p. 33). We need to be thinking in a holistic, problem-driven way of looking at the world, an approach that focuses on relationships between system elements. It is

with a fundamental change in education's curriculum that this can be done (Orr, Bowers, Sterling).

### **What Can We Do?**

One thing is sure: the earth is more cultivated and developed now than ever before; there is more farming but fewer forests, swamps are drying up and cities are springing up on an unprecedented scale. We have become a burden to our planet. Resources are becoming scarce and soon nature will no longer be able to satisfy our needs

Quintus Septimius Tertullianus, 200 B.C. (Pringle, 2003, p. 184).

The Earth, too, is beginning to have its say about our character and our conduct and our ignoring of its ways

David W. Jardine, et al (2003, p.199).

Modern biotechnology has been called “the third strategic technology of the postwar period, following nuclear power in the 1950s and 60s and information technology in the 1970s and 80s” (Gaskell, Bauer, & Durant, 1998, p. 3). Krimsky (1991) explains that by the 1980s, “a great campaign had been started by major corporations, industry trade associations, state governments, and universities to promote the biotechnological revolution first to the investment community and then to the American people, promising a cornucopia of improvements to civilization” (p. 13). These improvements are conflicts that have yet to be resolved. Is biotechnology ethical? Does it positively contribute to our lives?

The biotechnology debate typically falls within two different categories in terms of how the technology is used: agri-food (food and crop production) or “green” biotechnology, and

biomedical or “red” biotechnology. While applications of red biotechnology have been around since the discovery of rDNA technology in the early 1970s, applications of agri-food biotechnology began to emerge in the early 1990s. Since then, it has become one of the most controversial biotechnology topics, as countries in Europe, parts of Africa, and Asia have resisted imports of genetically modified (GM) grain, fruits, and vegetable products from the United States (Alvarez, 2003; Becker, 2003). In 1998, with suspicions about the health and safety of GMOs at their height, the European Union banned any new GMOs for planting or use in the EU. The ban was lifted in April 2004 when new rules on labeling and traceability of GMOs were adopted.

While the stakes are high in the debate over the revolution in modern biotechnology, the resources and opportunities are not equal among actors (Bauer, 2002). Politicians, scientists, policymakers, corporations, social activists, the food and agricultural industry, and other interest groups seek to influence how the technology will be used. How the technology will be used or how biotechnology policy will be formed are debates unlike those in other scientific areas where questions of scientific truth or falsehood are primary, such as debates over evolution and creation or debates over the existence of global warming (Priest & Ten Eyck, 2004). Biotechnology does not always provide a clearly defined scientific or medical position from which opponents can argue. Rather, issues of biotechnology policy are unique in that they involve the application of science by a variety of actors pursuing particular goals and under conditions of scientific uncertainty (Priest & Ten Eyck, 2004).

Critics of green biotechnology contend that the cultivation of GM plants may lead to environmental changes and that human consumption of GM food is unsafe, and at the very least, should be labeled as containing GM ingredients. In fact, the labeling issue has been described as

the most contentious within the agri-food debate (Pew, June 2002). GM foods do not currently require labeling because the United States Department of Agriculture, and the FDA has judged them to have the same nutritional content as similar non-GM foods. Proponents of green biotech argue that there is no solid evidence showing that GM foods are harmful, and they could reduce world hunger. They also argue that agricultural biotechnology is but one of the tools in a farmer's toolbox and that farmers should have access to all available technology.

### **Holistic Education – My Recipe**

Necessarily, when we speak of making a difference, we have in mind one or more particular arenas of interest in which a difference might be made.

Carolyn Merchant (1978, p. 99)

Holistic education aims to call forth an intrinsic respect for life and a love of learning through direct engagement with the environment. Dewey (1959/1938) believed that students need educational experiences to become valued, equal and responsible members of society and the value of the experience is to be judged by the effect it has on the individual and his/her ability to contribute to society. William Doll seems to agree with a more holistic approach to curriculum when he writes that curriculum should be derived from “the defining characteristics of open, relational systems; perturbations and disequilibrium, self-organization, chaotic order, and lived experience” (1993, p. 89). Apple writes of holistic education and sustainable curricula when he tells teachers they “must...assure themselves that the course they follow, inquire into [and] analyze...will dignify human life, recognize the playful and creative aspects of people, and see

others not as objects but as ‘co-responsible’ subjects involved in the process of democratically deliberating over and building the ends and means of all their institutions” (2004, p. ix). Timeless learning (Miller,2006) is integrative, not compartmentalized like to much learning is today. It allows teachers to lead by example, and see ourselves in relationships to others, “[t]imeless learning often leads to a sense of how we are supported and nourished by the earth” (p. 7). It is characterized by the flow experience, a term coined by sociologist Mihaly Csikszentmihalyi to explain what happens when a person becomes fully immersed in an experience (Miller, 2006). This flow occurs often in Montessori education when a child becomes so involved with a material as to lose awareness of the others around. Some classrooms are more set up for flow than others. I feel the Montessori classroom is an optimal place for flow to occur. As facilitators, we provide the students with the tools needed for learning. When first introduced to a new concept, students are in a small group with the teacher for a three-part lesson; usually about four students in a group. After the introductory lesson, students are welcome to choose the materials to practice and master the new ideas. Each morning we have an uninterrupted Montessori work period that only stops when we leave for lunch. Students are guided towards materials that are most suited to their learning needs and have the freedom to choose what and where they would like to practice. The students are allowed to spot their own errors on all work through feedback by the teacher, the Montessori assistant, or another student. Children are encouraged to teach, collaborate, and help each other.

Maurice Holt coined the term “slow education” that “encourages students to pursue questions in depth and not skip quickly through a curriculum of unrelated facts” (Miller, 2006, p. 108). Slow education is against standards based teaching and reform, it was born out of the slow foods response to fast foods. Slowing down the approach to teaching, getting away from teaching

to the test as we are so wont to do in our quest for data and outcomes, will allow students to experience flow and timeless learning. When William Reynolds writes that “curriculum should allow both teacher and student to develop a critical, caring, compassionate conversation rather than treat human beings as objects to be manipulated by prescribed and pre-fashioned technical rationale that reduce human beings to mere raw material to be fashioned and formulated into information receptacles for the ‘global corporate economy’” (2003, p. 43) I believe he agrees with slow education. Without taking the time to make connections, we treat nature as mere raw materials and this is why we need a sustainable curriculum. Our students are not mere information receptacles but they are being filled with poisons of our corporate economy through food.

“Curriculum integration has to do with keeping things in place, nested in the deep communities of relations that makes them whole, healthy, and sane....We are intrigued by [Wendell] Berry’s (1986) reminder that an orientation towards integrity and wholeness has something to do with health healing, and the mending of relations, and, therefore, that pursuing curriculum integration in our classrooms has something to do with ‘choosing to be healers’ in relation to ourselves, the earth, the topics taught in our schools, and the children invited to those topographies” (Jardine, D.W., LaGrange, A. & Everest, B 2003, p. 198). Teaching these relationships is important to give children meaningfulness. A holistic education can help. One of the tools that holistic education uses to help children learn what they need to learn is meaningfulness. When something is meaningful it is much easier to learn than something for which one has no care or concern. A holistic education will respect and work with the meaning structures that a child comes with rather than begin from a perspective of what should be meaningful to a child. For thousands of years before schools extended families, communities or

tribes or clans, and religions thought their children what it meant to be human. For the most part, these groups have disappeared or become compartmentalized in people's lives. Currently children are learning this from popular culture and schools that were designed to prepare them for the working world. “[F]ew teachers understand the most critical aspects of cultural transmission in the classroom, particularly how language encodes earlier thought processes, the way in which most of the particular culture learned is taken for granted, and how cultural assumptions underlie the structures of knowledge that constitute the subject areas of curriculum” (Bowers, 1993, p. 119). Meta-cognition “language is not a neutral conduit through which ideas are communicated to others, but plays a constitutive role in organizing the thought process itself....the lack of language can leave areas of experience unreflected upon and unarticulated” (Bowers, 1993, p. 121). The language we currently use reinforces capitalism. We need to learn to think about how and what we think and learn about what we are learning and why – this shift of consciousness is necessary for a sustainable curriculum.

Motivation is what makes us do what we do. It is an internal driving force that pushes us to start something and keeps us engaged. Our level of motivation for any given task will determine how well we do at it and how long we continue to try. Motivation is crucial to learning because to learn one must be engaged. It is a partnership; a teacher cannot simply fill a child like an empty vessel through teaching at them. As a teacher of five to seven year olds in a Montessori school, motivation is essential. Students and are taught to be self-motivated learners: they are given freedom to choose tasks that interest them from a prepared environment. Maria Montessori observed that children blossom in environments that are suited to their needs. She called the process normalization: “But in our specially prepared environments we see them all at once fix themselves upon some task, and then their excited fantasies and their restless

movements disappear together; a calm, serene child, attached to reality, begins to work out his elevation through work” (Montessori, 1963, p. 174). This is a motivated child at work. Today, with such competition with items of popular culture, other means to increase motivation are needed.

Freire’s empowerment model of education is one such means. This model argues students can take control of their lives and be active participants in their education. The model suggests that participation of people in group action and dialogue efforts directed at community targets enhances control and beliefs in ability to change people's own lives. Teachers must form partnerships with students to support and scaffold their abilities and encourage their personal responsibility and independence. Students will do better work when they are partners in their own education. Teachers must take care to provide the right environment for each student’s needs. This method emphasizes the intrinsic will to learn by providing students active learning experiences that develop self-motivated learning. This method encourages independence by providing the learner the tools needed for success.

This model fits in perfectly with the Montessori teaching which aims to provide the individual with the tools and environment he/she needs to learn and grow. Too often, education is thrust upon students sitting passively in desks and being lectured at. The empowerment model builds upon the students’ needs. Failure is certain when a learner is in a situation opposing his/her needs. As a Montessori teacher, I try to ascertain the particular needs of each student and provide the environment that will facilitate learning for him/her. After determining what students need from observations, conversations, and formative assessments, students are given three-part lessons, in which the teacher models the process and then scaffolds the learner, followed up with practice. The students choose from an environment rich with concrete hands-on materials that

reinforce the lessons. At their own pace, students will move into abstract work.

To be empowered students must be intrinsically motivated. This motivation exists when the source of motivation is within the learner and task. These learners engage in learning for their own sake and to do so feel competent in their abilities and self-efficacy. Students should have autonomy in their learning to be able to develop and nurture intrinsic motivation. When a learner is intrinsically motivated, he/she will engage in activities simply because he/she wants to: the task is worthwhile and enjoyable. Because of this, the learner will be more engaged and focused on the task, exhibit more persistence, and achieve at higher levels. To ensure students will develop intrinsic motivation for learning in the classroom, the teacher should ensure the activities have clear, but not too specific, goals and provide immediate feedback. Students should have freedom in determining some of the task's structure instead of being told exactly what to do. Learning activities should be available at the students' level of need and ability that lets them concentrate fully on the task at hand. The learning activities in my classroom are self-checking and focus on explicit learning goals that follow the three part lessons. The Montessori environment offers an ordered space where students can work on activities of their own choice and at their own pace. There is no competition which can stifle intrinsic motivation; instead there is a blend of freedom and self-discipline designed for their developmental needs. This environment builds the students' enjoyment of learning and increases their intrinsic motivation for learning.

Extrinsic motivation exists when the motivation is outside the task and the learner. Extrinsic motivation strategies associate task completion to a valued reward for students, but do not increase the value of the task for the student. Students who are extrinsically motivated will engage in tasks merely for some reward or because of coercion. Teachers can use low levels of

extrinsic motivation with high levels of intrinsic motivation to motivate for the most success. Extrinsic motivation alone can destroy a learner's motivation, especially competitive strategies such as grading systems. Students should be able to experience some external reward for effort and focused time spent on a task. They should not be rewarded with prizes or praise just for doing what is expected of them, but for actually going beyond and trying harder. Teachers must maintain high expectations and use extrinsic motivation to increase students' intrinsic motivation. In the Montessori classroom, much time is spent to determine what each child already knows and what each child needs to learn. They are not all lumped together as kindergarteners or first graders, instead they are valued as individual learners and allowed to continue in that mien. I have a few seven year olds working from a third grade language curriculum and I have a few that are working from a kindergarten language arts curriculum. There is no forced competition in our multiage classroom, and students are free to work at their own level. Students are taught to be intrinsically motivated and thrive from independence. In Montessori, children are given real responsibility and trust to help them learn self-discipline and self-motivation. They have the power to act from real choice, which can be a great motivator.

Normalization has been achieved. His[sic]organs of movement has emerged from chaos in the movement in which they were able to attach themselves to their inward guide; henceforth they will become the instruments of an intelligence hungry to know and to penetrate the reality of the outer world. And this wandering curiosity is transformed into an effort to master knowledge (Montessori, 1963, p 174).

David Orr suggests we restore and preserve traditional knowledge to attain eco-sustainability. I beleive that we cannot return to such earlier times, our technologies have taken us too far, but we can learn to use these and newer technologies in ways that complement the

earth and the health and livelihood of her people. We should be asking “what then?” when dealing with ecological processes, according to Garrett Hardin (Orr, 1991, p.85). O.K., we have new technologies that will allow crops to grow quicker and more efficiently. By using these chemical fertilizers and pesticides, crops will come to fruition earlier and in larger numbers than if not used. Well, what then? These crops are contributing to soil erosion because farmers are now subsidized by the government to grow soy and corn. Without crop rotation, soils are depleted of their nutritive value and it is not being replenished and topsoil is washing away. The chemical fertilizers are causing the plants to grow so fast that the roots are unable to penetrate deeply enough into the subsoil to have any nutritive value. The lakes of chemical pesticides are washing into streams, rivers, and oceans and wreaking havoc on our ecosystem, not to mention what the accumulation of such chemicals in our bodies are causing. And this accumulation is compounded by eating animals that have themselves accumulated them. And our government is not taking into account the expenses incurred from the depletion of soils and destruction of our ecosystem nor the costs of health care needed by people with health problems associated either from use of these chemicals or ingestion of them. Looked at holistically, the “what thens” can continue and connections made beyond the scope of this paper. Our education system is not allowing for these questions, it is merely chunking our knowledge and feeding us what we need to survive in a corporate economy. (Pollan, Carson, Orr). Ecological Critical theory will help restore balance and harmony to our values and hence our world. The focus of this theory and of sustainable education is complete and holistic. My aim is to focus on the aspect concerning farming techniques and bioengineering of foods through technology and science. Through education of these aspects of ecology, I hope we can learn to develop the means to better use

existing technologies or develop new technologies that will not be detrimental to our health or that of our world.

## **Epilogue**

The most dangerous thing in the world is to think you understand something –  
Zen proverb (Miller, 2006, p.11).

Discourse on ecological sustainability emerges because of the interweaving of industrial/technological awareness and an ecological awareness of the effects of technology on the environment (Bowers, 2001). A sustainable curriculum crosses disciplines to try to understand humanity and our impact on the ecology. Pinar, Reynolds, Slattery and Taubman tell us that “curriculum is a highly symbolic concept. It is what the older generation chooses to tell the younger generation” (1996, p. 847). William Doll tells us that curriculum should not be structured and deterministic but derived from the defining characteristics of open, relational systems: perturbations and disequilibrium, self-organization, chaotic order, and lived experience (1993, p.11). To me he is saying that a holistic curriculum is best. A holistic curriculum can move education to a level that touches every aspect of a students’ being. “If [teachers] can be more centered and caring, then [teachers] can create a space where students may also show these qualities” (Miller, (2006, p. 135). More than any other teaching method employed, I believe that Montessori exemplifies this caring space. The Montessori philosophy offers a completely different approach, featuring a unique, open environment that emphasizes the child’s natural interests and allows the child to set his or her own developmental pace. The basic tenet of Montessori education is that a child learns best in an enriched, supportive environment through exploration, discovery and creativity with the guidance and encouragement of a trained and caring staff. Montessori education does what Orr believes environmental education should do. “[It] change[s] the way people live, not just how they talk....Real learning is participatory and

experiential, not just didactic” (1993, p. 91). Modern education has splintered knowledge into manageable bits and pieces. Montessori and holism are more in line with the Greek concept of *Paideia*, the aim being self-transformation , personal wholeness and competence using open dialogue, participation and experience (Orr, 1993).

I feel that Dewey is also a proponent of holism when he states:

The present divorce between scholarship and method is as harmful upon one side as upon the other – as detrimental to the best interests of higher academic instruction as it is to the training of teachers. But the only way in which this divorce can be broken down is by presenting all subject-matters for whatever ultimate, practical, or professional purpose, that it shall be apprehended as an objective embodiment of methods of mind its search for, and transactions with, the truth of things. (1962/1904, p. 18)

Holism embraces our human interconnectedness and our environment. These shape how we live, how we treat all living things. “The idea of the individual responsible only to self and self interest must be transformed to the idea of social responsibility within a context of community” (Kannel-Ray, 2003, p. 3). A holistic approach to education can give us an understanding of how we are connected to each other and to the earth. It can help us to understand how our actions are interconnected and how they affect everything around us. An educational environment needs to address the personal interest of the learner. It must have meaningfulness because that is what plays a personal and emotional role in the learning process. “[N]ot only does learning need to be of emotional interest, but it also needs to challenge the student intellectually in a nurturing environment involving a trusting relationship between teacher and student” (Kannel-Ray, 2003, p. 6). This is Montessori. The goals of Montessori education are to cultivate each child's natural desire to learn, acquire and master skills, learn

responsibility and cooperation and foster strong, positive feelings about oneself and others. The method addresses the total child developing social skills, emotional growth, and physical coordination, within a thoughtfully designed environment. “[W]e realize that curriculum changes as we reflect on it, engage in its study, and act in response to it, toward the realization of our ideals and dreams. Curriculum ceases to be a thing, and it is more of a process. It becomes a verb, an action, a social practice, a private meaning, and a public hope” (Pinar, et al, 1996, p. 848). This is how I see a sustainable curriculum – it is ever changing and embracing new technologies and methods to learn for and care about the earth and all living things. To teach sustainability it is best to start young. Children have a natural affinity for animals and plants and a thirst for understanding the world around them. By giving them the right opportunities and guidance, they will grow up to be effective contributors to a sustainable future. Children should learn about sustainability on a scale that fits their age and focuses on the world in their immediate vicinity – it should be meaningful to them. Children will absorb a great deal of wisdom about the world around them simply by observing adults and participating in good sustainability practices. By learning about their local world as they grow up, they will develop a good sense of the big picture as they enter adulthood. In my classroom, we practice this by taking care of our class pets, exploring nature and learning about our local flora and fauna, we are raising money for the local Humane Society, we pick up trash around the school grounds, and we make sandwiches for a local homeless shelter.

Doing this research I found that teaching students about food, food choices, and food systems is a key component of rethinking school lunch. With a solid understanding of concepts and the skills needed in order to apply them, students are more likely to make wise food choices that affect their personal health and environmental well-being. Our society’s food habits in the

last few decades have taken their toll on both individual and environmental health. Obesity, type 2 diabetes, heart disease, and other diet-related diseases are on the rise. In addition, an increasing percentage of adults do not know where their food comes from, or fail to understand that food represents a web of relationships that sustains all life. If we are to reverse these trends, we must help young people understand the connections between their food, their health, and the environment.

Many schools attempting to meet mandates of the No Child Left Behind Act of 2001 eliminated nutrition education, physical education, and recess, while shortening lunch periods. Linking teaching and learning in the classroom to healthy and sustainable food in the lunchroom will help students develop healthier eating habits. It will also help support their personal health and lead to a more sustainable future for generations to come. Healthy eating in childhood and adolescence promotes optimal health, growth, and intellectual development, and plays a key role in disease prevention. Schools have a responsibility to teach health and nutrition, providing students with the skills, social support, and environmental reinforcement to adopt long-term, healthy behaviors. By doing so, they also influence the overall wellbeing of our society. Food is an interdisciplinary topic that is best presented through an interdisciplinary approach. With food as a lens, subjects like science, health, social studies, and math can come together in an integrated way that has value and meaning outside the classroom. An integrated curriculum helps teach content in a way that is more realistic and relevant to students' everyday lives than a subject-by-subject approach. The ways in which we grow, process, transport, market, prepare, and dispose of food are critical to central sustainability issues, including resource use, energy, pollution, water and soil conservation, and workers' rights. Food serves as an ideal entry point for understanding the interrelations of such issues as hunger, trade policy, energy use, and

climate change. The food served in the lunchroom can either support or undermine what students learn about healthy living in the classroom. Schools need to provide food that models what teachers are teaching about health and nutrition. By offering healthful foods, schools also support student wellbeing and help improve student performance.

Amy Kalafa, a filmmaker and nutritionist, made a documentary about her daughter's cafeteria called *Two Angry Moms*. Her goal was to learn how parents could change the food in schools. She "found model school food programs in the rarefied halls of Yale University, in a largely Hispanic desert community in California, in the urban streets of Harlem, in the chilly mountains of New Hampshire [ and other areas].... "Each example shows how the efforts of parents and community leaders have led to the implementation of new policies and programs" (2011, p.viii ). Children of all socioeconomic levels are at risk for poor nutrition. Some children do not get enough to eat daily because their families may not be able to afford enough food. Other children consume enough food but have diets high in fat, sugar and sodium that put them at risk for obesity or heart disease. As more parents are in the work force, more children are left to fend for themselves and may lack the education to make healthy food choices. Parents and teachers should give our children the practical and intellectual tools they need to make intelligent food choices. The younger the child is when this education starts, the easier it will be. As a teacher and a parent, I am starting to make a change. We had a screening of the film, *Two Angry Moms*, at my school to inspire parents to help affect a change in our children's food. We have started parent teacher committees for a healthy food initiative and through Savannah Food Co-op have made organic foods available at our school. We are also giving our students a more hands on approach to food, by enabling them to grow and prepare their own snacks. When schools and school districts are able to procure at least some fresh, local, and/or sustainably grown

ingredients, they enhance the nutritional value of student meals; offer food that is often tastier and more appealing, benefit the environment, support the local agriculture and economy, and help ensure better working conditions for food growers and processors.

I have learned from my research that premature maturation can lead to significant problems later in life. Breast cancer risks may be increased because “the duration and intensity of estrogen exposure may be a significant risk factor” (Larson, 2003, p. 19). There is also a psychological effect on young children’s self-esteem and body image. “The effects on the mental health of younger children experiencing sexual urges is a major public health concern. Females may undergo ridicule from peers about their appearances, or they may become targets of sexual advances for which they are unprepared” (Larson, 2003, p.19). I have seen the ridicule occur in my 9 year old daughter’s peer group. Last year one of her friends, who was eight at the time, developed breasts, underarm hair, and body odor. She is still embarrassed from teasing remarks and worried about what others think about her. These girls who develop early have a “greater tendency towards depression, aggression, social withdrawal, and mood swings. They are also more likely to smoke, use alcohol and drugs, be sexually active, have difficulties sleeping, and have problems in school (Larson, 2003, p.19).

Go play outside; explore the world with your child. Sometimes my dad would take me into the backyard and we would overturn loose flagstones in the walkway, or rocks in the woody section out back, to see what lived underneath. If I shrieked at a wriggling worm, my dad would say, “every creature has its purpose,” and tell me that the worm helps to keep the soil rich. He would tell me that ladybugs were lucky if they landed on you and that they kept roses safe. I did not grow up killing insects. I revered them as part of nature. This was the beautiful world we were protecting — and these were the resources we couldn’t afford to waste.

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