From: ***The Way Forward: Educational Reforms that Focus on the Cultural Commons and the Linguistic Roots of the Ecological/Cultural Crises***

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An e-book published by the Eco-Justice Press, 2012.

Chapter 6 How Print and Computer-Mediated Learning Undermine Ecological Intelligence

As Gregory Bateson would put it, the dominant characteristics of this era are the conceptual double binds that are pushing the world toward a series of crises that past ways of thinking have not prepared us to deal with. The double binds are in thinking that we are achieving genuine progress when we are actually undermining the world's ecosystems that sustain us. The following seem so obvious that one can only wonder why they are not being recognized by the general public: (1) Globalizing the western consumer and industrial- dependent lifestyle when the Earth's non-renewable resources are being depleted at a rate that cannot be sustained. The depletion rate will only accelerate as the world's population continues to expand toward the 9 billion mark now predicted; (2) Continuing to promote automation in the workplace that will displace the need for workers as the youth in many regions of the world now face 20 percent unemployment—and within certain countries the figure exceeds 40 percent; (3) The continued dominance of the market-liberal ideology that has its roots in the abstract thinking of liberal theorists of the 17th century and in the thinking of Libertarian theorists such as Ayn Rand, when the focus should be on conserving species, habitats, and the intergenerational knowledge and skills that have a smaller ecological footprint and are less reliant on the free-market economy that is now failing; (4) The increasing reliance upon electronic communication that promotes abstract thinking, when we should be moving beyond the self-centered ecological intelligence practiced in everyday life to exercising what can be termed stage two and stage three ecological intelligence that are necessary for recognizing how our ideas and behaviors affect the viability of the interconnected cultural and natural ecologies we all are dependent upon.

The knowledge and values promoted in publics schools and universities in the West, and in other regions of the world now attempting to out-compete the West in double bind approaches to progress, are also a carry-over from the last centuries dominated by the spread of the Industrial Revolution and the form of individualism required by the consumer-based culture. To repeat another insight of Gregory Bateson, the recursive epistemologies (or what I prefer to call the root metaphors that serve as powerful interpretative frameworks) continue to reinforce the myth of the autonomous and critically rational individual, the myth that organic processes that include the human brain can be explained in mechanistic terms, and the myth that technology is both culturally neutral while at the same time being the latest expression of a linear form of progress. I have written elsewhere about why these orthodoxies still promoted in public schools and universities are deeply problematic. But what needs now to be subjected to a

more in-depth examination is the myth that computers are the driving force behind the cultural changes many people now presume will far exceed the human benefits resulting from the Industrial Revolution. Indeed, the futurist thinking of many scientists, such as Hans Moravec, Ray Kurzweil, Gregory Stock, E.O. Wilson, Michio Kaku, among others, take for granted that computers will lead to developments in nanotechnologies, biotechnologies, and consciousness itself that will lead to a global monoculture of computer-based intelligence dictated by Nature's process of natural selection. That the culturally diverse world's population should have a voice in whether these futurist-thinking scientists should be developing the technologies that will lead to their extinction, as these scientists envision the next stage of evolution, is not taken as a serious question. As their predictions reflect yet another example of how the abstract thinking of western elite theorists is used to justify the introduction of technologies that lead to new forms of colonization and extinction—now in the name of science, the failure to question and debate their interpretations of what represents progress becomes even more problematic.

One of the reasons that so much of the thinking of our educated elites— in the sciences, political and economic theory and practice, and education generally—can be traced to the cultural orientation that has privileged abstract theory and knowledge over the forms of knowledge acquired from giving close attention to local contexts that should be understood as cultural and natural ecologies, and from what can be learned when all the senses are relied upon. What I want to focus on here is one of the western traditions that has given abstract thinking high-status, while treating as low-status the forms of knowledge that are acquired by giving close attention to face-to-face communication and to the culturally mediated experiences that constitute life in local contexts. Examining the role that print-based technologies continues to play in elevating abstract knowledge to the dominant position in our public discourses, and in the educational process, requires avoiding thinking in dichotomous categories. The following examination is going to highlight many of the limitations, myths, and ecologically destructive consequences of print-based storage and communication, and by extension the current role that computer-based education plays in this process. At the same time, it is important that both print-based and computer-mediated thinking and communication are recognized as contributing to many genuine benefits. Like so many aspects of culture, the gains and losses cannot be reduced to either-or choices. Rather, a more accurate way of thinking would be to recognize that the gains involve important and often unrecognized losses. Given the nature of the ecological crisis, and the double bind of relying upon the ways of thinking of past centuries in a world of more than billion people who increasingly want to participate in the consumer lifestyle, the question is whether the losses resulting from print-based storage and communication contributes to the unlikelihood that the cultural changes required for achieving a sustainable future will come about in time to avert the catastrophic collapse of cultures that many careful observers are now predicting.

Before suggesting the nature of educational reforms that will contribute to a clearer understanding of how the special standing given to print and now to computers that are a continuation of a tradition that began with the Sumerian script around 3500 years B.C., it is necessary to consider the most fundamental differences that separate print and oral-based cultural storage, communication, and thinking. As I want to make the case that print, and now electronic communication that includes computers, lead to abstract thinking and thus to reducing our potential to exercise ecological intelligence, it

will also be necessary to explain as fully as possible the nature of ecological intelligence––which will require drawing upon the core ideas of Gregory Bateson. One of the continuing influences of print-based consciousness is the tendency to think and communicate in a highly abstract language where words such a "freedom," "progress," "technology," "intelligence," are juxtaposed against other abstract words such as "individualism," "poverty," "free-markets," "liberalism," "conservatism," "equality," and so forth. At this level of thinking and communication, little is understood about the largely tacit and taken for granted cultural patterns that are reenacted in people's daily lives. In most instances, the embodied experiences of the people as they interact with other people, and with the constant changes occurring in the natural and cultural environment, are not easily put into words that convey the complex nature of their experiences. In a very real sense, the task of clarifying the differences between print (and now computer-mediated communication) and the spoken word is made difficult by the continued influence that print and thus abstract thinking has on the reader, and in the limited vocabulary for giving a full account of the multiple forms of sensory awareness that are more likely to influence the spoken word rather than the printed word. Translating what is learned from the senses into the spoken word is, by its very nature, a process of abstraction. But the abstract representation becomes more extreme when it is printed. Given how the printed word, even when used by a gifted writer, misrepresents the multiple ways we participate in the cultural ecologies of language, memory, identities, reflection, the responses of the Other, and in the natural ecologies that range from the micro level of genes to the macro level of oceans and global warming, it is important to identify the characteristics of print that undermine the exercise of ecological intelligence.

Characteristics of print and, by extension, computer-mediated thought and communication.

Understanding how the characteristics of print-based cultural storage and communication lead to abstract thinking will take on more importance if we identify several historical examples of abstract thinking that became sources of motivation for wars leading to millions of deaths, to massive burdens on today's economy, and contributed to the polarization of ideas and values that has put us on a slippery political slope where everybody and everything is under constant surveillance. The connections between the abstract thinking promoted in the printed Bible and the Reformation wars that ravaged Europe for hundreds of years are examples from our past that need to be cited. The role of abstract slogans, such as "freedom," "individualism," "democracy," and "patriotism" have played a powerful role in today's wars of liberation, such as in Viet Nam and Iraq. We also need to recognize the legacy left by the government officials of the 19th and early 20th centuries who were educated in print-based and thus abstract thinking in some of the world's most acclaimed universities. Their legacy can be recognized more clearly when we consider how the print-based and thus abstract thinking of the men who identified the political boundaries of Iraq and Afghanistan affected our national priorities. The western idea of a modern political state, with its centralized center of political control, which the western colonizing powers imposed on the tribal cultures that inhabited these vast regions, represented abstract thinking and the power of the printed word (and printed maps) to delegitimate other cultural patterns of social organization. The political boundaries were influenced by a variety of forces, but the

most critical issues that should have been taken into account were the tribal differences in religious and other cultural traditions that continue to be the source of the conflicts into which we have been drawn.

Yet another example of print-based abstract thinking that is a major contributor to the current phase of western colonization, and to the rapid depletion of the world's non-renewable resources, can be seen in the way Adam Smith's theory of free markets has been turned into a universal law where the quest for profits and control of markets governs all aspects of daily life. Smith's earlier book, *The Theory of Moral Sentiments* (1759), which took account of the face-to-face and thus oral traditions of community life, and should have led subsequent generations to consider the cultural influences on local markets and patterns of moral reciprocity, was relegated to the realm of silence by the power of such abstract words and phrases as *laissez faire* and today's "free markets." The print-derived abstract language that is the dominant feature of various ideologies and such scientific theories as evolution are yet other examples of thinking that ignore the cultural and ecological differences found in local contexts.

While there are important differences in the grammar of different languages and how these languages are read as printed texts, there are nevertheless common characteristics that set print apart from the culturally diverse traditions of oral communication. To reiterate, the purpose here is to identify the characteristics that are inherent in print-based storage and communication, regardless of differences in languages, so that we can better understand how the heavy reliance on print (and now computers) undermines the need to expand our ability to exercise ecological intelligence. While the media would have people believe otherwise, the ultimate test of intelligence is learning to think in ways that help to ensure the prospects of future generations of both humans and other species.

Print within the context of time:

A fundamental difference between the written and spoken word is that what is represented in print immediately becomes dated. The spoken word generally reflects the thinking rooted in the present or influenced by past ways of thinking, but when committed to print it ceases to change. It is as fixed as the letters appearing on the page. Ideas, evidence, and other interpretations may be updated by others, but what is committed to print in a book, or other forms of publication, becomes static. Jack Goody, an anthropologist studying the differences between the oral traditions of a tribal culture on the west coast of Africa, and the print-oriented British colonizers, noted that the British were exemplary keepers of records of births, deaths, marriages, and so forth. Every event was documented in print but was constantly being outdated by the changes in the life of the community. The oral traditions in the community were constantly revised in the spoken narratives; which meant that the spoken word more accurately reflected the ongoing life of the community. Goody's observation of differences in the static nature of the printed text and the organic nature of the spoken word does not mean that oral cultures are free of outdated narratives. Far from it.

Indeed, many of the historically rooted prejudices related to gender and racial issues in our own culture have been carried forward by both texts and by face-to-face communication. The more critical point is how print and the resulting abstract thinking reinforces the tendency to ignore local contexts, including interacting patterns that constitute the local cultural and natural ecologies. The word "tendency" is important here

as the printed word may lead some people to examine more closely the interactive local ecologies—especially when changes in the viability of the world's fisheries, the melting of Arctic ice, and the toxic impact on different species is being reported. This does not lead to ignoring the key point about the above generalization: namely, that the majority of people, who are in denial about the ecological crisis and that their lifestyle may be a contributing factor, are largely guided by the print-based abstract language they acquired in their education and from the ongoing media representations. It is also important to recognize that much of what classroom teachers and professors talk about, including lectures and explanations, reproduce the abstractions they learned in their years of graduates studies and from what they currently read. As students progress through the formal process of education, the abstract language and representations becomes increasingly divorced from their world of oral and sensory-based experiences.

How print objectifies and thus misrepresents what is real:

Regardless of whether the printed word appears on a page or on a computer screen, even when there are background images, it still reinforces the idea that the words stand for or represent the world of objective ideas, events, and processes. That is, without sensory awareness of the differences that make a difference in the micro or macro natural/cultural ecologies, the printed word is often assumed to represent what has a universal meaning. And when the author's name, or pseudonym is lacking, the printed word takes on a greater appearance of being factual, of being about real events, ideas, and so forth. The conduit (sender/receiver) view of language further strengthens the assumption that the printed word does not represent human authorship and interpretations. Words such as "progress," "free-markets," "development," and "individualism" appear to most readers as having a universal meaning.

The skills acquired through interacting with the abstract images on a computer screen are often transferred to operating other systems such as the guidance system of a drone, an attack helicopter, or a warplane. However, there are profound differences in initiating an action in the abstract world of avatars that is not followed with the smell of burning and torn flesh, and the cries of the dying. The result, that is, the number of killed or wounded, is also represented as an abstract number. This is not to deny the possibility that a gifted use of words that appear in a printed poem or novel may elicit human emotions, including empathy. Here we are not giving a full account of the important uses of the printed word, but of those characteristics that obstruct awareness of the complex interplay of the cultural and natural ecologies within which we make daily decisions.

Another consequence of the world of print where authorship is often hidden or ignored: The conduit (sender/receiver) view of language reinforces a basic misunderstanding of what the printed word actually represents. That is, reading the following statement by Ayn Rand where she writes "Capitalism is not the system of the past; it is the system of the future—if mankind is to have a future" (*The Virtue of Selfishness*, p. 33), prompts a variety of responses that reflect the prior socialization (including language acquisition) of the person reading the statement. The reaction may be to accept Rand's statement as an accurate representation of reality, or as that of an ideologue that should be subjected to historically and culturally informed criticism. The exercise of rational thought, which is itself an abstracting activity shaped by living in a predominately abstract thinking culture, is seldom able to provide a clear understanding of other cultures that have achieved a higher level of reliance upon ecological intelligence

by giving close attention to the interdependent patterns in the local cultural and natural ecologies.

Printed words, wherever they may appear, are abstractions that may convey useful or misleading information and ideas. But what they hide is that the printed words are also metaphors that carry forward the thought processes of earlier generations, and even other cultures that were successful in selecting the analogs that continue to frame the current meaning of words. For example, Rand's reference to mankind having a future may appear to many readers as a factual statement, but the reality is that the metaphor "mankind" can be traced back to the interpretative framework (what I refer to elsewhere as a root metaphor) that represented the fate of humans as separated from the fate of the natural environment. The title of Rand's book, *The Virtue of Selfishness*, as well as her arguments about the need for selfishness to be directed by rational thought, are also based on earlier patterns of metaphorical thinking that did not include awareness of environmental limits and the dependency of humans on the life-sustaining characteristics of natural systems. In short, the printed words of Rand, like the printed words found in the writings of philosophers, political theorists, economists, scientists, educators, and so forth, give the appearance of being objective representations of some aspect of reality. Nevertheless, they are human/cultural constructions that are basic sources of the deepest forms of mis-education.

Another reason the printed word fosters abstract thinking: As both Eric Havelock and Walter Ong point out, print relies upon sight while marginalizing the other senses as sources of information. This bias that connects sight with acquiring only a surface knowledge of the external world, in turn, has led to privileging a number of words that further reinforce this western bias, which is not shared by all cultures. This list, according to Ong, includes "insight," "theory," "idea," "evidence," "elucidate," "clarity," "illuminate," "explicate," "show," "demonstrate," "focus," "observe" (1997, *The Interfaces of the Word, p. 133).* The more important point is that print fosters only a surface knowledge because it is abstract and thus is unable to accurately represent the depth of culturally mediated embodied experiences in various cultural and natural ecologies. If we take account only of what humans bring to their participation in the cultural and environmental ecologies which Bateson refers to as the "differences which make a difference," we find the following: continual changing emotions, memory, intentionality, self-identity, along with the cultural influences on the linguistic and sensory encounters with the Other. Other cultures, as Ong notes, rely upon different senses as the primary source of communication and knowledge of their ecological relationships. The reliance upon sound, for example, is always context-specific and cannot be frozen in time as is the case with the printed word.

Shared characteristics of orality that transcend cultural differences.

To restate the basic issue: Given that we now live in a world where the life-sustaining capacity of natural systems is being rapidly undermined, the most critical issues today relate to how the dominant patterns of learning and encoding knowledge diminish the prospects of the world's population learning to exercise more fully their ecological intelligence (which will be explained more fully later in this chapter). This may sound like an impossible task until it is recognized that many oral cultures have already learned to exercise ecological intelligence. This should lead us to consider more carefully why many oral cultures, without relying upon books, encyclopedias, print-

dependent scholars, databases, facebook, and so forth have developed a level of ecological awareness that has enabled them to live within the limitations and possibilities of their bioregions. Of course, as Jared Diamond points out in *Collapse: How Societies Choose to Fail or Succeed* (2005), not all oral cultures have been able to adapt their cultural practices in ways that took account of changes in their bioregions. And with the rate of changes now occurring in local ecosystems, many more oral cultures are now facing collapse, which will lead to massive numbers of environmental refugees. At the same time, there is a world-wide re-awakening on the part of many oral cultures to the need to recover their intergenerational traditions of self-sufficiency, as well as the ecological knowledge of the natural systems that their ancestors depended upon. Many of these cultures, whose youth are too often being mesmerized by the western electronic communication technologies that appear to combine both voice and printed texts, are consciously resisting the forces of modernization—including the consumer-dependent lifestyle that is drawing both youth and adults into the urban centers where consumerism contributes to the loss of cultural memory.

The issue here is not that of learning to copy the oral cultures that have been partly successful in passing their ecological knowledge to the next generation—a process being further undermined by the spread of computers and literacy programs that are contributing to the loss of the world's spoken languages. These lost languages contain the vocabularies developed over centuries of observing the relationships between human behaviors and changes in the local ecosystems. Rather, it has more to do with achieving a better balance between the importance uses of literacy, and there are many, and reliance on the oral traditions that are storehouses of in-depth knowledge of the life cycles within their bioregion.

The Connections between the spoken word and local contexts (the cultural and natural ecologies). Again, it needs to be emphasized that the differences between oral and print-based storage and communication should not be interpreted in terms of which is better. Rather, the issue is which contributes more to the possibility of educational reforms that foster ecological intelligence rather than the myth of individual intelligence that scientists are now attempting to reduce to the neural processes occurring in the brain. That educational reformers will take this challenge seriously may be the expression of romantic and thus culturally uninformed thinking on my part. But sometime in the not-too-distant future, public school teachers and university professors will be forced by the rapid changes occurring in the natural systems to recognize the need to promote ecological intelligence, which is far more important than learning to introduce short-term "fixes" to environmental problems by adopting new technologies. Unfortunately, this approach ignores the deep cultural assumptions that lead to the need for even more temporary environmental fixes.

In any discussion of the characteristics of oral communication it is necessary to stress a point made by Eric Havelock in *The Muse Learns to Write* (1986). While the immediate act of oral communication is grounded in the local cultural and natural ecologies of multiple messages, there is always the possibility that the face-to-face community will hold onto certain beliefs and practices that a member may find objectionable. And in objecting, she/he may be punished or even banished by the community. Writing provides a way of expressing objections and thus escaping the penalties of going against the mores of the local community—that is, if other members of

the community do no read what is written. Also, there may be other insights that may not be understood by the immediate culture, but discovered by later readers to be profoundly important. This has been a well-established tradition in the West, and has led to powerful reform movements—as well as catastrophic results as when an ideology produced by the literate yet culturally uninformed theorist is imposed upon a society.

The point made earlier about how many oral cultures have developed a deep knowledge of the behavior of the local ecosystems should lead to asking why oral cultures have been more successful than literacy-dominated cultures in developing ecological intelligence—that is, being aware of the patterns that connect between the natural and cultural worlds. The answer can partly be found in what literacy marginalizes:

(1) Accountability between writers and readers. As pointed out earlier, print-based storage and communication, while inviting criticism and comparisons with other fixed texts, involves initially an asymmetrical power relationship with the reader. The author of a printed text may later be challenged, but there is little chance that the exchange will turn into a dialogue. For most readers, there is little possibility of having a meaningful exchange on questions of fact and interpretation.

(2) Orality involves an embodied and culturally mediated experience where all the senses become sources of information that influence the individual's communication with the Other—thoughts, emotions, memory, self-identity, intentionality, reflections, aesthetic awareness, and the earlier patterns of socialization that provide either an expanded or limited linguistic basis for exercising communicative competence. While print-based communication, including electronic variations that now include voice and even visual representations, marginalize many of the physical senses, there is always the element of temporal and spatial distance that separates the reader from the writer. And in terms of printed texts, also missing are the various sounds of the local cultural and natural ecologies, as well as the smells and the awareness of the behaviors that undergo constant change in response to what Bateson refers to as the "differences which make a difference" within the local cultural and natural ecologies. Indeed, giving attention to the other senses than that of sight is often viewed as disruptive and thus to be ignored. The need to be isolated from the local cultural and natural ecologies can be seen in how part of the equipment of the jogger or person walking along a wooded trail often includes being wired to some external source of music. The hours spent by millions of people in the virtual world of video games and social networking are also a form of individually centered escapism that limits awareness of the changes occurring in the environment.

(3) Unlike the static nature of the printed word (which does not preclude it being challenged at a later time), the act of speaking and listening are always current events—unless it is recorded or reproduced as a printed text. Sending a message by exercising silence, for examples, can only occur in the present. As we shall see in the upcoming discussion of ecological intelligence, it too is always exercised in the present—even though it is always influenced by the languaging processes constituted in the past, and it often affects the future prospects of both the cultural and environmental ecologies.

(4) Speaking and listening, as well as other forms of communication such as the use of body language, are constantly influenced by awareness of ongoing relationships with the Others, including the changes occurring in the natural environment. The writer, on the other hand, tends to focus on putting ideas down as accurately and as efficiently as

possible. The task is to connect thinking with constructing sentences that supports a conceptually coherent narrative or account of events. Texting, of course, changes the dynamics of writing so that it becomes a means of conveying immediate impressions or subjective responses to ongoing relationships—regardless of how trivial. The way in which electronic communication speeds up the process of putting responses into print, or as visual images, does not change the embodied relationship between the serious writer and the task at hand—where ongoing relationships with others are often experienced as interruptions.

To summarize the key point, orality (that is, speaking or exercising other embodied forms of communication) is highly influenced by awareness of contexts, that of the speaker and the ongoing responses of the Other. Print-based storage and communication, on the other hand, marginalizes the importance of local contexts while at the same time representing what is too often assumed to be an "objective" reality. While electronic communication now introduces important variations in what was formerly a much more static way of representing reality, the generalizations presented here can easily be tested in terms of their explanatory power by asking students, even graduate students, whether such printed word as "freedom," "progress" "individualism," "free-market," and so forth have a universal meaning. And if classroom teachers and university professors were asked whether such printed words as "tradition," "science," intelligence," "data," and "technology" refer to real entities and processes or are metaphors that carry forward earlier expressions of cultural intelligence, I think the answers would be, with only a few exceptions, largely the same. One of the key differences between the spoken and printed word is that the abstract nature of the latter (in its varied manifestations) is reinforced by treating language as a conduit in a sender/receiver process of communication.

The Connections Between Ecological Intelligence, Language, and Different Modes of Communication.

The combination of the conduit view of language and the printed word hide how the analogs that frame the meaning of many words were selected in earlier eras when there was no awareness of environmental limits. These earlier eras left a linguistic inheritance of misconceptions and silences, along with the dominant tradition of print-based storage and communication. Both have helped to create a number of the myths that underlie the industrial/consumer-dependent culture that is overshooting the sustaining capacity of natural systems. But one of the most dominant myths in the West is that we are born into a world as individuals, and that through education we can become more autonomous and self-directing. Indeed, this myth has developed through various historical periods, from being born into a fixed station in life where identity was that of a subject within a hierarchically ordered social world, to that of being a citizen possessing the rational capacity necessary for exercising the vote and thus a degree of control over the political process, to that of being creative—which evolved into the idea promoted by progressive educators and modern artists that individuals create their own knowledge and values through their subjective reliance upon critical thinking and creative expression. There have been other supporting myths, such as the root metaphors of patriarchy, mechanism, progress, economism, and evolution, that provided the conceptual framework that supported the myth of individual autonomy that was required by the

Industrial Revolution. This myth has led to a number of gains in the area of social justice but is still ecologically unsustainable.

Western philosophers also provided support for what has now become the world-view articulated by Ayn Rand and her Tea Party followers. Their varied ideas on the nature of individualism support the agenda of western-style corporations that view all aspects of life as having the potential of being integrated into free-markets where the process of natural selection will determine the better adapted. From Plato to the present philosophers such as John Dewey and Richard Rorty, other cultural ways of knowing were ignored, as well as the importance of the intergenerational knowledge and skills that are the basis of the world's diverse cultural commons—and that represent the mutual support systems within communities(along with other destructive myths) that were largely non-monetized. The diverse knowledge systems created by these philosophers and political theorists were not derived from a study of the world's diverse communities of memory, but from different traditions of abstract ways of thinking. The abstract nature of their ideas, including the misconceptions that were the basis of their explanations of the origins of knowledge, was further strengthened by relying upon putting them into print—which added to the myth of individual autonomy by promoting the idea that progress is attained by criticizing and thus keeping alive what were otherwise the still-born abstract theories that represented a universal reality rather than one that is culturally grounded and interpreted.

As elites in government and education were educated to view these abstract theories as high-status knowledge, their theories were often translated into political and economic policies. The root metaphors of individualism, progress, a human-centered world, and so forth represented both a more complex and even more abstract set of interpretative frameworks for these elites. In being unable to think in ways other than what was dictated by these taken for granted root metaphors (interpretative frameworks), these elites translated into law and social policies the philosophers' culturally uninformed theories about the origins of private property, the nature of free-markets, the connections between critical thinking and progress, the Social Darwinian justification for the colonization of other cultures, and the imposition of the one-true approach to knowledge as the way to modern development. What was missing in the heritage left by these well-intentioned but hubristic-driven elites was an understanding of other cultural knowledge and moral systems that that were based on ecological intelligence. Also, missing was an understanding of the metaphorical nature of language, and how it carries forward the misconceptions and silences of earlier cultural eras.

In the 1880s, Friedrich Nietzsche warned against thinking that relying upon the rational process exercised by supposedly truth-seeking individuals would lead to an objective understanding of how the world operates. He also provided a way of recognizing that thinking, and the language that guides it in ways few people are aware, is through and through metaphorical in nature. But it was not until the early 1980s that a series of books appeared that provided a coherent explanation of the metaphorical nature of the cultural/language/thought connections, but it was too revolutionary and thus had little affect on the education of most professor who continue to reinforce the misconception that language is a conduit that allows ideas, data, information, and other conceptual schemas to be put into print and passed to others who will also assume that what they are reading or viewing is free of the hidden influence of metaphorical thinking.

The importance of the myth of language serving as a conduit in a sender/receiver process of communication can be seen in how the root metaphor of mechanism has led scientists and others to use the language of machines to describe organic processes and even thought itself. And perhaps the greatest danger resulting from the failure to recognize how metaphors (and root metaphors) carry forward the misconceptions of earlier eras can be seen in how scientists took for granted that this is a human-centered world (another root metaphor), and that their achievements in introducing synthetic chemicals into the environment were representative of a linear form of progress (which is another still taken for granted root metaphor). Given the lack of awareness of scientists who introduced thousands of life-altering synthetic chemicals into the environment without being aware of how they interact with other synthetic chemicals, as well as the chemical systems that govern the development of humans and other organisms, the important question today is: Are scientists introducing their students to how the assumptions of the culture encoded in the metaphorical language frame their taken for granted patterns of thinking, or are they still perpetuating the idea that the scientific mode of inquiry and the language used to justify their research are free of cultural influences?

In my experience, getting scientists to recognize the many ways in which language contributes to ignoring the cultural roots of the ecological crisis, as well as recognizing its role in the massive poisoning of humans and other species, are near impossible tasks as they view themselves as the empirically grounded rationalists who have the power to explain all aspects of life. The prime example of the widely shared sense of exceptionalism within the scientific community can be seen in Stephen Hawking's claim that as soon as scientists have worked out the last problems leading to a "theory of everything," which will be a mathematical formula, we will know why we are here.

Individualism, as noted above, is such a long-standing and powerful root metaphor that most westerners have difficulty recognizing the contrary evidence. The most important evidence is that there are no instances when the individual is entirely alone: that is, when she/he is not in a relationship with some aspect of the physical and cultural environment. Being an autonomous individual exist only in thought; that is, only in the pattern of thinking influenced by a culturally and thus historically grounded metaphorical language. In light of the cultural roots of the ecological crises, this idea, which has motivated so many western reformers, needs to be regarded as a misguided illusion. As this previous statement suggests, the individual is never free of the influence of the languaging processes she/he acquired when born into the language community that provided the earliest forms of nourishment and protection. To make this point more directly, unless the individual is in some drug-induced mental state, or in a state of dementia, she/he experiences thoughts and communicates verbally and non-verbally by relying upon the language systems of the culture.

The argument that the idea of the autonomous individual is a myth should not be interpreted to mean that it has not led to the development of important conventions and institutions, such as ideas about the civil liberties and legal protections that are considered the rights of individuals. But even these traditions have been subject to abuse, including the current one of giving corporations the legal standing and rights as individuals. The achievement of greater social justice for groups previously marginalized and exploited politically and economically also represent the positive gains of thinking of the person as

an individual with distinct rights and responsibility for respecting the similar rights of other individuals.

These background observations about the historically derived linguistically based misconceptions and silence that have been translated into institutions, into approaches to economic activities, into ideologies and moral systems that separate the deserving from the undeserving, and into approaches to education, need to be kept in mind as we return to the main focus of this essay: namely, how print-based storage and communication undermine the wider exercise of ecological intelligence. To reiterate several key points: the printed word cannot reproduce the complexity of sensory experiences, the interactions with others in the local cultural and natural ecologies, the inner states of awareness that accompany these interactions, and the hidden historical influences on memory and linguistic competence. The printed word provides a surface account of highly abstracted information, and what it represents is fixed in time—until some other author updates and reframes it by introducing other print-based accounts of equally fixed and abstracted information. Computer-based storage and communication, of course, makes this process more dynamic—and can even create what Walter Ong refers to as secondary orality where background assumptions are shared and thus not needing to be made explicit.

The emphasis on the autonomy of individual intelligence undermines the need for accountability in how the individual participates in the local cultural and natural ecologies. That is, when our high-status educational institutions, as well as the media, promote the myth that language is a conduit in a sender/receiver process of communication (which hides the role of language in the cultural construction of what people take to be reality), along with the myth that the printed word or the abstract word that is spoken accurately represents what people take to be reality, they are then living in a world of illusions that are based on abstract thinking. The world of abstract representations leads to more arguments and subjective interpretations, but neither really comes to grips with the on-the-ground realities. This can be seen in the current debates where numbers are used to represent the state of the economy, the unemployed, the homeless, and so forth. These abstractions are unable to fully represent the complex feelings of the homeless child or the ecological changes occurring in the water as more toxic chemicals are introduced into the environment. As long as the debates are framed by the use of abstract words and images, there is little chance that reason, empathy, and a sense of responsibility will lead to reframing how people understand that their very existence is ultimately one of interdependence and mutual support. The use of numbers reframes how time is understood, and thus awareness of how, over the long term, we are interdependent with others and on the environment.

Ecological intelligence has been mentioned several times here, as well as the phrase “local context.” Gregory Bateson introduces a phrase that helps clarify one of the primary characteristics of exercising ecological intelligence, as well as the complexity and interactive processes in local contexts. When people are first introduced to this phrase, which leads to a way of thinking that is so radically different from the world of abstract and fixed entities and events, it is likely to be dismissed as a source of confusion and as meaningless. As Bateson writes in *Steps to an Ecology of Mind* (1972, p. 315), “A bit of information is definable as a difference which makes a difference. Such a difference, as it travels and undergoes successive transformation in a circuit, is an elementary idea.” His use of the word “idea” may put people off, as he is not referring to

an idea as we have traditionally understood this metaphor. Rather, his use of this word refers to the ongoing differences that occur at the chemical, genetic, human behavioral-conceptual, and macro-ecosystems that lead to other differences in the behavior of the participants and forces in these ecologies—which continue to lead to other differences that circulate and thus introduce changes in the interconnected world of cultural and environmental ecosystems. In short, the differences lead to changes that then become the differences that lead to more changes. These cycles of differences affect changes in the genetic maps that organize the life of a plant or animal, in the behavior of the person preparing a curry, in the actions and strategy of the sailor who recognizes how changes in the wind affects the surface of the water, in the growth of super weeds as their internal chemistry adapts in ways that make them resistant to herbicides such as Round-Up.

Ecologies, both natural and cultural, have their own ways of being receptive to differences introduced into their environment, and their way of responding may range from the chemical and genetic level to the symbolic/behavioral level of certain animals and all humans. These internal and external changes become the differences that introduce changes in the interconnected world of different ecologies. What is important is that each entity has its own way of responding to the differences introduced by other participants that co-evolved in the ecological system. For plants, the differences to which they respond may be introduced by the chemicals in the soil, by changes in temperature, and by whether the pollinators have gone extinct. For humans, awareness of differences are detected by the senses, by memory of what no longer exists (such as privacy), by how the cultural language systems influence awareness of certain differences while hiding other differences that should have made a difference in thinking and behaving. If we were to give our full attention, which includes giving attention to what our senses are reporting, to the ecology of differences in our conversations with others, in framing a doorway, in sitting in a lecture room, and so forth, we would then become aware of the sequence of minor changes that influence our responses, which in turn introduce differences that, like the circle of minor waves that follow from a rock being thrown into the water, affect other organisms within the larger cultural and natural ecologies.

The important point here is that when thought is focused on the abstract representations of reality, such as the printed word and the images on a screen, the multiple on-going differences which make a difference at the sensory/thought/memory/intentionality level of experience are largely ignored—except for such differences as the behavior of a drunk driver, the road sign improperly located, the patronizing comment, and so forth. The men and women who drive the oversize SUVs respond to a steady stream of differences in their environment, and hope they are introducing differences in how others perceive them (hopefully as macho, as rich, as the source of envy, etc.). But their behavior indicates that they are not giving attention to the differences introduced by the amount of carbon dioxide they introduce into the environment. And the cycle of differences, which make a difference in their behavior, can be traced back to the cycle of differences introduced in the manufacturing of their SUV: in the differences introduced as computer-driven machines displace craft knowledge and the workers themselves, in the ecological footprint of transporting the raw materials used in the manufacture of the SUV, in the differences in quality of life for humans and habitats resulting from the mining of coal necessary for the production of electricity, and so forth.

This example applies to all aspects of the built culture, and to all aspects of human experience. In short, all life-forming and sustaining systems, including systems that are destroying the natural ecological systems we have come to depend upon, are ecologies. In thinking about the educational reform implications of this largely overlooked reality, it needs to be recognized that as humans we do not exist independent of these cultural and natural ecologies. We are participants and interdependent, even when we think of ourselves as the Cartesian individual whose rationality separates us from the world that is the object of observation, thought, and manipulation. To make this point in a slightly different way, even though our common phrases such as "I think," "I want," and so forth suggest being autonomous and external to the world we think about and act upon, giving close attention to the steady stream of micro-actions and thoughts that are made in reaction to the ecology of differences will reveal that we all exercise some degree of ecological intelligence. That is, we all respond to differences, and what makes them differences which **make** a difference can be traced in part to cultural influences that can more broadly be understood as the influence of education.

As I have pointed out in previous writings, the languaging processes of the culture exert a powerful influence on which differences will be recognized and understood as important, and which differences will elicit a culturally conditioned response that lacks awareness of the cycle of environmentally destructive differences. Once we recognize that we all exercise some degree of ecological intelligence, which means that we respond to differences occurring in the natural and cultural environments, we can then begin to think about how the educational processes of the culture contribute to different stages in the exercise of ecological intelligence. Recognizing this means we have moved beyond the myth that represents the individual as an autonomous thinker and actor. Hopefully, we will also be able to move beyond the myths of objective knowledge, a rational process that is free of cultural influences, and the tradition of thinking of print as a more accurate way of representing reality than the oral traditions that rely upon all the senses and are more responsive to the immediate experience of differences.

Ecological intelligence is not an abstraction that has its origins in some academic's theory, just as the cultural commons are not an abstraction. Both are part of the ecologies in which we are nested. And awareness of both have been marginalized by the mythic patterns of thinking of philosophers, theologians, and other intellectual elites who failed to understand the culturally transforming characteristics of using the abstract symbols of a system of writing to represent the dynamic nature of the life-forming and sustaining ecologies that are part of daily experience. While print has made important contributions, it has also transformed consciousness in ways where the abstract is considered as more real than the experience of responding to the ecology of differences that are an inescapable part of everyday life.

The use of categories is always problematic as it involves imposing abstractions that have sharp boundaries in a world of diverse and interacting ecologies where there are seldom boundaries. But like print, it has its positive use, especially if it is remembered that what is included in each of the categories represents the dominant characteristics of a particular expression of ecological intelligence. The use of categories for identifying different stages in the development and exercise of ecological intelligence thus does not exclude the possibility that some people rely more on stage-one ecological intelligence, but may in some areas of life exercise stage-two or even stage-three levels of ecological

intelligence. The use of the categories is simply a way of identifying dominant patterns, which is important in terms of thinking about educational reforms that, hopefully, may lead students to exercise the more complex and inclusive forms of ecological intelligence.

Characteristics of Exercising Stage-One Ecological Intelligence. We all exercise this stage of ecological intelligence in that we all respond conceptually and behaviorally to differences occurring in our natural and cultural environment—and how these differences interact on each other. What is distinctive about exercising this stage of ecological intelligence is that it is primarily influenced by one's personal agenda. That is, it is individually centered, and largely pragmatic in terms of being aware of differences that must be taken into account in order to achieve a personal objective. Stage-one ecological awareness of differences becomes part of strategic thinking. The person speeding down the freeway, and looking for a space in the other lane of traffic into which to squeeze, is exercising a self-interest level of ecological intelligence. That is, the driver has to consider and respond to a number of differences that are constantly changing: the speed of the other cars and the changing space between them, the traffic immediately ahead, the changes in road condition and whether rain is hampering visibility. Other examples of state-one ecological intelligence include the cycle of decisions that lead to exploiting the known vulnerabilities in getting people to buy a product they don't need, in making corporate decisions about the amount of sugar to put in a cereal and the visual image on the box which rely upon market research that takes account of a wide range of differences in consumer habits, cultural differences, and competing market forces—all differences which make a difference in achieving greater profits. But this level of exercising ecological intelligence fails to take into consideration how the corporation's decisions contribute to the addiction of youth and adults to an excessive use of sugar and salt, to how industrially produced food undermines the intergenerational knowledge of different cultural groups, to how the undermining of the cultural commons makes people more dependent upon the environmentally destructive industrial system—and generally to the wide range of issues related to social justice.

I operated at this level when I put a sign on my office door that I was not to be disturbed (except in emergencies as the students understood them) until after 11:30 am, as I wanted the uninterrupted time for writing. This personal agenda introduced a chain of differences in the lives of my colleagues. Indeed, it would be safe to say that most of our daily activities involve this more limited exercise of ecological intelligence. However, the individually and corporate-centered stage-one exercise of ecological intelligence too often becomes driven by a host of psychological motivations. A recent example was the greed and desire to exploit others less able to understand the implications of signing up for a sub-prime mortgage, which became, in turn, part of the ecology of differences that led to a whole series of events that enriched a few who should have faced criminal prosecution while others lost their jobs and homes. Closer examination of these out-of-control and non-accountable ecological systems would reveal the same micro-level of differences which make a difference in other people's behavior and future prospects. The constant reinforcement by the media, by classroom teachers and professors, and by the prevailing ideologies that individuals are the basic self-directing social unit ensures the dominance of stage-one ecological intelligence in American life. But it also needs to b recognized that there are situations where stage-two and even stage-three ecological

intelligence are exercised: that is, where social justice and environmental issues are given careful and momentary attention.

One of the characteristics of people who exercise stage one ecological intelligence, and are unable to move to stage-two and three, is that their language is highly abstract and thus unrelated to the on-the-ground events (the experiential realm of being aware of differences which make a difference) that should be evident to anyone whose thinking is influenced by the total range of sensory experience. Their vocabulary is dominated by words that are often unrelated to events and processes in the real world. Indeed, their use of abstract words are meant to be taken as self-explanatory and judged to be true representations without requiring verification in terms of local contexts. The current political discourse by the millionaire and university-educated members of Congress, for example, includes such context free words and phrases as "free-markets," "national defense," "terrorism," "the rich should not be taxed because they create jobs," "American exceptionalism," "shrink the size and role of government," "sign the pledge not to increase taxes," "eliminate the Environmental Protection Agency," " freedom of the individual," "the poor should get a job," "eliminate child labor laws," and so forth. These abstract words and phrases are not informed by what is happening in the real world of daily experience.

The public who takes these sound bites as sources of wisdom and as guides to public policy are also victims of the influence of a largely print-based education and the constant reinforcement of abstract thinking promoted through the media and through an educational process that also emphasized their sense of individual exceptionalism in constructing their own knowledge, values, and sense of what is relevant to study. Perhaps the best evidence of the destructive effect of an individually centered exercise of stage-one ecological intelligence can be seen in the failure to recognize the connections between the low level of satisfaction with the performance of Congress and the fact that it was the uninformed judgment of the people who voted in the members of Congress who are in ideological gridlock with each other. In many instances their vote is based on the abstract words of ideologically driven narratives that still justify the industrial/consumer-driven culture that is putting future generations at risk of facing the collapse of the life-sustaining natural ecosystems. Yet the voters do not recognize their responsibility for the policies that are introducing a downward spiral of life-limiting differences in the lives of other people, such as driving them into poverty and accelerating the rate of environmental changes that are now affecting people's health and other life prospects.

Their abstract vocabulary is released into the world of thought like helium-filled balloons that drift upward and away from the realities of everyday life, and there is no accountability for how these abstract words distract people's attention from the life-altering changes that a more reflective and experience-informed use of language should take into account. Unprecedented floods, droughts, declines in fisheries, dying off of vast forests, raging fires, and increased presence of toxins that lead to cancers and other abnormalities, are now being reported daily. Yet these differences which make a difference that are part of people's daily struggles have not led to a large scale transformation in the guiding rhetoric of this segment of the population. The poverty resulting from the monetizing of more aspects of daily life and the decline in jobs due to computer-driven automation are also being ignored as people's attention is influenced by this emotionally charged abstract political language. Unfortunately, most public school

teachers and university professors also ignore how they are complicit in perpetuating stage one ecological intelligence that is backed by the certainties of the abstract vocabulary that has now taken on a ritualistic role.

Characteristics of Stage-Two Ecological Intelligence. Few of us are consistently able to exercise this level of ecological intelligence, but what separates it from stage one ecological intelligence is that it involves being aware of and responding to differences in interpersonal relationships, and in the work, political, and other settings where differences in ethnicity, gender, social class, and other marginalizing categories become important to how the Other is treated. Exercising stage-two ecological intelligence involves becoming aware of the patterns of discrimination, of the silences, of the poverty, and of the underlying language and cultural patters that are often unrecognized because they are taken for granted. It involves a heightened awareness of the moral and social justice implications of the differences that require an informed response—which, in turn, sets in motion behavioral differences in the experience of others who understand that the interdependent cultural and natural ecological systems we call community involve moral issues. And these moral issues call for changes in behavior—that is, behaviors not limited to words but in actions that are community affirming.

People engaged in the feminist, civil rights, and labor movements, as well as various efforts to eliminate poverty, exercised social justice-oriented ecological intelligence. Often missing from the various forms of discrimination and unequal treatment that were part of the cultural ecologies of differences to which social justice activists responded was the lack of awareness of the how the natural ecologies were being degraded—even as the social justice activists worked to enable excluded social groups to become equal participants in the individualistic/consumer-dependent lifestyle. For decades public school and university professors worked to end various forms of discrimination, but never questioned whether there were alternatives to the consumer-dependent lifestyle being upheld as the goal of achieving a more socially just society. Most public school teachers and university professors still have not taken this question seriously, which has led to ignoring that many of the ethnic groups victimized by various forms of discrimination still carry forward intergenerational traditions and skills that make their cultural commons stand out as alternatives to the individually centered industrial/consumer-dependent culture that is degrading the sustaining capacity of natural systems.

The vocabulary of the well-intentioned reformers who exercise stage-two ecological intelligence has also been dominated by their own set of ideologically driven abstractions. Nevertheless, their stage-two exercise of ecological intelligence led to an awareness of the cultural ecology of differences which make a difference in the level of poverty, limited possibilities for personal development, exclusion from the political process, and the many forms of prejudiced communication that undermined marginalized individuals and their group's ability to have a positive self image of themselves and of their primary culture. Awareness of these differences, which show up in the incarceration and school drop-out figures, in low involvement in the political process, in the rate of poverty and serious health issues, in the inadequate housing and crime-infested environments, in the poor diets, and in children who are homeless, and so forth, have led social reformers to act—generally facing opposition from that segment of society whose thinking is still dominated by the abstract theories of philosophers and economic theorists

who ignored cultural differences in the nature of local markets, in how language carries forward the conceptual frameworks of earlier eras that people today mistake to be the expression of their individualized thinking.

The exercise of stage-two ecological intelligence also has its silences that are connected to how their reliance upon an abstract vocabulary marginalizes awareness of the ecological crisis, its cultural roots, and how it is already impacting the lives of the marginalized groups they are seeking to help. Their abstract vocabulary includes such words and phrases as "freedom," "emancipation." "decolonization," "individualism," "social justice," "transform the world," "to exist, humanly, is to name the world, to change it," and so forth. This vocabulary is as abstract as the vocabulary of Ayn Rand and the other libertarians who have now merged with the thinking of the market-liberals. The latter can trace their thinking back to the abstract theories of John Locke, the misreading of Adam Smith, to the Social Darwinism of Herbert Spencer, and to current economic theorists following the lead of Milton Friedman.

The domination of this abstract vocabulary can be seen in how it marginalized awareness of the differences which should have made a difference if these social reformers had given careful attention to the ways of thinking and values of other cultures—in many cases, the cultures they were attempting to liberate. That is, the differences in cultural approaches to the exercise of ecological intelligence should have been clearly apparent —if these social reformers had bothered to set aside their ideologically driven abstract vocabulary and relied instead upon learning from the other cultures—which should have included an in-depth experienced-based understanding of these cultures. Also missing from the awareness of reformers exercising a limiting ethnocentric form of stage two ecological intelligence are the differences which make a difference in the behavior of the world's diverse ecosystems—and how these changes are impacting the bioregions of different cultures—and now their prospects for survival. Again, the power of language to illuminate and hide can be seen in which differences occurring in cultural and natural ecosystems are recognized as important. Indeed, a case can be made that introducing students to how the ecology of language influences awareness of the changes occurring in the cultural and natural ecologies should be part of reforming the curriculum of public schools and universities.

Characteristics of Exercising Stage-Three Ecological Intelligence.

Obviously, the individually centered exercise of ecological intelligence is not the model for learning how to live in ways that are less environmentally destructive. In fact, most situations where it is exercised contribute to undermining the viability of natural systems. Combining a social justice agenda with the exercise of ecological intelligence is also problematic if the agenda fails to take account of deep cultural assumptions underlying the industrial culture now being globalized. Equating equality of opportunity with joining the middle class of consumers is also problematic. The libertarians and market-liberals who have provided the conceptual and moral justification for the pursuit of self-interest, along with the Social Darwinian theorists who claim that Nature will sort out the winners from the losers (thus giving a sense of scientific legitimacy to the uninformed), are totally silent about environmental issues—which echoes the silence of most social justice educational reformers. The major difference is that the latter are critical of the libertarian and market-liberal mantra of claiming that nothing should stand in the way of economic growth and the need of the already rich to further expand their

wealth and political influence. But they both share many of the same deep cultural assumptions about American exceptionalism, as well as many of the assumptions about individualism, progress, and a human-centered world. While the libertarian and market-liberal approach to exercising ecological intelligence, which is centered in a extreme form of pursuing individual and corporate self-interest, ignores social justice issues by assuming the process of natural selection governs such matters, stage-three level of exercising ecological intelligence avoids the silences in the thinking of the social justice reformers.

Changes in the viability of natural and cultural systems have a direct impact on the well-being of the already marginalized groups. In short, the exercise of stage-three ecological intelligence involves addressing social justice issues. And it is this form of intelligence that recognizes that many ethnic cultures that have been excluded from participating fully in the western model of the consumer-oriented middle class still carry forward intergenerational skills and knowledge that have many of the characteristics of stage-three ecological intelligence. Unfortunately, the efforts on the part of some social justice advocates to make available to every child in the Third World a personal computer, which will reinforce the core assumptions underlying the western industrialized approach to a consumer-dependent lifestyle, will contribute to the loss of the oral and mentoring traditions essential to passing on to the next generation the multiple levels of sensory awareness and tacit learning necessary to exercising stage-three ecological intelligence.

Unfortunately, the widespread silence about the environmental changes that can be attributed to the modern myth of progress, was shared by the mentors who guided the graduate studies of many of today's professors. And this silence continues to be perpetuated in most social science, humanities, and professional school classes. The few faculty in the non-science areas who are introducing students to a problem-solving approach to renewing local ecosystems do so within the conceptual framework of their disciplines. This too often has meant perpetuating the conceptual silences and the taken for granted assumptions that have their roots in the conceptual history of the discipline. To be more specific, the environmentally oriented professors in the social sciences and humanities were educated in a time when the metaphorical nature of language, the fundamental differences between print- and oral-based cultures, and the cultural non-neutrality of computers were of interest to only a few faculty who were not pre-occupied with the various "isms" that dominated the academic landscape in the post-World War II era.

Rachel Carson's *Silent Spring* (1962) and the Club of Rome Report, *The Limits to Growth* (1972) were wake-up calls that led to the environmental movement and then to a large number of books, scientific reports, and government and international committees, non-governmental agencies, and now grass-roots efforts understand and find alternatives to environmentally destructive practices. But the same silences and misconceptions continue to go unquestioned by most university faculty—and by extension, nearly all public school teachers. The silences on the part of science faculty about the need to introduce students to an understanding of the interconnections between the different cultural and natural ecologies, and about the need to offer a course on the ethics of scientific inquiry and uses of technologies, continue to exist.

These issues are mentioned here as they are critical obstacles that stand in the way of an educational process that fosters stage-three ecological intelligence. The recent video produced by ABC, *Earth 2100: To Change Our Future, First We Must Imagine It* (2010), if shown to the widest possible audience, would awaken many people from the mythic thinking that continues to be perpetuated in the media, in every shopping mall, and in almost every classroom. It provides the viewers with a narrative and the visual representation of two scenarios of what humans are likely to face over the next 90 or so years. The first is based on the scientific evidence of the changes that different ecosystems are undergoing, and it shows how changes in one part of the global ecosystem, such as global warming, leads to other changes such as floods, droughts, and the release of methane gases that further accelerate global warming, and so forth. What brings the message home is how the narrative highlights the impact on humans, such as how the shortage of potable water, the failure of crops and the spread of hunger will lead people to migrating to regions that have not already been devastated—and to how this will lead to the further breakdown of civil society. Faced with environmental changes that make earning a living impossible, as well as the breakdown of local infrastructures, vast numbers of people will become environmental refugees and revert to earlier periods in human history when personal survival became more important than adhering to moral codes.

The alternative narrative, with its visual representation of what is technologically possible, represents how cities can be transformed from their current status of being dependent upon outside sources for energy and food to where they are self-sustaining in both areas. Buildings will be designed in ways where the residents can grow their own food and the buildings themselves will be able to capture their own sources of energy. But overlooked in this scenario of how an ecologically sustainable future is to be attained are the cultural processes discussed earlier in this chapter, and in other parts of this book. That is, the continued domination of print and now computer-mediated thinking, as pointed out earlier, reduce awareness on the part of the majority of the population of the sustainable differences which make a difference—in the uses of technology, in relying upon the interpretative frameworks (root metaphors) inherited from various elite groups who assumed that this is a rationally centered world, in the various ways in which local intergenerational traditions of self-sufficiency are being undermined by the market system that has no moral limits on what can be monetized, in an ideology that promotes economic globalization and thus the loss of linguistic diversity, and so forth. That is, there is no recognition of how to address the political/linguistic issues that divide the country between the exploiters and those who are working to address eco-justice issues.

The message in E*arth 2100* is clear. Whether it prevails over the counter-messages promoted by various corporations and their ideological bases of support is doubtful. If humanity is to have a future that does not degenerate into the social chaos that will follow from the rapidly diminishing resources, it will be necessary for all cultures, including our own, to promote stage-three ecological intelligence. The rapid transformation in the life-sustaining characteristics of natural systems has already been set in motion by over three to four hundred years of mythical thinking about the ability of humans to control their fate by exploiting an environment mistakenly assumed to be endless. When we consider the scale of changes occurring in the world's oceans, in the climate systems that impact and thus transform huge regions of the world, and in the

continued release of carbon dioxide and other gases, and toxic chemicals by a consumer-dependent lifestyle that has taken on the status of an addiction, it is hard to avoid the conclusion that the needed reforms cannot be achieved by a small number of people who have already learned to exercise stage-three ecological intelligence.

Yet, there are many scientists who are claiming that we have not yet reached the tipping point where the rate of environmental change will be irreversible. The most optimistic prediction is that we have thee or four decades before reaching the point of no return. If public school teachers and university professors in the various disciplines wake up from the myth of living in an era of unending progress they will need to begin introducing reforms that foster the exercise of stage-three ecological intelligence. A partial list includes the following:

1) Introducing students to the differences between relying upon abstract (printed) words as a source of knowledge, and relying upon a combination of sensory awareness of the differences which make a difference (in the behavior of local natural and cultural ecologies) and the linguistic/conceptual ability to understand how behaviors and other aspects of the built culture need to be understood as ecologies that either undermine or enhance the prospects of a sustainable future.
2) Learning how indigenous cultures intergenerationally reinforce their traditions of stage- three ecological intelligence through a variety of means, such as narratives and mentoring in the daily exercise of ecological intelligence which requires both careful observation and memory of past mistakes. Students also need to learn how to exercise of stage-three ecological intelligence within their own culture where print-based abstract thinking is considered the source of high-status knowledge. They also need to be able to recognize the many sources of resistance to stage-three ecological intelligence. These include:
    a). The idea of being an autonomous individual can be challenged by introducing students to how language carries forward earlier ways of thinking that they are socialized to accept as their own taken for granted way of thinking.
    b) Introducing students to how to think about the ecology of language, and how earlier ways of thinking are encoded in our built environment, including the uses of technologies—and in how our moral systems continue to represent us living in a human-centered world. This will enable students to become aware of how the earlier ways of thinking continue to frame the meaning of metaphors that are the basis of current taken for granted patterns of thinking about relationships. Understanding the metaphorical nature of language, in turn, is critical to students being able to articulate why the differences which should make a difference in the natural and cultural ecologies are important. Awareness of differences occurring in the environment, as Bateson reminds us, should lead to differences in behavior and thinking, especially if students are aware that learning to exercise stage-three ecological intelligence is essential their survival and that of their progeny.
3) The curriculum, starting in the early grades, should introduce students to an understanding of various natural systems as ecologies, including how cultural beliefs and practices affect the sustaining characteristics of the natural ecologies

and how changes in natural ecologies, ranging from the micro to the macro systems, affect the prospects of humans. The role of language, including whether it is spoken or printed, should also be part of the study of the interdependencies between cultural and natural ecologies.

4) Students should be introduced to the different historical periods that required different forms of intelligence, starting with the hunter/gather societies, the early stages of agriculture and permanent settlements, and then the industrial/consumer-dependent cultures, and why it is now necessary to make the transition to a post-industrial and ecologically sustainable form of intelligence.
5) Students should be asked to give close attention to the differences in what they experience when they rely upon various abstract symbol systems as well as electronic mediated thinking and communication. They also should be asked to give close attention to how learning differs when it is not limited to print and to what is acquired from the Internet, but instead relies on a combination of the knowledge they access through the senses, memory, and the conceptual ability to recognize whether the relationships and patterns of which they are aware are ecologically sustainable. They should also be encouraged to give close attention to how differences which make a difference in their interactions with others, within the natural world, and so forth, affects how they think and act. This part of the curriculum should enable students to recognize that the exercise of intelligence is participatory as it takes into account and involves responding to the changes (differences) introduced by interacting within the cultural and natural ecologies. The connections between what the metaphorical nature of language illuminates and hides should also be part of what students should be asked to consider.
6) Students should be encouraged to learn about the ecologically sustainable post-industrial, cultural practices being carried on by different groups within the community. These practices, which are examples of the cultural commons that vary from ethnic to ethnic group and from rural to urban settings, should be discussed in terms of how the industrial/market-oriented mindset works to enclose them—that is, to monetize them by integrating them into the market/consumer-dependent culture.
7) Students should encounter at some level in their education in-depth discussions of the various ways in which abstract thinking have been elevated to higher status over oral traditions. This would include how the idea of a liberal education may have been part of this process of denigrating local knowledge and marginalizing awareness of those aspects of the cultural commons that have a smaller ecological footprint. This should also include examining how various theories, ranging from those of major western philosophers to those of political and economic thinkers, have marginalized awareness of cultures that have taken a more ecologically informed pathway to development.
8) Developing the capacity to recognize differences which should be understood as making an ecologically sustainable difference requires introducing students to the following: (1) The connections between the history of words and ideologies, particularly how the root metaphors inherited from the past continue to influence the thinking of scientists who were and continue to be responsible for the

> introduction of synthetic chemicals whose toxic qualities are still inadequately understood; (2) The ways in which market liberal ideology, religious fundamentalism, and the alliance between politicians and corporate interests have become part of the infrastructure of a police state that has a globalizing economic and cultural colonizing agenda; and (3) The importance of understanding the differences between science and scientism.

Like the video, *Earth 2100* and all the books now urging that we need to undertake consciousness-changing educational reforms, this will only be possible if attention is given to what most people find especially difficult to recognize: namely, their own taken for granted patterns of thinking. And when this aspect of the culture-consciousness relationship is taken seriously, the next step will be to focus on the different ways that earlier ways of thinking—including the myths, misconceptions, prejudices, and silences––have been intergenerationally passed along as the taken for granted ways of understanding and responding to the culturally constructed reality. The above analysis of the differences in how the spoken and printed word illuminate and marginalize awareness of the cultural and environmental changes that past ways of thinking may be unable to understand or even recognize suggests the difficulty facing educational reformers. Just as this chapter focused on the basic cultural reproduction and thus consciousness shaping characteristics of oral- and print- based storage and communication, the following chapters focus on equally basic and thus often overlooked issues: (1) The historical processes involved in framing the meaning of words (metaphors) as well as how to update the analogs in ways that are ecologically and culturally informed; (2) The dangers inherent in how noted scientists are misrepresenting scientism as science; a misrepresentation that further perpetuates the scientist's earlier patterns of ethnocentric thinking and lack of understanding of how scientists are unable to escape the cultural assumptions encoded in the language they take for granted; and (3) The need to explore one of the major areas of silence in the thinking of futurist-thinking scientists and proponents of the modernizing agendas: namely, what do we need to conserve in an era of political and ecological uncertainties.