

HUMAN BY NATURE: HUMAN NATURAL HERITAGE AS A GUIDE FOR
TEACHING AND LEARNING

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To RWH, for your love, support, and faith

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CHAPTER ONE

Introduction

It was Thanksgiving and I was about 14 years old. Entrusted with the task of whipping the cream for the pumpkin pie, I poured the cream in the bowl, added the sugar and a bit of vanilla per the instructions my mother called back over her shoulder on one of her frenzied trips through the kitchen. I snapped the metal beaters into the electric hand mixer, lowered them into the cream and flipped the switch. I watched with fascination as the cream thickened and rose towards the rim of the bowl. It wasn't long before I had the results I expected: the cream stood in soft, fluffy peaks when I lifted the beaters from the bowl. I decided to keep going to make it even better. Within a minute or two my pretty white peaks were gone and my perfect whipped cream was now yellowish blobs and watery liquid stuck to the bottom of the bowl. I called for my mother, already on her way back in to check my progress. She looked into the bowl, frowned and yelled, "You made butter!" I was confused and replied, "No, I made whipped cream but then something happened to it." Eventually I was able to get her to explain to me what had happened. My mother was a farm girl and couldn't understand that I didn't know how butter was made. I, on the other hand, was raised in towns and cities and had no idea that whipped cream could be transformed into butter just by beating it long enough. I had never even thought about it.

While I was horrified that I had ruined the whipped cream, I was filled with wonder and fascination that I had made this other substance without even trying. Butter, so familiar, such an everyday household thing, yet I had never thought about who made it or how. I knew that it was a dairy product and had some vague notion of people in the

“olden days” churning butter, but that one could create it purely by accident was amazing to me.

That a person could eat butter nearly every day and have no idea where it came from was incomprehensible to my mom, but it wasn't my fault. The skills and knowledge of butter-making were not passed on to me by family members nor was it taught in school. Granted, butter-making is not essential to know in this country in this day and age. Butter isn't even an essential part of our diet although most people would not think of doing without it. Does that mean that butter is not important? Of course not, it has economic, culinary and cultural importance. What about the knowledge and skill of how butter is made? My guess is that many people would answer that question with “No, it isn't important for people to know how to make butter.” In this country, we usually have some knowledge about the natural origins of the finished products we use and consume, for example the fact that butter is a dairy product originating with cows. But what happens in between is a yawning chasm in most people's knowledge.

The butter story is a simple, convenient way to look at this chasm, this gap, this separation of modern humans not just from nature but from our natures as human animals. Butter is not an unexplained mystery of nature like a black hole or how many species of insects there are in the world, but it is an example of human ingenuity. Humans somewhere in history accidentally caused and observed the phenomenon of butterfat coalescing from cream. What was done with this observation/discovery is the important thing. These clever ancestors found that this substance was good. It kept longer than the cream it came from and traveled better. It supplied them with calories needed for survival and flavor for their simple diets. It was a useful, important innovation that humans found

important enough to pass on to others. It also connected them to the milk-giving animal: and its care, the pasture it grazed upon, the water it drank, the wild animals that preyed on it and all the other systems that were in a direct or distant way a part of the milk our forebears made into butter.

The point is that I feel it is important to give students the whole story from natural systems to human systems. We teach children about cows and farms and milk and we teach them about towns and cities and streets and stores where the butter, the finished product, is sold. But what happens in between? What is missing is the human part, how humans as a species have provided for themselves throughout history. How we accomplished an astounding feat of survival despite being slower and weaker than other predators and equipped with relatively dull senses. Neither were we gifted with the benefit of sharp claws and teeth or fur or blubber for warmth that our fellow mammals had.

In its most basic sense it is the story of how humans used their intellect, imagination and ingenuity to adapt, survive and thrive in environments populated by, at least physically better equipped species. To skip the middle part is to pass over what should be essential knowledge of our human natural history. It's a story of what makes us special as a species, and we should all know that story. Each time a student participates for the first time in the catching of a fish, the building of a fire or even the transformation of cream to butter they are reliving a discovery made by an ancient ancestor, experiencing the kinship of creative problem-solvers, taking their place in a long line of dexterous thinkers who imagine, discover and create to survive.

The butter making is just a convenient example of the types of knowledge and skills humans once commonly had and used out of necessity. While we still need many of these products, we no longer need to make them for ourselves and consequently lose the knowledge of how to make them. With the loss of this knowledge, I fear we lose many other things important for humans to have. We lose the ability to do for ourselves, and entrust unknown “others” to provide us with goods and services to meet our most basic and vital needs. Wendell Berry in his essay, *The Idea of a Local Economy* says “What has happened is that most people in our country, and apparently most people in the “developed” world, have given proxies to the corporations to produce and provide all of their food, clothing and shelter” (2001, p. 13). In addition to our self-sufficiency being diminished by this system, I believe that we also lose the sense of satisfaction and pride when we have accomplished a task to benefit ourselves or our family.

This is not to say that we should all begin building our own houses and killing our own food. But by losing all control of the goods and services, for which we could substitute the words, necessities and skills, we need and use daily, we lose the insider’s expertise to judge what makes a product “good” simply because we do not possess the skills to make it ourselves or even have knowledge of those skills. Gone too, for many of us is familiarity with the natural materials in our environment, our habitat, for making the things that we need. What breed of cow’s milk will make the best butter? What species of tree is best for boat building? How do we dispose of our waste to protect our water supply? While butter, boats, waste disposal and clean water are part of modern human life, the knowledge of how these things come to us are not. The cumulative effect of these losses renders us unconnected to and unaware of the natural cycles of which we are an

inextricable part. These missing things connect us to who we are as species, to each other as part of the human family and to the environments that we inhabit.

The Thanksgiving accidental butter story is one that I repeat to hundreds of students every year for the classes I teach at the Science Museum of Minnesota. I tell it as an introduction to butter-making which is part of many of my classes from chemistry to mammals to science-fiction writing. Why do I feel the story is worth sharing? First, story telling is a fun way to focus student attention and I think all kids like to hear about adults as children, especially the adult's "imperfect" child moments. Second, there is the story itself. I feel that nearly every student in the room knows they could have done the same thing had it been their job to whip the cream. The story appeals to a collective consciousness. Third, most are amazed, as I was, at the origin of butter so they are eager to try their hand, and discover for themselves. "Story, like beauty, is a powerful connector. A good story is honest, universal and sensory." (Waterhouse, 2002, p. 241).

In the many years since I first began using butter-making and other sorts of human heritage skills, I notice students in every class from preschool to middle school responding in very similar ways to what they experience. Verbal and behavioral responses vary little from class to class. I began to take note of these response patterns and began jotting them on my lesson plans so I could look them over later. I began to think that perhaps the impulse to imagine, design, create and build is hard-wired into the human brain as a survival skill and as such, we humans, all humans, derive pleasure and satisfaction from the things we make.

The butter making activity, like so many others that involve creating a product from natural materials, taps into what I have come to believe is a shared response, a universal

relevance for students which provides an educator with a jumping off point for student engagement that crosses all boundaries. The only experience a student needs to bring to class is the human experience. They belong by virtue of their membership in the human family. Where or how doesn't matter, what is needed to be engaged by what I have come to call by the cumbersome title of "human natural heritage," is something every student is born with and carries with them their entire lives. Jeff Bickart, primitive technology expert and professor of natural science at Sterling College in Vermont says,

"Each one of us, every single person on this earth, has ancestors who knew how to break rocks.... Each of us is the descendant of consummate basket-makers; of skilled builders in bark, grass, mud, snow, stones, skins, leaves, poles ...our essential humanness was formed during our evolution in this way of life [as hunter-gathers], that is who we still are, and that we must bring into our lives now some of that heritage if we are to truly reconnect with nature" (2002, p. 29).

Human Natural Heritage

What is meant by the term human natural heritage? It is a complex subject, which, like many things, cannot be adequately described by a few words. I am wary of terms and labels in general; over time, they tend to reduce or change the meaning of what they are meant to describe.

Yet, the subject must have a name. To begin on the right foot, here is what I mean by human natural heritage. It's useful to work backward to give the most difficult to define element its due. Begin with the word "heritage". The American Heritage Dictionary offers three definitions for heritage. The first of these is: *Property that is or can be inherited; inheritance*. Initially I did not feel this was the right meaning for my purposes. I was troubled by the word "property" because I wanted to talk about the nature of humans, not the things they own. The same dictionary defines "property": *a*

characteristic trait or peculiarity and special capability or power; virtue. In the end, I decided that the first definition actually adds more clarity, not less.

The definitions from the American Heritage Dictionary for the word “heritage” are: *something passed down from preceding generations; tradition. The status acquired by a person through birth; birthright.* By virtue of these definitions, human natural heritage is a human birthright, one passed down and on by preceding generations. It is the inheritance of our human properties, our traits, characteristic and peculiar to humans, our special capabilities, powers and virtues.

As for the word natural in human natural heritage, a “natural” heritage would be one that is inherent as opposed to acquired. Humans present in and produced by nature as other organisms are.

Certainly the most difficult element to define is “human.” The likelihood of finding 100 random humans to agree on a satisfactory definition of themselves as such is small indeed. Ideology aside, for the purpose of this study it is important to ask, what are humans?

Biologically speaking, human beings are animals, unique in our own human way but animals, none-the-less. As animals, we have many of the same basic needs as other large mammals: we need to keep our body temperature constant, take in nutrients frequently, shelter ourselves from the elements and stay well hydrated. A glaring uniqueness of the human species is its physical disadvantage in relation to other mammal species. Why do *Homo sapiens* lack a workable coat of fur to preserve precious mammalian body heat? Why do we lack the speed, strength and senses present in our fellow mammals to aid us in procuring sustenance? Perhaps more compelling is how human beings have responded

to the challenges posed by these handicaps. What humans don't have physically they have more than compensated for with intellect. Human beings are masters of using what they have to make what they need and what they have is the materials available in their living environments: plants and animals, water and air, stone and earth. They discovered, experimented, fashioned and utilized. Because of these original basic skills they survived and thrived as a species. They took what they knew and added on to their knowledge, innovating, improving, streamlining, and then passed the knowledge and skills on to others.

In short natural human heritage can be defined as: The inherent human impulse to create for survival, pleasure and meaning. So it follows that a natural human heritage lesson would be one that usually involves making things, usually useful things. Deep in our human genes is the ancient affinity for “making things,” the things that we need to survive. Honed by millions of years of natural selection, making us all what we are: human beings, *Homo sapiens*, wise man. The pool from which to draw is deep. Any food, clothing or shelter tradition would do, from bread-making to gardening. Or it could be pottery, carpentry, sewing, fire-building. The possibilities are almost endless and the potential benefit great.

As a science instructor for Youth and Family Programs at the Science Museum of Minnesota I have followed my own human impulse to “make things” and incorporated many natural human heritage type activities into my classes over the years. My reasons for doing so were initially based on using food to motivate and engage students.

For microbiology, we examined the action of yeast in bread dough, for chemistry we investigated the properties of sugar by making it into candy. My old standby, butter,

taught about mammal products, fats and accidental discovery and invention. I never tired of using food to teach and the enthusiasm of my students toward what they were doing told me the way to their minds was through their stomachs.

From food I began to include other types of basic human need skills such as clothing and more recently shelter. The clothing lessons started in classes with mammals as their theme. We studied sheep's wool, its history, origin, structure and properties. We dyed it, spun it, felted it and talked of its historical importance to humans. Though they couldn't eat it, wool too was a big hit with students. Again, I was struck by the seeming universality of student responses to the content of these lessons.

Recently I have branched into using the theme of shelter to teach. Archaeology and anthropology are its most obvious applications and I hope to have the opportunity to integrate building materials, weather, climate and physics, math and esthetic values in the coming year.

I am a non-traditional educator with limited student contact. Evaluation of students is not part of my job and as a result I have very little opportunity to evaluate the effectiveness of my lessons. But like most educators I would none-the-less like to know how I am doing. I have made and recorded many observations of students and always look at their work to try and determine their level of interest and retention of the material. I have no concrete way of knowing for sure what is working and what could and should be changed and improved. I have my hunches and philosophies supported by the aforementioned observations and records, but I think I could benefit from the experiences of other teachers in other settings who have used similar types of activities in their teaching. I think it would also be useful to speak to other students, not my own, to find out what

interests them about making things. What do they get out of it? What is the value for them and for educators? If the impulse to create is truly a universal response, as I suspect it is, I think speaking to kids of differing ages and backgrounds that make things can provide some supporting evidence.

I am a science teacher but I am also an environmentalist for lack of a better word. One of my prime objectives as an educator has always been to try and reintegrate nature into lessons and student's lives. I am looking at this study as way to not only improve the effectiveness of science education but also as a way to increase the awareness of learners of their connection to natural cycles. I believe that once this connection is well-established, respect for the natural world, an appreciation for its complexities and an understanding of our place in it will follow.

I am also curious to find out what other benefits and values there are to be gained by incorporating natural human heritage knowledge and skills into curricula. The question that will guide my research is, *How does the inclusion of human natural heritage, specifically the impulse to "make things" add value to curricula?*



CHAPTER TWO

Literature Review

In this review I begin with an examination of research and literature that explores the nature of human past from an evolutionary/biological standpoint in order to better understand its present. What have educators, anthropologists, psychologists and other researchers found out about us as species and what is the value of what has been learned? The next step was to take a look at the types of educational practice that I believe take into account the human characteristics shaped by nature and therefore common to all of us and of great value to educators. These include indigenous knowledge, place-based education, and Waldorf education. What are the philosophies of these pedagogies and what evidence is there that they are valuable? And, of course how do they help me to find answers to my research question and support or weaken my arguments for the value of including human natural heritage in curriculum?

Human by Nature – An Ecological/Evolutionary Perspective

In 1965 Jerome Bruner led a group of zoologists, anthropologists, psychologists and other experts in their fields, including a young Howard Gardner, to devise “Man: A Course of Study” for upper elementary students. It came to be known as the MACOS project. The MACOS project focused on, in Bruner’s words, “man ... his nature as a species, the forces that shaped and continue to shape his humanity. Three questions recur throughout: What is human about human beings? How did they get that way? How can they be made more so?” (1971, p. 57). Bruner lists the sources of “humanization” as tool-

making, language, social organizations, the management of the prolonged childhood of humans and the human urge to explain. Bruner is quick to point out that these forces of humanity are not airtight or easily compartmentalized due to the complexity of human kinship. He recognizes that young students and perhaps adults as well will have difficulty appreciating the relevance of tool-making or language in human evolution, "... without first grasping the fundamental concept of what a language is. These are not self-evident matters, even to the expert." (ibid., p. 57). MACOS made use of contrast in the form of film of non-human primates, in this case baboons and "primitive" people, Netsilik Eskimos "...to help children achieve detachment from the all too familiar matrix of social life..." (ibid., p. 58).

Raised as humans, we seldom question what it means to be one. We see things from a human perspective because we have no other. But we do, as thinking, reasoning, imagining creatures, have the ability to recognize that there are other perspectives to consider, examine, and finally compare and contrast with our own. Bruner states, "We traffic in inductive propositions: for example, the different activities of a society are interconnected such that if you know something about the technological response of a society to an environment, you will be able to make some shrewd guesses about its myths or about the things it values, etc. We use the device of significant contrast - as when, in linguistics, we describe the restricting traditions of a baboon troop to always stay within a given range - in order to help us recognize the system of reciprocal exchange of a human group, the former somehow provoking awareness of the latter." (ibid., p. 60).

Here Bruner refers to universalities in the ways that humans process information and sort out its relevancy to their lives in their places.

During the course of MACOS, in which students watch film of the life-ways of the Netsilik people, Bruner observes that at first the students are critical of the appearance and behaviors of the Netsilik as their clothing is made from animal hides which they view as “crude.” The students also judge the hunting and killing of animals for food as “cruel.” But as time goes on, the children show a change of perception in their discussions, finding beauty in the braids of the family’s daughter and admiration for the way the family provides for themselves in their harsh environment. Bruner calls it “The experience of discovering kinship and likeness with what at first seemed bizarre, exotic and a little repellant.” (Bruner, 1972, p. 64).

Bruner’s ideas about the relevance of education wisely include human culture without neglecting human biology. He states:

“Two things, it seems to me can keep us mindful of both universality and cultural diversity. The first is an appreciation of the universals of human culture, which revolve most often around reciprocal exchange through symbolic, affiliative, and economic systems. But beyond the universals of culture, there are the universals in man’s primate heritage. The primate series illustrates to an extraordinary degree the emergence of curiosity, play, planfulness, anticipation and ultimately the ways of seeking, transforming, representing and using information that characterize the human species. Theories of human development are guides for understanding the perfectibility of man as well as his vulnerability. They define man’s place in nature and signal opportunities for improving or changing his lot by aiding growth. A theory of development that specifies nothing about intervention is blind of culture. One that specifies only intervention is blind to man’s biological inheritance.” (1965, p. 154).

Bruner’ work on the MACOS project is remarkable for its appreciation of cultural diversity and its understanding of the ways that human beings learn. For Bruner, at least in 1965, the characteristics of humans included tool-making, language usage, social organization, management of the relatively long childhood of offspring and the impulse to explain things. These characteristics find their modern equivalents and more in several

bodies of research.

In his book, *The Basic School, A Community for Learning*, Ernest Boyer discusses what he terms “core commonalities” which are universal human experiences. By focusing on eight core commonalities which all human beings possess, educators can help students to recognize relationships and patterns and be able to apply their learning to their own lives. The core commonalities allow students to discover relationships across disciplines, resulting in less disjointed and more connected learning. Boyer adds that “Students learn as well, that the human experiences we all share are lived out in very different ways from one culture to another” (1995, p. 86). Boyer summarizes the core commonalities as follows:

- we all share the sacredness of life,
- we all send messages to each other,
- we all belong to groups and institutions,
- we all place ourselves in time and space,
- we all respond to the aesthetic,
- we’re all inseparably a part of nature,
- we’re all engaged in producing and consuming,
- we all seek to live with purpose.

There is certainly much overlap of Bruner and Boyer’s ideas about the nature of humanity with regards to social structure, the need to make meaning and the use of language. Bruner makes certain to give our evolutionary history its due, while Boyer speaks from a more social standpoint.

For my own study, I am very interested in researching how our natural heritage informs our social/cultural attitudes and how it might direct student interests, motivation and attitudes toward what they learn and how they feel about themselves and their accomplishments. In traditional scientific research feelings are excluded as too subjective

and therefore not part of the objective rigors of scientific research. However a study of human beings would not be complete if we ignore the emotions which direct much of human thought and action. In the introduction to *Children and Nature, Psychological, Sociocultural and Evolutionary Investigations*, editors Peter J. Hahn and Stephan R. Kellert assert "...we take as a starting point that humans are biological beings with an evolutionary history and that any comprehensive account of children and nature must dovetail with and then build from this evolutionary basis" (2002, p. viii). Bruner similarly states "We are primates and our primate heritage affects our growth." [By this he means biological maturation]. All cultures must work on the stuff of the biological organism, specifically on man's primate constraints" (1965, p. 50). This is the "natural human" of natural human heritage, the biological being whose body and mind was shaped by evolution within our natural environments.

Proving evolutionary connection to modern human behavior and tendencies is undeniably a tricky proposition. Like Bruner, Peter Verbeek and Frans B. M. de Waal attempted to gain perspective and provide evidence of the connection by including nonhuman primates in their study, *The Primate Relationship with Nature: Biophilia as a General Pattern*. The questions Verbeek and de Waal asked were "How can we best describe our evolving place in nature? To what extent does our relationship with nature affect us, both as a species and as individuals?" (2002, p.1).

Using the perspective of E. O. Wilson's "biophilia hypothesis" (Wilson, 1984) which proposes that humans, and in this study, non-human primates, have a genetically-based affinity for other living things. Included in biophilia is an emotional response component. The response which may be either positive or negative is linked to adaptive behaviors

that have allowed us to survive to this point in our present form. An example of a negative response would be the innate fear of snakes common both to humans and non-human primates. Wilson argues that evolution shaped this fear response to snakes which are often venomous and therefore a threat to survival. In this respect, emotion serves a living thing's prime directive; survival.

In their research, Verbeek and Waal propose that "If biophilia is rooted in our evolutionary past, it is reasonable to assume that it may have originated in the ancestry we share with currently living primates" (2002, p.1). The point being that if aspects of biophilia could be detected in the behaviors of non-human primates, then studying those behaviors as they manifest themselves as a relationship with nature, it could tell us something about our own relationship with nature. The authors of this study are particularly interested in how this relationship with nature presents itself in childhood.

So what is the evolutionary purpose of biophilia other than a wariness of the potential danger of a snake? Verbeek and de Waal's study cites an increasing body of research that supports the suggestion that nature has a significant psychological pull on humans that is both cognitive and emotional. Children as young as six will sort natural from human-made materials (Wohlwill, 1983). Why do we pay so much attention to natural things? And why do non-human primates share this behavior? From a survival standpoint, being able to unconsciously and automatically recognize things that are alive is advantageous. Existence is based on being able to find food, mates, and avoid danger. Living things are potentially all of these. An interest in living things leads to exploration, which facilitates discovery of meaning and value in the natural world.

Both humans and apes are skilled at putting knowledge accumulated through

investigation and discovery of the natural world to sophisticated use in skills like tool-making and use of medicinal plants. These are learned behaviors passed on to each generation through social learning mechanisms (Verbeek and de Waal, 2002). “Because tool technology is learned rather than innate and because use and nonuse, or variation in tool technology, does not appear to be linked to environmental factors, primatologists refer to population differences in tool technology as differences in culture” (de Waal, 1999). Verbeek and de Waal conclude that, “... direct perception and the way that the emotions of investigation and discovery (fear, joy, fascination, etc.) mediate learning from and about nature are psychological particularities that we feel are most likely shared by the young of human and nonhuman primates alike” (2002, p. 21).

To fully understand the way that humans learn and why it is necessary to consider our evolutionary background is the ecological-evolutionary perspective. “... to show how conditions experienced in ancestral environments tug at us, sometimes quite strongly, even today” (Heerwagen and Orians. p. 29).

In their essay *The Ecological World of Children*, Judith H. Heerwagen and Gordon H. Orians argue that modern human neural capacities and patterns of response are the result of our evolutionary history. Responses that were positive contributions to human survival were incorporated into our neural machinery and those that did not were eliminated. The responses that Heerwagen and Orians refer to are, of course, responses to biological and physical environments. They further state that “... children’s environmental behaviors should show evidence of specific adaptations to enduring challenges and opportunities, from birth through reproductive age” (2002, p. 29). Thus they predict age-related patterns of behavioral responses. From an ecological-developmental perspective, environmental

information taken in by children is not equally useful at all ages so a child's responses to environmental stimuli would vary with age or developmental ability. The challenges that humans encounter and respond to as they grow are:

- Safety: staying close to sources of help
- Avoiding hostile conspecifics (members of the same species)
- Avoiding topographic and climatic hazards
- Finding refuge
- Avoiding large predators
- Constructing shelter
- Finding the way home
- Foraging and feeding: distinguishing edibles from non-edibles
- Finding a place to live

Heerwagen and Orians state "Throughout their lifespan, children face numerous risks and hazards generated by their environment. However, the specific threats and hazards they face change with age as children become more mobile and more capable, physically and cognitively, of moving about on their own" (2002, p. 35). The significance of this according to Herrwagen and Orians is that these predictable responses of children to the environment may well occur largely independent of personal experience or modeled behavior. "The neural processes that guided our ancestor's behaviors in Pleistocene hunting and gathering bands are likely to still be in operation today" (Pinker, 1997: Cosmides & Tooby, 1993).

This has important implications for educators who want to understand why children have the interests and tendencies that they do at certain ages and stages of development. To try and defeat or work around evolutionary behaviors would be counter productive if not impossible. An understanding of the stages of childhood has always been an important tool for educators and an ecological-developmental perspective attempts to explore and explain the most deeply-rooted human developmental characteristics.

What about older children? In adolescents on the cusp of adulthood, what evolutionary evidence is in their behavior and responses to environmental pressures? Rachel and Stephan Kaplan asked, “Do teens favor natural settings less than others? Do they relate differently than others to natural settings? Do their environmental preferences reflect different patterns of needs and desires?” Previous studies on environmental preference show a great deal of consistency across nations, cultures and settings. (Kaplan and Kaplan, 2002). Adolescents as a group, however, deviated from other groups in photo preference studies in which people grouped by age were asked to rate their preference of scenes depicted in photographs.

Kaplan and Kaplan cite several studies of this type with similar results: adolescent subjects, compared to older and younger groups, had a lower preference for natural settings and a greater preference for certain types of developed areas. The studies showed that teenagers appreciated natural settings, just not as much as adults and younger children. “They favor places where they can be with their peers and activities that convey excitement and action. To the extent that natural settings support these inclinations, they are preferred” (Kaplan and Kaplan, p. 242). If most children begin life with a strong interest in nature and humans who have reached adulthood also enjoy natural objects and places as so many studies have found, what happens in adolescence that causes this “time out” as Kaplan and Kaplan have termed it?

As children enter their teenage years their peer group becomes a focal point in their lives. But is this cultural or evolutionary? Kaplan and Kaplan argue that the two are not mutually exclusive; “We fully agree with Midgley’s (1978) succinct statement to the effect that humans are a species that has evolved to need culture” (2002, p. 245). As they

explore the interaction between culture and evolution, Kaplan and Kaplan focus on the needs of humans, particularly informational needs.

Humans to a large extent depend on information. We need to seek, understand and act upon it. “Considerable evidence suggests that humans evolved to be particularly adroit information processors and that their survival depended on this capability” (Lee & Devore, 1968; Pfeiffer, 1978). It makes sense then, as a teen approaches adulthood that s/he would be drawn to more peer interaction as a way of processing information as they seek to establish themselves in the social order so critical to survival.

In addition to an adolescent’s social drive is her/his affinity for “excitement and action.” This is associated with risk-taking, independence and trying new things, a sort of proving that one is no longer a child, to oneself and to others. Risk taking provides feedback on one’s abilities and limitations which is important information both personally and socially. Kaplan and Kaplan cite another adolescent informational need, and that involves taking action. “The motivation to act in an effective way, although relying on understanding and exploration, is perhaps an even more basic human need. From an evolutionary point of view, a complex and powerful brain is of no consequence unless it can lead to adaptive action” (2002, p. 247).

So what motivates one to take action? To Kaplan and Kaplan, it is something they call “meaningful action.” Meaningful action is a collection of actions which are adaptive with regards to resources, goals and requirements of the group of which one is a member. Meaningful action is activity or accomplishment that makes one more valued by one’s group. By being a valuable member of a group, one gains the social support to assure one’s place and membership and thus one’s survival.

The adolescent time out, the focus on self and peers that decreases a teenager's attraction for natural environments, is temporary. As an adolescent achieves autonomy, social support and acceptance, it is adaptively advantageous for an interest in natural environments to become reestablished. Historically, with the onset of adulthood, these young humans shift attention to providing for themselves and others, looking to their natural environments for the means to do so.

The ecological-evolutionary perspective of Heerwagen & Orians concludes that children's developmental stages are grounded not only in experience and culture but also in evolutionary history and that these stages unfold in a predictable pattern of adaptive behaviors related to survival. Similarly, the work of Kaplan and Kaplan explores adaptive behaviors of adolescents as they make their transition to adulthood. How these behaviors mesh with culture forms the basis for the adolescent "time out" in preference for natural environments while the focus shifts to establishing oneself as an individual and as part of a social group.

For educators that work with this age group, Kaplan and Kaplan suggest that nature-related programs and activities be structured to meet the needs of adolescents with regards to peer interaction, self-determination and displaying competence as these are most likely to qualify as "meaningful action" from their perspective. "We strongly suspect, that participants in such activities gain familiarity and comfort with the natural environment, which will serve them well as the time out years give way to adulthood" (Kaplan and Kaplan, p. 253).



Human Universals

According to evolutionary science and more recently molecular anthropology, all humans share a common ancestry. We are one race of primates that on one hand exhibit a great deal of diversity in both physical appearance and culture. On the other, we humans have a set of species-specific behaviors, tendencies and characteristics as other animals do. These “human universals” as I have termed them, identify and connect us all as members of the human family.

So what are these universals and what is the value of them for educators? To recall Ernest Boyer’s Core Commonalities in *The Basic School*, “These eight commonalities, based on shared human experiences, integrate traditional subjects, helping students see connections across the disciplines and relate to what they learn to life” (1995, p.81). I have borrowed from Boyer’s commonalities to identify five human universals that I believe form the basis for human natural heritage. The five human universals are identified as follows:

- humans are inseparably a part of nature,
- humans respond to the aesthetic,
- humans seek to make meaning,

- humans use language,
- humans belong to groups,

What follows is a more detailed description of what is meant by each of the human universals listed above.

Humans are inseparably a part of nature.

Most scientists working in the field of paleoanthropology and more recently genetics agree that humans evolved in Africa about 200,000 years ago. Mitochondrial DNA is passed intact from mother to child without the gene shuffling that happens when male and female DNA combine to produce offspring. By studying this mtDNA, as it is called, scientists have calculated that all humanity is linked to one woman who lived in Africa 150,000 years ago. Regardless of how we perceive ourselves through the lenses of our respective nationality, culture or ideology, every human being on this planet is at least 99 percent genetically identical to every other (National Geographic, March 2006, pp. 62).

We arrived in our present form shaped by the natural world in which we evolved. Nature dictates our physical and psychological needs and has made us what we are. Edward O. Wilson has hypothesized that modern humans still retain a preference for a habitat like the one in which humanity evolved successfully, the African savannah. Not just the human body but the mind as well is predisposed to recreate the original human environment;

- Open savannah which provides a clear view and abundant food sources
- Some topographic features such as cliffs and hills to serve as vantage points and shelters

- Lakes and rivers as sources of food and water and as natural barriers from predators



Open savanna, the original human habitat.

Photo: Geoff Grant

“...the landscape architects and gardeners, and we who enjoy their creations without special instruction or persuasion, are responding to a deep genetic memory of mankind’s optimal environment. That given a completely free choice, people gravitate statistically toward a savanna-like environment” (Wilson, 1984, pp. 111). The choices that we humans make about where we live and spend our time are determined by genetic preference of the habitat in which we were successful and thrived. These choices are made by and large because of how these places make us feel and the aesthetic values we assign to them. These values come from our human genetic connection to the natural world which shaped our bodies and minds.

Humans respond to the aesthetic.

What is the evolutionary purpose of the human attraction to and appreciation of what

we call beauty? What do we find aesthetically pleasing? In his book *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature*, Geoffrey Miller states “Our sense of beauty was shaped by evolution to embody an awareness of what is difficult as opposed to what is easy, rare as opposed to common, costly as opposed to cheap, skillful as opposed to talentless, and fit as opposed to unfit” (2002, p. 76). While Miller speaks of the aesthetic as the means by which we identify the best genes for mate selection, this definition could also be expanded to the ways human beings perceive other things in nature as beautiful and how they learn to equate beauty with quality.

Beauty is in the eye of the beholder the old saying goes. What does the human eye behold that it finds aesthetically pleasing? As far as we know, beauty is a human construct but what are the criteria for beauty? What do all humans find aesthetically favorable? Scott Russell Sanders describes beauty this way, “I sense in these momentary encounters a harmony between myself and whatever I behold. The word that seems to fit most exactly this feeling of resonance, this sympathetic vibration between inside and outside is beauty.” Of the human response to beauty, Sanders continues. “It may be that in pursuing beauty we are merely obeying our genes. It may be that the features we find beautiful in men or women, in landscape or weather ... are ones that improved the chances of survival for our ancestors. Put the other way around, it’s entirely plausible that the early humans who did not tingle at the sight of a deer, the smell of a thunderstorm, the sound of running water, or the stroke of a hand on a shapely haunch, all died out, carrying with them their oblivious genes” (Sanders, 1998).

While Sanders’ words ring true for many there is research to back up some of what he says. Recall Verbeek and de Waal’s study of non-human primates in which they

mention instances of chimpanzees reacting to an encounter with a dramatic waterfall “.... as a mixture of silent contemplation and euphoric celebration” (2002, p.17). Jane Goodall noted that during heavy rain, chimps’ activity was depressed as though they were waiting out the storm. Another observer documented the activities of a group of captive mandrills clustered around a live toad in their enclosure. They observed and gently touched the toad, apparently captivated by the creature. Eventually they let it go, unharmed.

Are the chimpanzee’s responses to the waterfall and heavy rain and the mandrill’s fascination with the toad the “tingles” for the sound of running water, smell of a thunderstorm or sight of a deer that Scott Russell Sanders spoke of? Or are they just adaptive primate responses to their environment that make good survival sense? Or are they one and the same? Recognition of what is good and life-affirming is perhaps what an appreciation for beauty is; a means by which primates gain and use information from their environments to enable and enhance their fitness and therefore their ability to survive.

In his book *Biophilia: The human bond with other species*, Edward O. Wilson discusses beauty as natural law marked by *elegance*. Elegance in the scientific world is theory that provides the “...maximum amount of information with the minimum expenditure of energy” (1984, pp. 60). Beautiful, elegant explanations are the product of a brain that processes an enormous amount of information out of necessity. To sort through the chaotic jumble of sensory input, the human brain had to evolve to be discerning in what is important and how to most quickly and efficiently make sense of what is perceived. As a result, the human mind specializes in categorization, analogy and

metaphor, things all closely related to art as well as science. Wilson: “The symbols of art, music and language freight power well beyond their outward and literal meanings. So, each one also condenses large quantities of information” (ibid., pp. 74). Wilson goes on to say “... these esthetic contrivances give pleasure. Put in more mechanistic terms, they play upon the circuitry of the brain’s limbic system in a way that ultimately promotes survival and reproduction” (ibid., pp. 61). The human response to the aesthetic has a physiological basis.

If the limbic system of the human brain is involved then it would follow that emotion is part of the universal human response to beauty. One of the limbic system’s main functions is to mediate the emotions of investigation and discovery of the affordances of nature as well as play an important role in the social interaction of primates (Verbeek & de Waal, 2002). Paul Krapfel, in his essay *Deepening Children’s Participation through Local Ecological Investigations*, observes that his students emotionally bond with the leaf or flower they are caring for and discusses the importance of students fusing intellect and emotion. He quotes Henri Bortoft, a teacher of physics and philosophy, “In a moment of intuitive perception, the particular instance [that particular flower and its place within the sequence] is seen as a living manifestation of the universal [the fascinating process by which flowers develop into seeds]....As an authentic discovery, this moment can only be experienced directly; it cannot be ‘translated’ adequately into the verbal language of secondhand description” (in Seaman and Mugerauer 1989, 299). (pp. 56).

Beauty implies attraction and positive experience. Negative aesthetic experiences carry value also. Many things that humans find almost universally unattractive, such as

spiders and snakes can be dangerous. We seem programmed to find them repulsive, at least initially (Heerwagen & Orians, 2002). Evolution programmed responses to spiders and snakes manifest themselves in human behavior with negative language and avoidance behaviors. Inclement weather is perceived as “bad” weather as it can bring about hazardous conditions and interferes with important human activities such as finding food.

To philosopher Immanuel Kant, aesthetics dealt with judgments about the beautiful and agreeable as related to the experiences of pleasure and displeasure (Wickman, 2005). Perhaps in a more evolutionary sense, aesthetics deal with judgments about the beneficial and benign as related to the ability to survive and thrive. The human tendency to assign aesthetic values, both positive and negative, serves to make meaning of sensory information. Aesthetic judgments help us categorize information so its meaning is easily and quickly understood by ourselves and others. They evoke the appropriate emotion, fear, elation or attachment for instance, in order to bring about the optimum adaptive response.

In his research on aesthetics and its role in meaning-making in science education, Per-Olof Wickman observed, “...aesthetic experiences could be seen to partake in transforming and making diverse situations continuous and so in learning science. More generally, aesthetic experiences also followed recurrent patterns of action, which could be said to form habits. These habits apparently constitute more general human patterns, existing beyond science education, and as such they should be crucial in making science continuous and meaningful with life generally” (2005, pp. 136).

Humans seek to make meaning.

Simply stated, our senses are the means by which we experience the world and take in information. What we do with that information is anything but simple. The complex organ that is the human brain processes enormous amounts of information over the course of a lifetime. It is necessary to our survival to sort what is useful from all this information, discard what is not, and form and attach values to make sense of and use the sensory input we receive from the world around us. At its most basic level, “meaning-making” is taking information and figuring out what to do with it. This is accomplished by what Bruner describes as “...models or theories those human beings build to render varieties of experience into some manageable and economical form” (1965, p. 17).

Meaning-making is the stock and trade of the educator. An effective educator strives to introduce students to information and experiences that are meaningful to them. To better understand the ways in which humans make meaning, Stephan Kellert’s description of the three modes of learning in child development is useful.

The first of these is *Cognitive development*, which emphasizes the development of thinking and problem solving skills and the formation of causal relations. The cognitive mode forms a sort of the “basic skills” for meaning-making, providing the tools for discerning what is significant and meaningful.

The second mode is *Affective development*. The affective mode focuses on the emergence of emotional capacities. Emotions affect a child’s willingness to receive and respond to information. “Delight, elation, and affective engagement appear to form a crucible in which the child and later adult shape and mold an inclination for creativity

and discovery” (2002, p. 127). So important, Kellert asserts, is the affective mode in learning situations “... that it precedes intellect as a basis for maturation and development.” He quotes Iozzi (1989a, 1989b, p. 5), “Significant evidence [exists] that the affective domain is the key entry point to teaching and learning.”

The third learning mode is *Evaluative development*. Evaluative development stresses the creation of beliefs, morals and values. Included in the evaluative mode is aesthetic, symbolic and spiritual interpretation of information (Kellert, 2002).

These three modes of learning demonstrate the complex ways that humans process information to make meaning. Many factors color these meanings: learning, culture and experience, the diverse ways in which humans interpret process and express information. Despite the diversity in the human quest for meaning, some things remain universal. Every culture creates art, uses mythology and symbols to communicate deeper, archetypal meanings that transcend place and time and resonate for us all. Bruner said,

“Man creates theories before he creates tools. His capacity and skill for catching the invariances of the world around him probably underlie not only his success as a tool user but also his use of that powerful instrument for expression and thought: human language. His myths, his art, his ritual, his sciences are all expressions of this deep-lying tendency to explicate and condense, to seek steady meaning in capricious experience” (1971, chap. 1).

Humans use language.

Sharing information is the logical offshoot of meaning-making in a social species. Just as honey bees dance to communicate the location of a food source to other members of their colonies, humans have their methods of passing acquired information to other humans.

In his book *The Impact of the Gene*, Colin Tudge states that all human beings share the ability to learn their own language with all its quirks, within the first few years of life, merely by being exposed to it "... given only a minimum of always rather scrappy clues. All human beings do this, in the absence of gross pathology. No other creature can" (2000, p. 175).

Ernest Boyer (1995, p.p. 65) describes language as central to learning and defines it broadly to include not only words, but mathematics and the arts as well. These three symbol systems are unique from one another yet closely related. Boyer breaks down his definition of the three components of language this way.

The language of words includes oral and written communication. When sounds and words are put in a larger context language takes on meaning.

The language of mathematics is universal, transcending individual language barriers and is the one we use to explore quantity, space, time and patterns. Through mathematics humans find order, beauty and consistency.

The language of art, like mathematics, is universal. Through the language of art, humans can communicate feelings and ideas where words fail. Art develops our intellectual, emotional, and aesthetic capacities.

The complexity of human communication undoubtedly has its origins in our social hunter/gatherer past. The ability to process information and transfer it to others would have been an adaptive advantage in survival imperatives like cooperative hunting and skill acquisition. Language facilitates passing on vital information for identifying, warning, directing, instructing, and interacting. The human ability to communicate is responsible for establishing or strengthening relationships with others that have sustained

humanity through the ages.

As social animals, humans have evolved to be interdependent. Our ability and predisposition to send and receive messages, to teach and learn, and to derive meaning from others of our kind is the hallmark of a species that lives, works and creates together.

Humans belong to groups.

From birth, humans are a part of a group, first the family they are born into. We are also born into the larger human family. A solitary animal like a porcupine lives in relative isolation from its fellow porcupines. Interaction with others of its species occurs only briefly to mate and for the female to raise her brood to independence. At which time mother and offspring all go their separate ways to carry on the solitary porcupine lifestyle. By contrast, shortly after birth, humans will likely become a part of other human groups in addition to the family unit. Extended family, friends, and religious institutions are among the first groups that humans fall into. As children grow they form new relationships, have new experiences and become members in an increasing number of groups. Ralph Waldo Emerson said “We do not make a world of our own, but fall into institutions already made and have to accommodate ourselves to them” (Boyer, p. 90)

Theoretically, our ancestors banded together in order to better survive in their environment. The benefits of community included sharing food and the effort required to acquire it, the passing on of skills and knowledge and making use of individual talents for the good of all. Humans cooperated to exploit what their surroundings had to offer, plants and animals, water and soil. They were members of a society of humans and natives of a place.

Although in many places it is hidden under urban infrastructure and modern cultural clutter, human groups still have both a cultural and natural context. In the introduction to *Ecological Education in Action*, editors, Smith and Williams point out that as human values shift from the relationships between people and landscapes to those of the marketplace people tend to seek security not in collective effort but in individual striving (1999, p. 2).

What are the consequences of humans turning away from their communal nature? Smith and Williams go on to say “Neglected in this shift in educational purpose is the role that acculturation and socialization once played in the maintenance of the health of the broader community. In earlier societies, that community often included nonhumans as well as people and a profound sense of relatedness to the land. Individuals were not educated for themselves alone but for what their education would mean to the welfare of the whole” (Smith & Williams, 1999, p. 16).

The Art and Science of Human Natural Heritage

While there are certainly more universal human characteristics than listed here, these five are the basis for the universal nature and appeal of human natural heritage lessons. These are five things important for humans to know and recognize about themselves. Making something useful, beautiful or both is how human natural heritage teaches us about ourselves.

In the Kaplan and Kaplan study of adolescent attitudes towards nature, activities are described as a source of satisfaction that foster autonomy, increase one’s standing in a group, and address the need to seek, understand and act on information. They call these

activities “meaningful action.” They relate meaningful action to resources, individual goals and the requirements of one’s group (Kaplan and Kaplan, 2002.). I would further suggest that these preferences are guided by an aesthetic sense.

Like the human relationship with nature, these five universals are interwoven and inseparable. They are threads of the fabric of humanity, not the only threads, but strong ones which bind us to one another and the natural world. When human beings make things for utilitarian purposes they do so in a uniquely human way. What we call the disciplines of art and science are inner drives that guide us to make what we need. Take, for example, an accomplished weaver planning a blanket. The weaver needs to have knowledge of the sheep and its wool from which the blanket will be made. The weaver will need to identify, collect and prepare the plants to dye the wool to color the blanket. The spinning of the wool into yarn necessitates the use of a machine such as a drop spindle or spinning wheel. So the weaver must have some biological, chemical and physical science knowledge, formally acquired or not, to proceed with the creation of the blanket. The scientist weaver is also an artist whose work is guided by an aesthetic sense of color and design, skillful practice and a sense of purpose. Meaning too may be incorporated into the blanket in the use of representative color or symbols. The finished product is a work of art because of its quality, due to the weaver’s knowledge and skill and by the meaning it communicates as a useful, beautiful and symbolic object. It is in our heritage to appreciate such things. Art and science are inseparable in the human psyche. They have been teased apart and given the separate labels of “art” and “science” but in our minds they function together as part of our natural biological/evolutionary heritage.

Art and science are important human constructs rooted in the human universals.

When separated they often became adversarial. Take for instance this quote of Per-Olof Wickman, “ ... although the aesthetics of artistic activities might sometimes be more immediately understood by students, it is not a matter of course that they are helpful in learning science, including its cognitive and normative as well as its aesthetic sides” (Wickman, 2005, p.159). Wickman is a proponent of including aesthetics in science but it is his belief that the discipline of science is not only separate from the discipline of art, but that the aesthetics of each are different and should be kept separate. Contrast this point of view with that of Edward O. Wilson who states “The two vocations [art and science] draw from the same subconscious wellsprings and depend upon similar primal stories and images. The aim of art is not to show how or why an effect is produced (that would be science) but literally to produce it” (Wilson, 1995, p. 62). Do these two scientists agree that art and science should be separate? It is difficult to tell.

Wendell Berry makes his position clear and takes exception with the “two cultures” of art and science, and especially to what he perceives to be Wilson’s view that art and science should conciliate on the terms of science.

“ ... once we have cracked the code of academic convention we can see that ‘science’ means knowing and ‘art’ doing, and that one is meaningless without the other. Out of school the two are commonly inter-involved and naturally cooperative in the same person – a farmer say, or a woodworker – who knows and does both at the same time. It is not possible to imagine a farmer who does not use both science and art” (2000, p. 124).

Science and art both suffer from perceived and real snobbery and elitism which seems to be what Berry is talking about here when he references “...the code of academic convention.” As they are related to the acquisition of food, clothing and shelter art and science are by and large considered “folksy” pursuits, implying they are quaint but

outdated and unnecessary in the modern world. There is also the less flattering perception that these sorts of skills are backward and menial, carried out by the uneducated and somehow beneath most of us.

With industrialization and affluence, many people did not “do for themselves” much anymore. Initially slaves and servants did the work of procurement of food, clothing and shelter. Later, human heritage skills became relegated to service people and the lower classes such as farmers and laborers. There is the common perception that weaving a blanket or crafting a chair from wood are not art but a hobby or craft. There are those argue there is no real art or science in natural human heritage skills and knowledge.

Does the knowledge once so vital to human survival have relevance today? Is there evidence of its value for modern humans? If we don't have to grow our own food and knit our own socks, why should we teach or learn these skills? There is no doubt many craftspeople find deep satisfaction in making things and so would answer “yes” to these questions. They would have a variety of reasons for feeling this way but their answer would still be yes. For the educator, however, how and where does one begin?

I began with indigenous knowledge. The knowledge of indigenous cultures provides a window to the past, a glimpse of the natural history of a people, their place, and the origins and importance of the things they made. It is in essence the knowledge that shaped our natural heritage.

Two other methodologies emerged from this literature review that incorporate significant aspects of human natural heritage.

They are:

- Place-based education
- Waldorf education

Indigenous knowledge.

“Indigenous knowledge” encompasses a large body of information and skills held by long-resident peoples of an area. Often indigenous knowledge is used interchangeably with the term “indigenous science.” Indigenous science as defined by Ogawa (1995), is “... a culture-dependant collective rational perceiving of reality, ... where collective means held in sufficiently similar form by many persons to allow effective communication, but independent of any particular set of minds.” (ibid., p. 588).

Indigenous science, sometimes called ethnoscience, has also been described as “... the study of systems of knowledge developed by a given culture to classify the objects, activities, and events of its given universe” (Hardesty, 1977). It is the science knowledge of long-resident, usually oral-culture peoples, closely tied to place and characterized by close contact with the natural world. Within the scope of indigenous knowledge is “traditional ecological knowledge” or TEK. TEK is referred to as a “a subset of indigenous science...which is both the science of long-resident oral culture peoples and a biological sciences label for the growing literature which records and explores that knowledge” (Snively and Coriglia, 2000.) (8).

The knowledge systems and life-ways of indigenous peoples are closely interwoven and not easily compartmentalized into “subjects.” I prefer the term indigenous knowledge, as it is broader and more inclusive and reflects the holistic nature of the

knowledge and skills of indigenous peoples. Indigenous knowledge systems are based on acquiring knowledge through direct experience in the natural world, the school of all human ancestors. Knowledge is therefore based in the context of survival. Western notions of competency are typically based upon what a person should know. Competency is measured by indirect forms of testing. In contrast, indigenous competency is based on survival. You either have the knowledge or you don't. Survival is the measure of whether you passed the test or not.

Cajete speaks of the central characteristics of indigenous education as "...an intimate and complex set of inner and outer environmental relationships. This is the relationship to a place... This is not only a physical place with sun, wind, rain, water, lakes, rivers, and streams but a spiritual place of being and understanding" (1999, p. 193). This relationship to place is reflected in indigenous arts and ways of community and in oral stories and metaphor that encapsulate wisdom and knowledge. While entertaining on the surface, such stories contain hidden meanings which can be decoded upon reflection. "These expressions present a window into a whole context of community, with people, plants, and animals being mutually supportive and reciprocally dependant" (Cajete, 1999, p. 194).

Kawagley and Barnhardt (1999), describe four areas in which indigenous understandings can benefit educational practice:

Indigenous View

Long-term perspective

Educational Application

Education must be understood (and carried out) across generations

Interconnectedness of all things	Knowledge is bound to the context in which it is to be used (and learned), and the elements are interrelated
Adaptation to change	Education must be continuously adapted to fit time and place
Commitment to the commons	The whole is greater than the sum of its parts

Researcher June George adds that incorporating indigenous science can:

- Draw upon cultural experience and everyday life,
- Access different ways of thinking about scientific concepts,
- Bridge the gap between the traditional and the conventional (George, 2001).

Values of indigenous science knowledge reflect the focus of survival and putting practice into real-world use. The basis of indigenous teaching is shared experience, reinforcing ties to place and community. “Time-honored values of respect, reciprocity, and cooperation are conducive to adaptation, survival, and harmony” (Kawagley and Barnhardt, 1999, p. 127).

Place-based education.

The Orion Society is credited with coining this term for a pedagogical strategy that seeks to restore ties to the place in which one lives. In the words of David Sobel, “Place-based education is the process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science and

other subjects across the curriculum.” (Sobel, 2004, p.7).

Key characteristics of place-based education include:

- Student involvement in real-world projects within the community
- Integrated curriculum with emphasis on teacher collaboration and project-based learning within the context of the community, inclusive of human, natural and cultural resources.
- Curriculum designed to be appropriate to a child’s own developmental transitions.
- Curriculum that aspires to cultivate and nurture the diverse talents and strengths of each student and those of the local environment and community.

Describing the value of place-based education, Sobel cites “*Closing the Achievement Gap: The SEER Report.*” The State Education and Environment Roundtable (SEER) is a group of education agencies from sixteen states working cooperatively to improve student achievement by using the environment as an integrating context (EIC) for learning. “EIC-based learning is not primarily focused on learning about the environment nor is it limited to developing environmental awareness. It is about using a school’s surroundings and community as a framework within which students can construct their own learning, guided by teachers and administrators using proven educational practices...” (Lieberman and Hoody, 1998. p.7).

The SEER report showed that not only did student science scores improve at EIC schools, as researchers had predicted, but there were improvements in scores across the curriculum. EIC teachers also reported an increase in student problem-solving ability, critical thinking and enthusiasm, while there was a decrease in behavior problems (Lieberman and Hoody, 1998).

Sobel likens place-based education as a tool for “building a three-legged stool” of academic achievement, social capital, [“the willingness and capacity of individuals to work for the collective good of a community”], and environmental quality. The stool will not stand if any of the legs is missing. To do this, Sobel says, “Let’s find schools that want to ground their curriculum in their local places – the natural environment and the social institutions of the town” (2004, p. 48). Place-based education is about connecting people to one another as well as connecting them to their places.

Waldorf Education.

Waldorf education is rooted in philosophies of Rudolf Steiner (1861-1925) who began the first Waldorf School in Stuttgart, Germany in 1919. At the time, Germany was struggling socially and economically after the First World War, the owner of the Waldorf-Astoria cigarette factory asked Steiner if he would open a school for the factory employee’s children. Steiner agreed to do so but insisted on four conditions that were unusual for the day.

They were:

- that it be open to all children;
- that it be co-educational;
- that it be a unified twelve-year school;
- that the teachers, those actually in contact with children, have primary control of the school, with minimum interference from the state or from economic sources (Barnes, 1991).

Steiner's ideas were both spiritual and scientific. In essence he based his philosophy on the premise that spirit, soul, and body "unfold" in developmental stages as a child grows.

These stages occur within three phases:

- Early childhood, when learning is based on experience and sensory input;
- the middle, or elementary years, when learning is imaginative and takes place through creative and artistic activity;
- adolescence, when learning is abstract and intellectually rigorous (Barnes, 1991).

Teachers play a central role in Waldorf education. Students stay with the same teacher for eight years, the teacher giving direction, structure and coherence to the world of the developing child (Schwartz, 1999). The teacher and the students along with colleagues and parents form a community, a sort of extended family for students.

The use of the arts, natural materials, and handwork such as knitting and woodwork are integrated into the curriculum. Language in its many artistic forms is held in high esteem in Waldorf education. Creating something artistic is seen as a natural endowment of children so Waldorf students develop a keen aesthetic sense and do not separate art from life.

Steiner's learning model is less linear than traditional education in that cycles of expansion and contraction, delays and reversals, are all part of the learning process that supports the unfolding nature of the child (Schwartz, 1999). Waldorf educators believe that a slower approach to learning allows full digestion of material and thus a deeper

understanding. “It is in the nature of the human being to slowly unfold its nature, sometimes advancing, sometimes holding back, but never ceasing in the quest for improvement and perfection” (Schwartz, 1999, p. 212).

In Waldorf education Rudolf Steiner saw the child’s senses as foundation for the unfolding of the intellect that would occur later. Waldorf methods seek to engage the sensory as well as the emotional and physical to connect children to the material to be learned. “In its deep heart’s core, Waldorf education is an education that rises out of real life needs, and remains fresh and current because of its living links to the world of childhood” (Schwartz, 1999, p. 292).

Conclusion

It is important to emphasize that indigenous knowledge came before any formal pedagogy and that all else is based on the wisdom that humanity acquired from living and surviving in the natural world. In my opinion any education is incomplete without it. To use a Waldorf term, all of humanity “unfolded” from indigenous beginnings and those beginnings were tied to the place of residence.

David Sobel describes one of the core objectives of place-based education, “...to look at how landscape, community, infrastructure, watersheds, and cultural traditions all interact and shape each other.” The ways in which we connect ourselves to our places also connects us to ourselves and our fellow human beings; it defines our culture, at least traditionally. In a modern industrialized society it is less so. David Orr accuses us of

educating our young people to be "...mobile, rootless and autistic toward their places" (Orr, 2004).

I would add that we are also in a great hurry towards the more and better. Children are pushed to achieve skills and move forward as quickly as possible. Does a child who is made to learn to read at the age of three or four grow up to become a happier, more productive adult?

In Rudolf Steiner's view human beings must recapitulate the historical stages of human consciousness of our ancestors to become fully human (Schultz, p. 121). He believed that a child's metamorphosing consciousness must be recognized and nurtured stage by stage. A child should not be rushed or pushed out of a younger stage of consciousness and treated like an adolescent or adult.

Indigenous knowledge, place-based education and Waldorf education overlap one another in many areas but what is most striking is the way they connect on the level of five human universals. It is one of the tasks of the researcher to look for patterns or reoccurrences in collected data as these are indications of something truly significant (Anderson, Herr, Nihlen, 1994). From what we know of indigenous peoples around the world, the values of community, language, aesthetics, nature and the making of meaning from these things have carried through to modern cultures. We all have our languages, our groups; we all have an aesthetic sense of what is pleasant, good and beautiful. We seek to make meaning of our lives and relationships and we are part of the natural world.

It is significant that indigenous knowledge informs and dovetails with the relatively new educational idea of place-based education. It is as though a broken connection has been mended. It is also significant that Waldorf education based in early 20th century

Europe, has caught on and spread to other parts of the world with its appeal of a natural, nurturing, childhood grounded in the cycles of nature and the human being's place within them. The significance lies in the value these three views hold and for the five human natural heritage universals:

- humans are inseparably a part of nature,
- humans respond to the aesthetic,
- humans seek to make meaning,
- humans use language,
- humans belong to groups.

In addition to these universal themes, other commonalities shared by indigenous knowledge, place-based education and Waldorf Education emerged from the literature.

Some of the most significant are:

- begin with the near and familiar,
- use of myth and story,
- value of elders,
- cultivation of individual talents,
- connecting the self and the natural world through meaningful action: indigenous skills, (indigenous knowledge), real-world projects, (place-based education), handwork, (Waldorf education).

Additionally, Indigenous knowledge, place-based education and Waldorf education all place value on an emotional, spiritual connection with the natural world as normal, natural and good. Kellert quotes Rachel Carson, "Once the emotions have been aroused –

a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love – then we wish for knowledge about the object of our emotional response. Once found, it has lasting meaning” (1998, p. 56).

Through this literature review I have sought to build a case for the evolutionary, biological and cultural nature of human beings. To establish a common ground for all of humanity as a species upon which the relevancy of human natural heritage skills and knowledge is based.

The examination of three systems by which teaching and learning occur, indigenous knowledge, place-based education, and Waldorf education, revealed not only similarities in philosophy but a true interest, appreciation and affection for humanity.

Somewhere between the opposing perceptions of ourselves as the entitled dominators versus the guilt-ridden protector/destroyer of the earth is the intelligent, creative, communal hominid. The ingenious creature that derived every single thing needed for life from wild nature. How do we connect people to the natural human that they are inside? Jeff Bickhart states in his article *Reclamation*, “...our essential humanness was formed during evolution in this way of life, that is who we still are and that we must bring into our lives now some of that heritage if we are to truly reconnect with nature” (2002, p. 28).

CHAPTER THREE

Description of Study

Purpose

The purpose of this study is to gather data on the value of including human natural heritage in curricula. I have come to believe that HNH incorporated into lessons provides universal relevance for students, is highly motivating, and provides opportunities to connect students to the natural world. With this study I am seeking support for my ideas about HNH by questioning students who make things and educators who incorporate human natural history into their teaching. I am particularly interested in basic human needs things such as those pertaining to food, clothing, and shelter.

Throughout most of my career I have been first and foremost a science educator. In my work at the Science Museum of Minnesota my curriculum is diverse and includes biology topics such as animals and microbes, chemistry concepts imbedded in themes of wizardry, food science and forensics, as well as archaeology and anthropology. Science content must be taught in a ways that adhere to the philosophy of Youth and Family Programs of the Museum that is to provide a fun, interdisciplinary, active science experience. Instructors are encouraged to include opportunities for both independent work and cooperative learning and to take advantage of the amenities of the museum site. For better or worse, our classes must be entertaining and fun.

Museum classes tend to keep students moving while they use microscopes and other scientific equipment. Students are physically and mentally engaged constructing coral reef models, kneading bread dough or exploring related exhibits in the museum. I am

there with them assisting with equipment, providing direction, making suggestions, giving feedback, supervising the handling of live animals and guiding students through exhibits.

As a museum educator, the quality of my contact with students could be characterized as short-term, intense, and fast-paced with everyone, students and teacher, actively-involved. Class length ranges from 30 minutes to three hours. The majority of my classes occupy a time interval between the upper and lower limit and most of the time I see a group of students just once for one class. The rest of the time, classes meet from two to five times. I have one group in the summer for a comparatively luxurious three weeks.

I usually have little or no knowledge of the characteristics of my students and so can assume nothing about them. Therefore it is necessary to design a curriculum that will meet the needs of most any student. To do this I have to think in universalities. With the diversity of student populations today, this is a daunting task. I decided the way to begin is at the beginning. What do all the students have in common? They are all human beings. That is my starting point. As human beings we all have certain needs and characteristics. This is how I arrived at the idea of utilizing the human needs of food, clothing and shelter to guide my teaching.

Given these parameters, I am challenged to make my time with students count and have little time to take note of what is happening as I am usually at least as busy as my students are. This makes research problematic in my classroom. The observations I have made are due to sheer repetition. I have seen student reactions to an activity so many times that it is etched in my memory well enough that I can write it down later. I am also doggedly determined to sit down immediately after the last student is out the door, no

matter what is dripping from the table to the floor or how many crickets have gotten loose, in order to recall all that I can about student responses to the day's activities. Consequently, I have a small, informal collection of my own data that I believe to be significant in supporting the value of including human natural heritage in science curriculum. I am only one researcher providing only evidence from my own experience, hardly enough data to make a strong case. The problem remains. How will I get the data I need to build a stronger case for the inclusion of human natural heritage? How HNH add value to curricula other than science? And what about what I believe to be one of the chief values of HNH, the "golden nugget" imbedded within the exercise of the human impulse to make useful things, the connection made to the natural world missing in the lives of so many modern humans.

I have ideas about the research I would like to see done. My present professional situation makes a more in-depth research project infeasible. The three major roadblocks are:

- Lack of a consistent student population as to study: I don't have enough students often enough to collect their thoughts and feelings on what they work on in class.
- Lack of sufficient research opportunity: Time constraints do not allow opportunity to observe and record student behaviors and responses as they participate in my classes.
- Lack of professional peer perspective: I would also like to add the thoughts and observations of fellow educators on the value of human natural heritage, compare and contrast findings and add other participant voices and professional experiences to my argument.

These problems might be solved if I were to study the classrooms of other teachers who utilize HNH activities in their lessons and conduct interviews with students and teachers. My hesitation with this solution is that I prefer to be more of an “insider” than this method affords. As an insider, I believe I gain a better understanding of what I observe and what I hear from participants. How will I find out what I want to know in a way that will provide well-rounded, authentic viewpoints that will highlight the values of human natural heritage?

While I would be very interested to compare observation notes of class responses to HNH lessons with fellow educators. I think the best way to assess the value of the inclusion of human natural heritage activities in the classroom would be to ask teachers who have chosen to include making things as part of their lessons. I would also like to talk to students who have made things as part of a class as well as those who have chosen to make things on their own time.

For the latter category, I would be interested regardless of whether they are extending something they were first exposed to in the classroom or something they came to in some other way. In particular, I would like to include adolescents who are at an age where self-determination and autonomy is at the fore. For example, a teenager who cooks or does woodworking in their free time must be motivated by some powerful force. Is it an assertion of independence? Or is it that the food they cook or furniture they make wins the approval of peers? I believe a researcher would find more than one reason. I would also expect to find patterns in the responses of different interview subjects. The common denominator here is choice. If making things isn't required by a learning institution's

curriculum to be taught or learned then why would a teacher choose to include it in their lessons? By the same token why would the kids who make things on their own time choose to include such an activity in their lives?

This sort of study would of course be most feasible in a situation where a researcher has access to a ready pool of interview subjects. Because access to subjects for this study would be a stumbling block for me in my current situation as an informal educator, I will direct my effort toward designing a series of questions as instruments of study and conducting a small-scale study of teachers and students.

Method

I will design two sets of interview questions, one for the educator subjects and one for student subjects. They need not be the students of the subject educators. Presumably they are students. Both interviews will be of the structured type with sets of prepared questions that flow logically from one to the next. While the interviews will be structured, participants would be allowed to elaborate on their responses to some extent if they wish. The interviewer may want to ask additional questions to clarify a subject's answer.

The interviews for students and educators will differ in the following ways:

- Students will be asked to provide an example of something they have made or are working on to illicit genuine responses about the work and not just answers to questions.
- Educators may or may not have on hand or be inclined to show examples.

- Student questions will center on the interview subject and their feelings about what they have made.
- Educator questions will focus on the interview subject's teaching practice and rationale for their methods.

How does the inclusion of human natural heritage, specifically the impulse to “make things,” add value to curriculum? How will a researcher conducting this study know when an interview subject has provided information that will help to answer to this question? What are the values of human natural heritage that a researcher is looking for? As a science teacher, in an informal educator role, I would find things in the following list valuable to my practice:

- Ways to enhance the content of my science classes and make them relevant to students.
- Ways to get my students' attention to make the most of my short time, something immediately attractive and appealing to students.
- Ways to make an impression, have an impact, hopefully a lasting one. If HNH could create meaning for my short-term students that they could take away with them and that might stimulate further interest and investigation.
- A very important value for me is universal appeal for my always varied audience of learners.
- I would find unquestionably valuable, anything that would help me integrate the natural world into my lessons in ways meaningful to my students.

With these things in mind, the values that I will try to identify in the student subjects will be primarily values they hold personally. With the educators, I would expect to find some personal values but also elements the teacher feels are valuable to students and the objectives of the curriculum at large.

By looking at these two groups, I hope researchers could get an idea of the values students and educators hold for themselves, as well as the value of the process and product. Important too, are aesthetic judgments, both positive and negative. Then I will compare teachers' views on the value of human natural history in lessons with my own. I hope I will find a similar universal appeal of HNH among educators that I have found with students. If the appeal of learning and using human natural heritage to create relevancy and meaning, among other things, is that it is a natural impulse for humans, then the research should provide evidence for this.

CHAPTER FOUR

Description and Outcome

How does the inclusion of human natural heritage, specifically the impulse to make things, add value to curriculum? To provide some answers to this question, two sets of interview questions were designed, one for use with students who make things and one for educators who utilize human natural heritage type activities in their teaching.

In preparing the questions for the student interviews I wanted to get responses that would provide a researcher with information about what is valuable to a student about making things:

- What is valuable to them personally and what values do they hold about both the process of making things and the product, the things that they make?
- Is it possible to determine where these values originate in a child?
- Are they learned in the home or at school?
- Are these tendencies in place in the developing human being, ready to emerge as other natural behaviors do?

For the teacher interviews I was primarily interested in obtaining responses that would provide a researcher with information regarding:

- What types of human natural heritage activities are they using in their teaching?
- Why they choose to include them?
- What value do they feel HNH has for students?
- What HNH adds to their practice.

Student interview analysis.

Of the fourteen student interview questions half, questions three through nine, ask students for personal feelings, aesthetic judgments or opinions to help assess personal values they hold for making things and the things they made. The other seven questions ask about outside influences with regards to learning skills and what is made. These questions are intended to determine the extent to which these influences affect a student's decisions, motivation and feelings about making things.

What is important about focusing on student values when designing lessons or curriculum? In an informal and short term situation like mine at the Science Museum, student interest and attention is largely a matter of personal choice. Appealing to a set of previously held values allows an educator to make the most of their limited time with students. Even in a situation where teachers don't have to be as frugal with time, the alignment of student values with their own teaching objectives and curriculum content is apt to be more successful in achieving those objectives. In addition, students are more likely to take away something from the learning situation that will be relevant in another part of their lives.

Student Characteristics

The subjects for the student interviews fell into one of two age distributions:

- 1) eight, nine, ten years
- 2) fourteen, fifteen and sixteen years

While it would have been preferable to have a fifty percent split with regard to gender, I was only able to identify one boy in each age range who made things. The final gender distribution was four females and two males. Subjects attended different schools in urban or suburban areas. Socioeconomic backgrounds of subjects ranged from low income to affluent. All were of European heritage. The students were selected for this study because they were known to have made at least one thing.

Interview Process

I interviewed each subject individually. Each was asked to bring something to the interview they had made. I asked each subject the same set of fourteen questions. Each interview was recorded and transcribed later for analysis. Interviews lasted ten to fifteen minutes.

Findings

The following analysis lists each interview question and a summarization of the student responses. A full transcript of each of the student interviews follows this data summary.

Q. # 1. How did you get interested in making this?

Two of the student's projects were initiated for school and one for Cub Scouts. The other three students worked on projects of their own choosing. Two were introduced by relatives and one was self-initiated.

Q. # 2. Did you make it for some purpose?

Two of the students made their project for school assignments, one for a Cub Scout race, one made her project as a gift and the other two students had no specific purpose for what they made.

Q. # 3. How did you feel about it after you finished it?

All students expressed positive feelings about what they had made.

Q. # 4. Would you make it again?

Five out of the six students found the experience positive enough that they would repeat it with the sixth expressing interest in trying something new.

Q. # 5. Why make it yourself/ why not buy it?

All students felt what they had made was worth making rather than buying. Half of the students assigned a higher value on things made as opposed to bought.

Q. # 6. What is it you like about the skill or craft?

The word “fun” was used in four of six of the student responses. Two students expressed pleasure in watching the progression of their projects and two students alluded to the calm nature of the process of making as “relaxing” and “quiet.”

Q. # 7. How do you feel when you look at or use what you’ve made?

All students expressed positive feelings. Half mentioned the pride they feel in their work and two spoke of being able to recall the experience when they looked at what they made.

Q. # 8. Is there anything else you like to make?

All students had other things that they liked to make.

Q. # 9. Is there anything else you’d like to learn to make?

Five of six of the students had other things in mind they would like to learn to make. Four of the five expressed a desire to become more advanced in what they had already made.

Q. #10. Is this something you worked on by yourself or others?

Five of the six students said they worked on their projects “myself.” Two of the six students worked completely on their own, and four mentioned that an adult helped them. Two had their teacher’s help and two had the guidance of non-teacher adults.

Q. #11. Do you have friends that make things too?

Five of the six students have friends who make things. One student did not know.

Q. #12. Who taught you to make this?

All students were taught by an adult as opposed to a peer. Half were taught by teachers and the other half by family members.

Q. #13. Have you ever taught or do you think you will ever teach someone to do this?

Half of the students have taught someone else, two leave open the possibility that they may teach someone, and one cites the difficulty of teaching someone because of the equipment needed.

Q. #14. What do other people say about what you make?

Students all received positive feedback about their projects. One student expressed pleasure in seeing her project in use.

Summary

In questions 3 through 9 asking about a student's values about making things, the responses were overwhelmingly positive. Here are the main points that emerged from interview responses to questions 3 through 9:

- All respondents felt positively about their projects after finishing them. Most would make them again and all felt it was worth making rather than buying.
- All respondents gave positive responses about the process.
- All respondents like to make other things and most have other things in mind that they would like to learn to make.

The other seven questions asked respondents about outside influences on their projects. The answers to these questions were more diverse than those of the personal value questions. Here are the main points that emerged from interview questions 1 and 2 and 10 through 14:

- Students became interested in making what they did for a variety of reasons and purposes.
- All students mentioned that they worked by themselves and also mentioned an adult helped them.
- Most students responded that they have friends who made things.
- All students were taught by adults to make what they did.
- Half were taught by family members and half by teachers.

- Most of the students left open the possibility that they would teach someone else to make what they made.
- All students received positive feedback from others about what they made.

This data shows that the students value making things, both the process and the product and place positive value on how it makes them feel to make something from beginning to end. The positive nature of their responses suggests that they derive pleasure and personal satisfaction from both the making the item and with the finished product. I was struck by the personal nature of the student reactions, the “ownership” that each seemed to have not only with what they made but how they made it.

I was also intrigued by what appeared to be the solitary nature of these activities. All but one respondent wanted me to know that they worked on their own, utilizing the help of an adult at times but none of these projects appears to be something worked on with peers. Two respondents even use words like “quiet” and “relaxing” to describe what they like about what they did. Again this suggests an important, solitary, personal component to these activities.

The students came to make what they did by various means but the values and feelings described are remarkably similar. Making things allows them to demonstrate their own competence and industry to others, while on a personal level making things generates feelings of self-sufficiency and autonomy. The data also suggests that regardless of how the students came to make what they did the outcome was a positive one for all.

I feel that the very personal nature of the student responses to making things strongly favors the existence of an innate behavior, rather than merely a learned response, as an explanation for a young person’s propensity toward making things. Making things appears to be serious work in the students’ view, deserving of their time and attention. It

also appears to be its own reward bringing its creator a sense of satisfaction, accomplishment, and independence.

Taylor, age 16, wooden lathe-turned bowl

1. Shop class
2. assignment
3. Happy that it was done and I hadn't lost a finger and that I didn't mess it up because everybody when we were done kept messing theirs up. It's a lot of work to just screw it up.
4. No, I would probably want to make something different but I would make something else. I probably wouldn't want to make another bowl.
5. It depends because I do buy things like this but making it was a lot more satisfying but it took a lot longer so if you needed it right away I probably wouldn't make it.
6. It was fun watching it develop from a block of wood into a bowl. And then everybody's looked different, like some people didn't do theirs right so they just looked bad. There was different problems with people's, it was fun to see how you could fix the problems and if you couldn't fix the problems what they would look like afterwards.
7. Well now that I'm looking at it I still can't believe I made it. Because when I started it I didn't think ...I was like how are we gonna make a round bowl out of a square block piece of wood. And now that, those feelings are all back. I don't know using it is just, it's cool to see it used, because I spent a long time on it and I almost lost a finger.
8. Other than wood? Yah, I like to cook. Baking and cooking. I like the wood-working thing but I wouldn't have come up with that if I hadn't had to take the class.
9. I actually always wanted to learn to do pottery, but I never did, clay stuff. Maybe sewing. With sewing stuff it's the same with wood working, you can watch it develop and then use it in the end. It's pretty, with pottery and stuff it's kind of just pretty and stuff, like the wood working but with sewing it's actually useful. You can actually make clothes and wear them. This bowl is not really realistic to use in an everyday situation. Not dishwasher safe and there's other alternatives that are easier to clean and probably safer to eat out of.
10. I worked on it myself but my teacher helped me a lot because I didn't know what I was doing.
11. I had friends that knitted. And cooking, does that count?
12. My high school wood shop teacher.
13. I don't think this kind of thing because it takes a lot of machinery. I don't know if I could... well, I kind of do remember...but no, I don't think I'll ever teach anybody to do this.
14. My teacher said it was really good 'cause everybody else, I had friends in that class and they all screwed around but I actually made mine. It did turn out really well and that was nice because he knows a lot about wood. And of course my parents said it was good because they have to, [laughs], No but it's cool to see it have candy in it and stuff. And then I can tell people that I made it, like the kids [the kids she baby sits] who are amazed when I told them I made it. Me too.



Rhys, age 14, wooden tray

1. Well, I thought of something that I could use and that would be interesting and challenging to make. I thought of this because I was going to purchase one in the first place.
2. Well like I said before, I was planning on purchasing something like this and I was taking woodshop anyways so I decided to ah, just make it.
3. Pretty good, it wasn't what I expected but it was pretty good.
4. I think so.
5. I had to do something anyway so I figured I should do this because I was gonna buy one.
6. Um, I'm not sure, it's challenging, interesting, I like working with the machines and I like the smell of sawdust.
7. I remember things. That's mostly what I feel. I just remember making it and what it was like.
8. I like to make clay stuff, it's pretty entertaining. I like that if you make a mistake you can just squish it and try again.
9. I'd like to further the wood because this was not incredibly difficult to make [the tray] but I'd like to learn to make some more challenging things.
10. It was by myself with the exception of my teacher who had to guide me along the way.
11. Yah, I do. I have a friend who knits.
12. My teacher.
13. I showed this one kid all the machines when he came to school.
14. They said it turned out very nice. [teachers and parents].



Abby, age 10, wool woven purse

1. My parents sort of got me interested in weaving. And I just like things that people used to do. I just sort of did it whenever I had the time. I started doing it when I was really young. And then I just kept working on it whenever I had the time.
2. I just wanted to make it.
3. Good.
4. Probably. My parents said that I might be able to take a class and actually make big stuff.
5. It's more special when you make it.
6. It's quiet; you don't really have to concentrate that much but you do a little.
7. Proud, I guess.
8. Drawing, designing, clay, yarn, pretty much anything to do with making. I like doing experiments, earrings.
9. I'd like to learn to do patterns; I don't know how to do that. This [points to a stripe woven into her purse] doesn't really count as a pattern, like a picture, actually. [A picture or pattern is what she'd like to learn to make].
10. Well, my mom and dad got me started but then I just did it.
11. Yes, a lot of my friends like to knit and draw and crochet and pottery and earrings.
12. My parents.
13. I sort of taught my friend to finger-knit.
14. My relatives say it's good. I haven't shown anyone else.



Shelby, age 8, polymer clay coil box

1. I had a bunch of extra clay laying around the house and I needed something to make.

2. This was when I was in my phase of liking pottery so I made a whole bunch of pots and that was one of them.
3. I think I was very proud of it.
4. Yah.
5. 'Cause making it yourself is more personal and they usually turn out cooler anyway and it's not mass produced.
6. Something to do and it's fun and usually you can be proud of it in the end.
7. I liked it.
8. I just decorate stuff.
9. I don't know I guess I'd like to learn to make a lot of different things. I think it would be cool to take more pottery classes. And it would be fun to make jewelry and weave.
10. I did this by myself.
11. Probably not, I don't know.
12. I learned how to do the coil thing in an art class.
13. I might.
14. It kind of depends on what it is but a lot of people like my stuff I guess.



Dylan, age 9, wooden soap box derby car

1. Well, I'm in Cub Scouts and I said maybe we can make a car and I always really wanted to make a car and see if I could race it and see if it could win trophies and stuff.
2. For a Cub Scouts downhill race.
3. It was actually quite cool and I really liked it.
4. Oh yah, totally.

5. 'Cause it's too expensive, the stuff that you have to buy costs more money than it does just to make it.
6. Well, the cool thing is I like to paint and stuff, it's fun painting.
7. It makes me feel pretty proud of myself how I could actually make that thing.
8. I like to make... I like different stuff, I like to draw and some different stuff, I made a birdhouse once, a top and a couple other things.
9. I don't know
10. With other people, Claire and me we did it together.
11. I have a friend named Matt and he likes to make stuff.
12. Pretty much Claire did.
13. I don't know I might.
14. They say it's really cool. This one time I made this one thing and I got it in the District 196 art show.



Chloe, age 15, knitted wool mittens

1. I've always enjoyed winter accessories [laughs] and my grandma taught me and I thought it would be an amusing thing to pass the time.
2. A gift for a friend.
3. I felt pretty accomplished.
4. Yes.
5. I don't have much of a social life [laughs] I like at least doing something with my spare time.
6. Um, it's pretty relaxing, I like the finished product, I how you can see how far you've gotten and it's a lot of fun.

7. Pretty good about myself.
8. I haven't really made much else except for some cooking.
9. Sweaters.
10. By myself.
11. Yes.
12. My grandma started me off and I didn't knit for a really long time and I forgot and then I bought a book and learned again.
13. I tried teaching Kamika, she's having a really hard time ... I'm not a very good teacher. [laughs]
14. Um, they say it's pretty snazzy.



Teacher interview analysis.

The nine teacher interview questions are mostly geared towards obtaining information about what the educators choose to include in their practice and why. Two questions ask for the teacher's opinion on the value of human natural heritage for students and themselves.

I am interested in comparing the ideas and beliefs of other educators to my own on the subject of including human natural heritage in their curriculum. I hope to find and name specific values for including HNH in curriculum supported by the responses of other educators.

Teacher Characteristics

The two educators teach in very different situations both with regards to subject, grade level and student background. Carol is an elementary teacher in a rural school, teaching all subjects. Julie is a secondary science specialist at an urban alternative school.

Interview Process

In order to fit the interview into the teacher's busy schedules and give them time to think through their responses to the interview questions, the list of nine questions was sent to each of them to answer and return.

Findings

Like the student interview findings, the following analysis lists each interview question followed by a summarization of the teacher responses. A full transcript of each of the teacher interviews responses follows this data summary.

Q. #1. What subject(s) do you teach?

Carol: All subjects, using place-based, integrated content areas

Julie: All science classes

Q. #2. What ages or grade levels are your students?

Carol: Grades 3-5

Julie: Grades 7-12

Q. #3. I am interested in lessons where something is made or produced, especially things that fall into the basic human needs categories of food, clothing, and shelter. Could you describe one of these lessons or projects for me that you have used with your students?

Carol: We have a school garden, greenhouse and orchard. This year we will focus on more food that students will actually consume as part of their school snack program.

Julie: We eat calamari and then dissect squid for marine science.

Q. #4. How did you arrive at the decision to include this activity?

Carol: I have been an organic gardener for almost thirty years and became distressed by how little students knew about the food they were consuming. I am also interested in encouraging students to eat healthier foods.

Julie: I have been to MANY workshops in my career. I chose activities I think illustrate the concepts and are fun.

Q. #5. How do students respond to it?

Carol: Students are more apt to try foods they have a hand in producing. I think they take their work very seriously because they produce a real product with real value.

Julie: They LOVE anything to do with food.

Q. #6. What, in your opinion is the value of activities of this type for students?

Carol: Helps to develop a sense of community as well as the other reasons listed above.

Julie: Motivation

Q. #7. What is the value for you as an educator?

Carol: I believe teaching children to make choices is critical, I love to garden and enjoy passing the culture on and I find it easy to meet many of my curriculum standards with the garden as the focus.

Julie: I enjoy the student responses and they remember what they learned.

Q. #8. Are there any other activities that you use in your teaching where things are made to enhance or reinforce a lesson?

Carol: Students have worked with local weavers to create rugs and wall hangings. They wove a garden fence from saplings, tapped maple trees, spun wool, learned to knit and crochet, baked bread and churned butter.

Julie: We make pickles to demonstrate osmosis, make RNA/DNA out of marshmallows, dissect (eat) chicken wings and label the bones, “mine” chips out of cookies and take core samples from cupcakes.

Q. #9. Will you, or would you like to, include more of these types of activities in your practice in the future?

Carol: I can't imagine teaching any other way.

Julie: YES

Summary

While these two educators have very different jobs as far as the places they teach and the populations they serve, both are enthusiastic about using human natural heritage themes in their teaching. Both educators cite the motivation of their students as an outcome of HNH. Carol speaks of sharing her love of gardening and the ease with which she uses the garden as a context for achieving her curriculum standards. Julie cites her enjoyment of her students' responses to food-themed activities and the value of these activities in making lessons memorable for students.

Carol and Julie are two educators working in very different situations with very different student populations. Yet both of them successfully and enthusiastically implement HNH in their teaching practices. How do two such diverse situations find

consistent, relevant value by integrating basic human needs such as food? The students of these teachers are interested in food because it is in the nature of living things to be interested in food. It is human nature to be interested also in procurement, preparation, and origins of food, as well as many other things that humans need to survive. Using a theme with such a universal appeal gives an educator an instant “in” with students of any background.

The findings of this study with regards to both students and teachers are consistent with my own professional observations. The values of including human natural heritage in teaching and learning suggested by this study include:

- Generation of interest and motivation
- Universal appeal
- Real-world relevancy
- Development of confidence and self-sufficiency
- Engagement of both body and mind
- Encouragement of autonomy and independence
- An appreciation for skill, labor, and artistry
- Understanding of origins and properties of materials
- Easy integration into curriculum
- A source of personal satisfaction

The passing of knowledge from one human being to another, often from older to younger is also part of our natural human heritage. Teaching and learning have prehistoric origins for humans and are natural and vital to do. I believe we are hard-wired for teaching and learning as a means for survival. Elders by nature pass on knowledge

and skills; younger people are naturally receptive to information they can incorporate into their existing knowledge base and use. In addition to the above mentioned values of human natural heritage, I think it is important to include the vital role of our impulse to bestow and receive wisdom in human success and survival. Teaching and learning too, are part of our natural heritage.

Carol's Interview Responses

1. I teach all subjects in a multi-graded classroom in a two room school. I teach place-based education using integrated content areas. I particularly like the sciences, but believe that all of the subjects are connected. The historical, cultural and natural context of our location is the focus of my teaching.
2. My students are in grades 3-5.
3. We have a school garden and greenhouse and are developing an orchard. Students have been involved in a variety of activities in this setting including designing a bird and butterfly garden, have grown a Three Sisters Garden (corn, beans and squash) to mimic the Anishinabe people who once inhabited our community. This year our focus will be producing more food that students will actually consume as part of their school snack program.
4. I have been an organic gardener for almost thirty years and became distressed at how little students knew about the food that they were consuming. We, as many other schools in the nation, have a high rate of diabetes and obesity and I am also interested in encouraging students to eat healthier foods. We also use the garden and the food that we produce as a springboard for discussions on sustainable food production. We have had local CSA farmers visit with the children and have discussed heirloom varieties of plants that were part of the heritage of the region.
5. Students are more apt to try foods that they have a hand in producing. They love the outside experience and being out of the classroom. They collect ORT from the lunchroom and compost leftovers to add nutrients and bulk to our red clay

- soil. I think that they take their work very seriously, because they produce a real product with real value.
6. This experience helps to develop their sense of community as well as the other benefits listed above. They have designed a PowerPoint Presentation to teach the younger students about composting, how to do it and the reasons for doing it.
 7. I believe that teaching children to make choices is critical if we hope to maintain a sustainable future for these kids. I love to garden and enjoy passing the culture on. It is very easy to meet many of my curriculum standards with the garden as the focus. We read and write in the garden, produce multimedia projects to share our work, use the garden as a creative and artistic setting, teach scientific concepts and conduct our own experiments and investigations. It is also a way to connect to the history of our community, where self-sufficiency was once a necessary part of living where we do.
 8. Weaving and textile arts are part of our past and current economy. Students have worked with local weavers to create rugs and wall hangings. They wove a garden fence from saplings and created a peace banner from fabric and weavings. The Anishinabe once inhabited our community. Students this year created a model of an Anishinabe community using birch bark, sinew and deer hides. We have tapped maple trees and made maple syrup with a parent in the past, spun wool and learned to knit and crochet with a local sheep farmer and artist, and learned to bake bread and churned butter.
 9. I can't imagine teaching any other way.

Julie's Interview Responses

1. All science classes including biology, chemistry, earth science, marine science, anatomy and physics.
2. I am the science teacher for the SLC, (Secondary Learning Center) at my school so I teach grades 7 – 12.
3. In marine science we eat calamari and then dissect squid.
4. I have been to MANY classes/workshops in my career. I chose activities I think illustrate the concepts and are fun. Kids can be hard to reach and if class is fun in their minds it really helps.
5. They LOVE anything to do with food. They love to eat or at least play around with the preparation. The kids usually try things if they make it themselves even if they say they won't.
6. Motivation. If kids know that something fun or interesting is going to happen in class they are more likely to show up, pay attention and participate.
7. I enjoy their responses and they remember what they learned.
8. We make pickles to demonstrate osmosis, we make DNA/RNA out of marshmallows, licorice and gummi bears, we dissect (eat) teriyaki chicken wings and then label the bones, we "mine" chips out of cookies, we take core samples of cupcakes.
9. YES

CHAPTER FIVE

Reflection and Conclusion

A number of years ago during one of my classes, I jotted on my lesson plan notebook these words: “Remember: when you hear repeated, an observation that a child makes in different classes at different times about the same activity, you’re hearing a universal “Ahah!”, a common important shared learning experience, a monumental discovery that they are all making ...” Hastily written and barely legible, I still have that that torn-out notebook page with those words scrawled on it. It was these consistent, repeated student responses in class after class that brought me to the idea of human natural heritage, the inherent human impulse to create for survival, pleasure and meaning.

What began as an activity to make the science content of my classes “fun” and provide something for the kids to make to take home, became an epiphany for me in my teaching practice. I return to the earlier example of butter making to illustrate my point. The making of butter ties in well with the study of mammals and is fun and interesting at the same time. By listening to students over the years as they worked, I realized that it is more than that for them.

The lesson begins with my telling the story of how I accidentally made butter when I was young, followed by an explanation of how butter comes to us from cow’s milk and the science behind it. In each class, when the students partner up and make the butter themselves, they react with surprise and delight when the butter forms in their jars. Here are some of the responses that I have heard repeated and have recorded over the years:

“We did it! We made butter!”

“It’s butter!”

“We really made butter!”

“Is this all you have to do to make butter?”

“If I want to make butter at home all I need is cream?”

“I’m gonna make this at home.”

These are students who, less than a half hour before, heard the story of how I made butter and had the process explained to them step by step. Why do they seem surprised when it happens as they were told it would?

I believe the student responses show how important it is for students to experience what they are learning. They may hear information and be able to recall it all for a test, but what is memorable, meaningful and lasting is making the discovery for themselves. Recall Paul Krapfel as he quotes Bortoft, “In a moment of intuitive perception, the particular instance is seen as a living manifestation of the universalAs an authentic discovery, this moment can only be experienced directly; it cannot be ‘translated’ adequately into the verbal language of secondhand description” (in Seaman and Mugerauer 1989, 299). (pp. 56).

Listening to a teacher and watching her explain and demonstrate allows a student to take in only sights and sounds, which are mostly second-hand accounts of someone else’s experience. By actually making the butter or some other useful thing, students are able to experience first-hand the sights and sounds of the process as well as touch, smell, and in the case of food, taste. A full comprehension of the concepts occurs when a child connects factual understanding with his/her own empirical experience (Kellert, 2002).

Another part of this epiphany for me was the enthusiasm students have for making useful things. By useful I mean something that is relevant to their lives. The appeal of

making things cuts through age, gender, and background differences, not only grabbing a student's attention but maintaining it through completion of projects and out the door as they proudly carry home what they create.

A child's inclination to receive and respond to what is being taught depends a great deal on emotions and feelings - curiosity versus indifference, wonder versus boredom, attraction versus aversion, and excitement versus doubt. In many, perhaps most learning situations the affective domain precedes the cognitive as a basis for learning (Kellert, 2002). By using activities and learning situations that lead to something familiar, useful, and relevant, students tend to respond positively and are more immediately receptive to learning.

The result of this creative/constructive epiphany I had so many years ago, was that I began to include the making of useful things in most of my teaching with highly successful results. I began to see other benefits emerge, most notable was the way students began to form personal values about what they were doing. It wasn't only the finished product that was the focus of their attention. It was the process of making it that seemed most important. Kellert says "...values are regarded as a distinct synthesis of affective and cognitive perceptions and understandings" (Kellert, 1996). It is significant that these learning situations, that speak to a student's natural heritage as a human being can engage all three modes of learning and development: cognitive, affective and evaluative.

This was based solely on my own informal observations of student response to making useful things. However, I knew that I was witnessing something important and valuable for teachers and learners. The capstone process has given me the opportunity to look

more deeply at the idea of human natural heritage and to search and see what else has been studied and written. It afforded me the time and opportunity to be able to talk to kids and ask specific questions about making things and to question other educators about their thoughts and feelings about HNH-infused learning.

In reviewing the literature for this capstone, I was surprised to find little research in professional journals to directly support my ideas about and experiences of the significance and value of including human natural heritage in curriculum. I turned instead to studies of primate evolution and the origins of human behavior in an effort to provide evidence for a universal human response for making things, a predisposition to create, related to survival that is therefore hard-wired into our human psyches. While the research did not definitively confirm this, there is much consensus in the literature that in order to truly understand ourselves; we must take into account human evolutionary history (Bruner, 1965).

Making things - tools, structures, garments, weapons, vessels, and prepared food - to name just a few, constitutes a very large part of human evolutionary history. Our heritage of utilizing the affordances of our environments to great effect is definitive of our species and largely responsible for our survival.

The literature supports the idea that humans do have inherent behaviors common to all of us. This led me to the idea of a set of human universals based in part on Ernest Boyer's "core commonalities" (Boyer, 1995). These universals help to describe and define our human natural heritage. They are:

- Humans are inseparably a part of nature
- Humans respond to the aesthetic
- Humans seek to make meaning
- Humans use language

- Humans belong to groups

Upon reflection I recognized what I had been witnessing in my classes was students responding to these universals. They behave in a predictably human way when they set about to make something.

After establishing for myself that there is a scientific basis for universal responses to making things, I was curious to find what had been written by others on the value of engaging these primordial human impulses. Again, there was a dearth of specific information related to an innate human impulse to create useful things. Once more, I found myself looking back in human history to the wisdom of indigenous people.

Indigenous knowledge systems are human natural heritage stories. They are derived from a native people's close contact with nature, and encompass the knowledge and skills that allowed them to survive in their places. Because of its grounding in our natural heritage, indigenous knowledge informs much of my teaching.

I also found myself drawn to place-based education and its core precept of connecting to people to their places, and to Waldorf education and the value it places on connecting children to nature by handwork with natural materials. While place-based education and Waldorf methodology are not the broad and vast systems of knowing that indigenous knowledge is, they are informed by indigenous wisdom and share values such as recognition of the human connection to the natural world, the importance of place and community, and practical skills of doing and making.

Much of what I had suspected about the values of human natural heritage for students was confirmed by the interviews. I had observed enough of my own classes to know that students have positive feelings about making things. The interview responses bore this

out. Students were motivated and engaged by both the finished product and the process of making it. It didn't seem to matter what object they made or how they came to make it. All students expressed positive feelings of pride and satisfaction about what they had made.

One of the most fascinating and unexpected findings of the student interviews was how personal and solitary the process of making things was for the students. I was surprised to find that this active and social age span of eight to sixteen year-olds, told me that they worked mostly alone on their projects and they seemed to like it that way. I had expected to find more working in groups with peers or friends with the same interests but I found little to none. Instead, for the most part, students had private "ownership" of their working on what they had made.

The teacher interviews too, confirmed what I had observed and experienced in my own work about the value of incorporating human natural heritage into curriculum. Both teachers interviewed cite motivation for their students as well as elements of relevant, real-world experience for kids, especially with regard to food origins, production, and preparation.

The fact that two teachers who work in such different situations with regard to both student demographics and setting, were both able to successfully reach their students using HNH in their teaching speaks to its universal value for educators and learners. One of the deeper human heritage themes that emerged for me is that adult humans pass information that has been important in their lives to young humans who understand that what is being taught is significant and has relevance for their own lives. The process of

teaching and learning, the transmission of knowledge from older to younger, is as old as humanity.

To return to my research question: How does the inclusion of human natural heritage, specifically the impulse to “make things” add value to curriculum? Here are the values I identified in chapter four:

- Generation of interest and motivation
- Universal appeal
- Real-world relevancy
- Development of confidence and self-sufficiency
- Engagement of both body and mind
- Encouragement of autonomy and independence
- An appreciation for skill, labor, and artistry
- Understanding of origins and properties of materials
- Easy integration into curriculum
- A source of personal satisfaction

Upon reflection I add:

- Opportunities to connect meaningfully with the natural world
- An appreciation of the human activities of teaching and learning

So where do I go from here? Perhaps I will write a grant for a larger study of students, teachers, and the values of human natural heritage. An expanded study could yield data to begin to fill the void of professional literature on the subject. I am thinking

about using my experience, the information gained by my capstone, and future research to write a book on the incorporation of elements of human natural heritage into curriculum.

Conclusion

This project was born of my own inclination to make things and to teach students the processes that would allow them to gain the self-sufficiency and satisfaction I felt when I made something useful. It also came from the dismay I felt that so few children understand where their food comes from or how natural systems work. The chasm I spoke of in chapter one separates us not only from nature but also from ourselves as beings that evolved to live in the natural world.

I have observed that attempts to teach children about nature are, too often, once a year trips to a nature center or study of far away places like tropical rain forests most children will never see. David Sobel quotes seventeenth century education philosopher Comenius, “Knowledge of the nearest things should be acquired first then those of farther and farther off” (Woodhouse, 2001). What could be nearer than one’s own natural heritage?

I believe the way to bridge this chasm is to include our story, the human story, in a child’s education. Children should be taught about their history as natural creatures, just as they are taught about polar bears and penguins. Teachers and learners alike should understand the human universals:

- We should all understand that we are an inseparable part of nature. If we are anything wonderful, we are so because of the capacities gained by evolution in the natural world.
- We should recognize the importance of aesthetics in our lives and the underlying

purpose of our sense of beauty.

- We should acknowledge our quest to make meaning from information and experience and appreciate the creative ways we put this meaning to use.
- We should stand in wonder at our ability to pass information meaningfully back and forth through the languages of words, art and mathematics.
- We should embrace our nature as creatures that have need and want of others of our kind and develop understanding of what binds us together, be it place, blood, ideology, or common purpose.

Children should be guided to discover how our species managed to survive by using our powers of imagination, ingenuity and intellect. Let them recreate what our ancestors knew; let them make for themselves using their hands and their heads. Let them form strong attachments to natural places, other living things and each other. Then I believe they will have a full understanding of themselves as humans and the human connection to all other things. Then they will be truly native daughters and sons, grounded in their places with a clear vision of their natural heritage as human beings.

“What I have been talking about is the possibility of renewing human respect for this earth and all the good, useful and beautiful things that come from it.... The respect that I mean can be given only by using well the world’s goods that are given to us.... The callings and disciplines that I have spoken of as the domestic arts are stationed all along the way from the farm to the prepared dinner, from the forest to the dinner table, from stewardship of the land to hospitality to friends and strangers....to learn them is, I believe, the work that is our profoundest calling. Our reward is that they will enrich our lives and make us glad” (Berry, 2001, p. 44).



APPENDIX A

Student Interview Questions

1. How did you get interested in making this?
2. Did you make it for some purpose? (Gift, assignment, self, other?)
3. How did you feel about it after you finished it?
4. Would you make it again?
5. Why make it yourself? Why not buy it?
6. What is it you like about the skill or craft?
7. How do you feel when you look at or use what you've made?
8. Is there anything else you like to make?
9. Is there anything else you would like to learn to make? If so, what and why?
10. Is it something you worked on by yourself or with others?
11. Do you have friends who make things too?
12. Who taught you to make this?
13. Have you taught or do you think you will ever teach anyone how to make it?
14. What do other people say about what you make?

APPENDIX B

Teacher Interview Questions

1. What subject(s) do you teach? Or what is your specialty? If you had to put yourself into a category what would it be?
2. What ages or grades level(s) are your students?
3. I am interested in lessons where something is made or produced and especially things that fall into the basic human needs categories of food, clothing and shelter. Could you describe one of these lessons or projects for me that you have used with your students?
4. How did you arrive at the decision to include this activity?
5. How do students respond to it?
6. What, in your opinion is the value of activities of this type for students?
7. What is the value for you as an educator?
8. Are there any other activities that you use in your teaching where things are made to enhance or reinforce a lesson?
9. Will you or would you like to include more of these types of activities in your practice in the future?

APPENDIX C

Teacher Contact Letter

Dear Educator,

The following questions are part of a research instrument designed to help answer my research question “How does the inclusion of human natural heritage, specifically the impulse to “make things” add value to curriculum?” Human natural heritage is defined as: the inherent human impulse to create for survival, pleasure and meaning. I would like to add the thoughts and observations of you as a fellow educator about the decision to include making things in your curriculum, what you include and what you believe the values are for yourself and your students.

There are nine questions to answer and if you could structure your answers by numbering them with their corresponding question and send them back to me as soon as your schedule permits it would be very helpful. You will not be identified by name or specific institution for which you work. Thank you for your time and attention and agreeing to share your experience and expertise with me on this project.

Sincerely,

Kendra Hunding

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