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The Language of Ecological Intelligence

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Scientists are documenting a rate of change in the Earth's ecosystems that far exceeds the rate in which the West is able to introduce fundamental changes in its core guiding assumptions. Changes in the chemistry of the oceans that are affecting the viability of fisheries, as well as changes in the glaciers that are the source of water that hundreds of millions of people depend upon, are now being measured in mere decades. The additional five billion people added to the Earth's population since the beginning of the twentieth century is further accelerating the rate of environmental degradation. Changes in the consumer/technological sectors of western cultures, which are now being globalized, create the illusion that cultural changes are keeping pace with the rate of environmental changes. This illusion is based on the failure to recognize that the cultural changes we associate with progress are based on the conceptual foundations that can be traced, in terms of western cultures, back to Biblical times.—and to the beginning of the scientific revolution and the privileging of print-based abstract thinking. Similarly, cultures rooted in other ancient religious traditions that are resisting the West's continuing colonization efforts are also unprepared to meet the challenges resulting from the rate and scale of environmental change.

The paramount challenge we face in the West is how to change the core assumptions that underlie how we think. This is necessary as the changes we falsely associate with progress have not slowed the rate of decline in the self-renewing capacity of the Earth's natural system, and it is important as the core assumptions underlying the West's approach to progress are being promoted through the spread of western technologies and the myth that the American consumer lifestyle should be the model for the rest of the world. One of the reasons that the core assumptions and values in the West are so resistant to change, even in light of the growing awareness that changes in the Earth's ecosystems are threatening the lifestyle that so many Americans and others now take for granted, is that key words in today's vocabulary carry forward the misconceptions and silences of earlier thinkers who were responding to the social issues of their era. The misconceptions and silences carried forward the taken for granted patterns of thinking and values of even earlier times, which in turn influenced the analogs settled upon in the writings of philosophers and social theorists who are still considered essential to a liberal education. These analogs framed the meaning of words that are, in many instances, the basis of thinking and values in the West. Even though such important people as Albert Einstein, Gregory Bateson, and Jared Diamond, among others, urge that a change in thinking is the only way of addressing the rate of environmental changes now threatening life on this planet, our educational systems continue to ignore the critical role that language plays in perpetuating the ideas that were formed before there was an awareness of environmental limits. That is, what the vast majority of Americans, as well as citizens in other western countries, fail to recognize is that words have a history. If the history of words is ignored, the analogs chosen in response to a

different set of social circumstances will continue to frame how we understand today's problems. This history also influences the silences that are clearly present when people claim that they are concerned about changes in the environment, but have few ideas beyond embracing the technological solutions being promoted by experts who share similar silences about the deep cultural changes that must be undertaken.

The word "ecology" has become a prominent part of today's vocabulary, especially among environmental writers, scientists, and even some educational reformers. One of the purposes of this paper is to examine how the history of this word carries forward the silences and misconceptions of the scientists who borrowed this word from the ancient Greeks. Another purpose is to rectify over a century of reductionist thinking by explaining how the ancient Greek understanding of "oikos" can lead to challenging current ways of thinking about the nature of intelligence. Regardless of whether it is a constructivist, cognitive science, or behaviorist explanation of intelligence, none addresses the language issues and thus the core cultural assumptions that have put western cultures on the pathway of overshooting environmental limits. As I will argue in this paper, only as we develop the capacity for relying upon ecological intelligence will we be able to understand how we are nested in cultural ecologies, and how cultures are nested in and thus totally dependent upon the self-renewing capacity of natural ecologies.

Misinterpreting the Metaphors of Other Cultures

As the word "ecology" has become associated primarily with the vocabulary and thus epistemology of post-mechanistic science, its use as a descriptor of a form of intelligence may seem unwarranted. What may appear as even more questionable is the suggestion that educational reforms should foster ecological intelligence. Before explaining the characteristics of ecological intelligence, and how it differs from the dominant form of intelligence now reinforced in public schools and universities, it is necessary to recognize that the ancient Greek word "oikos" referred to a profoundly different set of relationships than what Ernst Haeckel intended when he translated the Greek word and introduced it as "Oecologie" to a scientific audience in 1866. Haeckel reduced the meaning of oikos to the management of household relationships (which was partly correct), but shifted the focus to the scientific study of how living organisms function as a single interdependent economic unit. According to Donald Worster, the modern spelling of "ecology" was introduced in 1893, and from then on scientists began, through their study of different forms of dependencies and bioregions, to give ecology multiple meanings (1990, p.192). This linguistic elaboration represented shifts in the study of ecosystems, and included "climax formations", "ecological succession", "biotic communities", "energy flows", "ecosystems" , and so forth. The important point is that over the last hundred years scientists have largely claimed to be stewards of which analogs can be associated with the word ecology.

The traditional scientific disregard of the nature of culture led to the reductionist thinking that equated management of the household relationships and activities with managing the household of nature. For the ancient Greeks oikos encompassed all aspects of the social life centered in the household but also extending to community affairs that ranged from who could

perform certain economic activities, the succession of property rights and inheritance, to the roles that were dictated by gender. In short, oikos referred to a wide range of cultural practices, just as the more widely recognized Greek word "polis" referred to the physical site as well as individual participation in governance (1999, Nevett, pp10-20). What has been ignored by the scientific transformation of ecology into an increasingly powerful paradigm that opened new understandings of natural processes is that oikos referred to the complex culture of family life and its connections with the culture that extended outward beyond the household. Learning to live within the norms prescribed by the culture of oikos as well as the polis involved developing what can be referred to as ecological intelligence. Yet there was a profound difference from what ecological intelligence should mean today. That is, the ancient Greeks lacked an awareness of the interdependencies between human behaviors and the natural systems that some indigenous cultures have so clearly understood—and that modern ecologists have increasingly focused attention on as they collect evidence on the rate of environmental degradation.

It needs to be kept in mind that while oikos referred to a complex range of cultural practices and taken for granted values and ways of thinking of relationships, it did not include the degree of awareness we now associate with ecologically sustainable daily practices. That is, in foregrounding the cultural dimensions of the Greek understanding of oikos, it is not being suggested here that we should emulate their ancient traditions. Rather, what needs to be understood is that the modern translation of oikos, that is, ecology, is as relevant to understanding culture as it is to understanding natural systems. At the same time, it should not be assumed that the elaborated ecologically oriented vocabulary of the scientific community can be used to understand culture as an ecology of ideas, behaviors, and practices.

There are aspects of culture that are profoundly different from the characteristics of natural systems. For example, the elaborated ecological vocabulary that now frames different areas of scientific research is not adequate for understanding why ecological intelligence is expressed differently in cultures—especially in indigenous cultures. Nor is it adequate for understanding the challenges that confront efforts to introduce educational reforms that lead to ecological intelligence becoming a taken for granted pattern of thinking in Western cultures. As scientists study the energy flows, the processes of plant succession, the disruptions in food chains, the chemical/information exchanges within complex systems, the changes humans introduce in the evolution of plants and animals, and so forth, they have learned to exercise a limited form of ecological intelligence. But limited in the sense that their focus on natural systems has not included a similar level of understanding of cultural systems. Indeed, when it comes to how the majority of scientists understand cultural processes, it would not be inaccurate to claim that they take for granted many of the same cultural assumptions that are responsible for overshooting the sustaining capacity of natural systems.

The way in which ecologically oriented scientists have learned to think provides an important contrast to the taken-for-granted patterns of thinking now being reinforced in the media, through the use of computers, and in classrooms at all levels of the educational process. Core scientific understandings include the following: that all life forming and sustaining processes are part of a hierarchy of communities where the waste at one level becomes the source of food at another level—that is, each level of community affects the energy flow and structural coupling of what Humberto Maturana referred to as the life producing autopoietic systems, that

interdependent relationships and constant information exchanges at the chemical level and, for humans, at the cognitive and emotive level, are the norm. Gregory Bateson argued that the idea of individual autonomy is an abstract cultural construction by noting the basic unit of information that undergoes transformation as it circulates and sustains the ecosystem is a "difference which makes a difference" – and that what we take to be an individual is always a participant in these larger cultural and natural ecologies of information exchanges (1972, p.315). Another core understanding is that living systems are intergenerationally connected, and that some adaptations may not meet the test of Darwinian fitness and thus become extinct.

This iron rule of natural selection applies both to the biological and, for humans, to symbolic adaptations—with the problem for humans being the failure of the symbolic adaptations to take account of the characteristics of the bioregion that are the source of fiber, protein, water, and shelter. Jared Diamond documents this process of culture/ecosystem collapse in his study of the failure of a number of cultures to adapt to the changes in the ecosystems they were dependent upon (2005). Bateson makes the same point more directly when he writes in Steps to an Ecology of Mind that "the unit of survival is not the breeding organism, or the family line, or the society….The unit of survival is a flexible organism-in-its-environment" (1972, p. 451). His following warning is a direct challenge to a number of cultural assumptions that underlie what in the West have become the basis of the high status knowledge still being promoted in public schools and universities:

> The environment will seem to be yours to exploit. Your survival unit will be you and your folks or conspecifics against the environment of other social units, other races and the brutes and vegetables. If this is your estimate of your relation to nature and you have an advanced technology, your likelihood of survival will be that of a snowball in hell. You will die either of the toxic by-products of your own hate, or, simply, of overpopulation and overgrazing. The raw materials of the world are finite.

"The most important task today", he concludes,"is, perhaps, to learn to think in a new way". (p. 462)

Key Cultural Characteristics of Ecological Intelligence

This short overview of the living systems of which humans are a part makes it possible to begin identifying differences between a culturally grounded ecological intelligence and the high status patterns of thinking that can be traced to Enlightenment thinkers who were unaware of environmental limits, and who were still under the influence of a theology that represented the environment as both a threat and a source to be exploited. The intention here is not to prescribe another conceptual reform agenda that is to be adopted by other cultures. However, in the event that other cultures are basing their approach to development on the following characteristics of the West's high-status knowledge, the following discussion may serve as a guide to what needs to be avoided—especially when the margin of error in terms of feeding an expanding population in

an increasingly degraded environment may be greater than what exists in western countries that rely upon technology to mask the degraded state of the Earth's natural systems.

Danger of privileging abstract ideas and theories

One of the most prominent characteristics of the scientists' approach to studying ecosystems is that they avoid relying upon abstract theories to dictate the outcome of their research. When ecology serves as the interpretative framework, observation of the patterns and processes occurring in the natural systems become the source of knowledge. Scientists cross over into the realm of ideology when they attempt to extrapolate their empirical findings into general statements about cultural change—such as when scientists claim that computers represent the emerging post-biological phase of evolution, and when they assume that the technologies emerging from scientific discoveries are examples of a linear form of progress. Their focus on the behavior of natural systems does not mean that they are uninfluenced by many of the same cultural assumptions that are responsible for the ecological crises they are studying. The toxins in the human body, as well as in the world's oceans, are evidence of how scientists are too often unaware of the cultural assumptions they take for granted—assumptions about the progressive nature of change and the ability of rational thought to bring nature under human control. In spite of these lapses, the thinking of ecologically oriented scientists adheres more closely to what the ecological paradigm brings into focus. Thus, their ecological thinking stands in sharp contrast to such areas as philosophy, social and political theory, educational reforms, and business practices, where the abstract representations of reality formulated in past centuries still exert a major influence,

The abstract theories about the nature of knowledge, universal values, the ownership of property, the nature of individualism, as well as the silences about other cultural ways of knowing —including the failure to understand how the fate of humans is dependent upon the sustaining characteristics of their local ecosystem—have been the dominant feature of Western philosophy from the time of Plato to the present. Even the so-called empiricist philosophers approached the question of the experience/knowledge relationship not by observing cultural patterns, but by starting with another set of abstractly based assumptions. From Adam Smith to the Chicago School of Economics, the idea of free markets has been regarded as beyond questioning —except when they fail as they have today. Yet many market liberals (wrongly referred to as conservatives) continue, in the face of spreading poverty, to hold onto this abstract idea. However, as Karl Polanyi points out in *The Great Transformation* (2001 edition), the idea of free markets as self regulating processes that transcend cultural differences was not derived from a study of different cultural contexts, but was and still is represented, in Platonic fashion, as a universal truth. Similarly, the theories that explain the purpose of educational reform as emancipating students from all traditions that limit the achievement of greater individual autonomy are also derived from abstract theories that misrepresent the most basic characteristics of the consciousness shaping influence of being born into a language community. The key point about privileging abstract theories over the culturally mediated embodied experiences in everyday life, regardless of the discipline or professional field, is that they have not led to an awareness of how humans and their symbolic worlds are contributing to the degradation of the

ecosystems that their long-term survival depends upon. These abstract theories not only marginalize the importance of cultural contexts, but lack the vocabulary necessary for overcoming the silences perpetuated by the theories.

When Rachel Carson observed the dead birds near the fields that had been sprayed with DDT, her questioning of what other scientists assumed to be yet another achievement of western science took on a new urgency. A similar change of consciousness occurred for Aldo Leopold when he looked into the eyes of a dying wolf and began to realize that the wolf was not just the enemy of the hunters wanting to kill deer, but played an important role in protecting the mountain from being destroyed by an out-of-control deer population. The irony is that the culturally mediated embodied experiences of market liberals and western philosophers, to cite just two examples, involve cultural patterns that are marginalized by the abstract theories they promote as universals. Knowledge framed by abstract theories and explanations leads to a bifurcated state of consciousness where what is taken to be real is often totally divorced from the cultural and natural systems that are unconsciously relied upon on a daily basis. As I have explained elsewhere (Bowers, 2008, pp. 57-74), language carries forward the analogs that made sense in earlier times, but the analogs too often have no relationship to the present. Unfortunately, they too often become part of the abstract representations that people assume to be more accurate than what could be learned if they were to give attention to their culturally mediated embodied experiences.

Importance of context to exercising ecological intelligence

If the reader interprets this reference to the importance of knowledge being derived from the individual's encounters in local contexts as further justification that students should be encouraged to construct their own knowledge, as many educational reformers and linguist/philosophers such as George Lakoff and Mark Johnson now advocate (1999), they are being influenced by a cultural assumption that is one of the chief contributors to the ecological crises that now confront us. As will be explained later, the idea of the autonomous individual is itself an abstraction that does not make sense when we begin to understand the structural couplings between everyday patterns and identities that constitute the cultural ecologies we are embedded in, and how these cultural ecologies are interdependent with natural ecologies

The digital phase of the industrial revolution we have now entered continues to marginalize awareness of the importance of cultural and environmental contexts. For example, the increasing reliance on cell phones, text-messaging, and video games marginalize the importance of face-to-face interactions as well as awareness of the behaviors of natural systems —the sounds of birds, changes in flora and fauna that accompany changes in seasons. As computers reinforce a sense of temporality where the individual is the center of the universe there is a loss of cultural memory of species that were part of people's experience in earlier times, such as the changes in the quality of water in streams and rivers, changes in weather patterns, and so forth. Reliance upon computers also contributes to the cultural amnesia that occurs when the narratives that are part of face to face relationships become replaced with reading the printed word on the computer screen or observing the out-of-context computer mediated performances of

others. Instead of observing the information exchanges circulating through natural systems, as well as the culturally coded messages that make daily behaviors and values predictable and viable at the taken-for-granted level of experience, the experience of abstract thinking contributes to the idea that local contexts are unimportant.

Ecological intelligence does not mistake the parts for the whole

While scientists gain a greater understanding of the various processes of information exchange between the living organisms that make up the web of life, the major approaches to education in American society—ranging from public schools and universities to print and electronic media—continue to reinforce the long-held idea that society is made up of self-directing individuals. The reality is that individuals act and think in ways that reflect, with only minor variations, the traditions of their culture. But this has not led to questioning the dominant cultural idea that individuals think their *own* thoughts, choose their *own* values, possess legal and property rights as individuals, and become ill and die as individuals. Copyright laws are based on the idea of individual origination, just as our legal systems hold the individual accountable even though the social environment largely influences the individual's self-concept, sense of hopefulness or helplessness, provides models for behaving and thinking, and so forth. The widely shared idea that change is part of the progressive force that animates life at all levels, from natural to cultural systems, contributes to the sense of individualism where responsibility is primarily focused on self-interest—and, at the most, may extend to one's grandchildren.

This culturally mediated experience of self has also been influenced by the misconceptions of well-intended Enlightenment thinkers whose limited understanding of "tradition" was influenced by the politics of their era. Their major focus was on the privileges and forms of exploitation taken-for-granted by the aristocracy, the church, as well as the seemingly unyielding cultural traditions that limited peoples' prospects to that of their parents' social standing in a hierarchically ordered world. The analogs they associated with tradition did not include the highly developed traditions of craft knowledge, the systems of mutual support, and the knowledge of local ecosystems so essential to their survival. Just as in natural systems, where the process of generational succession of species must meet the test of Darwinian fitness, the process of carrying forward the symbolic traditions that represent genuine gains in the areas of social justice, systems of mutual support, and wisdom in how to live lightly on the land requires a radical revision in the way the individual is now understood as the basic self directing unit of society. To recall Bateson's warning, the fate of individuals cannot be separated from the fate of the ecosystems of which they are a part—and upon which they are absolutely dependent. Bateson is not alone in situating the individual within the larger interactive life-shaping systems being referred to here as ecologies.

The following propositions represent how many people in the field of human development are already relying upon Uri Bronfenbrenner's ecological paradigm.

1. The individual functions and develops as a total integrated organism. Development does not take place in single aspects, taken out of context.

2. The individual functions and develops in a continuously ongoing, reciprocal process of interaction with her or his environment.

3a. At each specific moment, individual functioning is determined in a process of continuous, reciprocal interaction between mental factors, biographical factors, and behavior—on the individual side—and situation factors.

3b The individual develops in a process of continuous reciprocal interactions among psychological, biological, and environmental actors. (Moen, Elder, Luscher, 1995, pp. 24-29)

If Bronfenbrenner's key idea can be summed up with some degree of accuracy, it would be that his model for understanding the interactive relationships that influence the individual's development must take account of the network of environments--ranging from family, peers, school, parent's workplace to the larger cultural context of politics, economics, and environmental events and transitions over the individual's lifespan. There is no such thing as an autonomous, self-creating individual in his ecological model for understanding human development. Nor, according to Bronfenbrenner, should a single event or idea be seen as the determining or causal factor.

Thinking of the influence of interactive and reciprocal relationships provides a powerful mode of analysis, just as the thinking of reformers who are addressing social justice issues involves understanding the interacting networks that privilege some while marginalizing others. This more holistic way of thinking is now found in many approaches to inquiry—ranging from the social sciences to the humanities. But it represents only a partial approach to the exercise of ecological intelligence. For example, Bronfenbrenner and his many followers do not address how to promote ecological intelligence through the various cultural approaches to education. Nor does their ecological paradigm take account of the central problem of understanding cultural patterns and behaviors that are further degrading the ecosystems. The recommendations of his followers, like those of most reformers, fail to frame proposal for social change in ways that address how to renew intergenerationally the non-monetized traditions of different cultural groups that will become increasingly important as the current industrial/consumer-oriented culture comes under more pressure from failed economic policies and degraded environments. Yet another omission in their thinking is how to promote ecological intelligence through the formal educational process where there is an opportunity to reinforce patterns of thinking that may be absent in the home, church, media, peer group, and so forth.

While social justice groups rely upon a limited approach to thinking within an ecological paradigm, they often are unaware of the ecologically destructive cultural assumptions that guide their thinking about what constitutes social justice for different social groups. Achieving greater equality in the political process is an important goal for all. But is achieving equality as a consumer in the industrial/consumer-oriented culture the right goal when this culture is a major contributor to global warming and to the other life altering environmental trends? Both John Dewey and Paulo Freire, for instance, were dedicated to achieving social justice for marginalized groups that lacked political efficacy. However, both shared the widely held way of thinking that cultures developed from a primitive stage to that of modern, critical rationality. Dewey, for example, wrote about the "savages", cultures locked into a spectator view of knowledge, and

those that had advanced to the point of basing their knowledge and values on experimental scientific inquiry. In Education for Critical Consciousness, Freire identified three stages of cultural development as moving from a condition of "semi-intransitivity of consciousness" to "transitivity of consciousness" to the most culturally advanced stage of "critically transitive consciousness" (1972, p. 17-18). In effect, their taken-for-granted pattern of thinking, which they shared with scientists and other proponents of modern development, supported one of the long-standing sources of prejudice in the West. At the core of this prejudice was the assumption that education should enable each generation to recognize that the traditions of previous generations was the source of their own oppressed condition. One expression of this prejudice was the idea that literacy must emancipate people from the hold of illiteracy—that is, the hold of oral traditions and face-to-face relationships. The assumption that change is inherently progressive in nature led to the failure of educational reformers and other proponents of development to ask about what needs to be conserved, such as the non-monetized and social justice traditions of previous generations that have a smaller ecological footprint and that protect people's civil liberties from various totalitarian forces. A fully developed ecological intelligence has to be free of the otherwise taken-for-granted assumptions that represent change as inherently progressive, humans as in control of the natural environment, and the West as the teacher of the world.

The role of critical thinking in ecological intelligence

Bateson's reference to an ecology of bad ideas that puts the community on the pathway to self-destruction, while causing needless human suffering, brings into focus the question of what the role of critical thinking should be in the exercise of ecological intelligence. To find concrete examples of an ecology of bad ideas, we need look no further than the policies of George W. Bush's presidency. These are policies that undermined the long-held traditions of separation of powers and civil liberties that protected people from unlawful surveillance and imprisonment, that advanced the interests of corporations at the expense of the well-being of the general public, that engaged in secrecy and deception in promoting the invasion of Iraq, that undermined the existing environmental policies, and that gave billions to Wall Street without an adequate system for holding accountable the perpetuators of greed and the smoke and mirror practices of Wall Street culture. Yes, critical thinking is an essential part of ecological intelligence. But it needs to be recognized that critical thinking is not a panacea in itself and that its use does not always lead to more progress.

Critical thinking is not just relied upon by individuals and groups working to achieve greater social justice. It is also used by different groups attempting to work out a strategy for achieving their own political agenda, which often involves seeking economic and political advantage over others. For some religious groups, it is used to develop strategies that will force politicians to enact legislation and policies they want imposed on the rest of the country. Corporations rely on critical thinking in deciding which technologies and products to develop, in promoting a demand for new products, in identifying a campaign for exploiting new markets that have a global reach, and in masking the unequal distribution of corporate profits, and so forth. Critical thinking, as Dewey tells us, is really the basis of problem solving that does not rely upon

repeating already established approaches. Thus, the carpenter engages in critical thinking when the designer of the building introduces changes that have not been encountered before, just as the airline pilot and others engage in problem solving situations. The reformers who have made critical thinking their main approach to achieving social justice tend to equate critical with being a progressive force in society. That is, they interpret the word "critical" to mean exposing unjust social practices--thereby improving the lives of others. Their approach is to examine historical and current prejudices, as well as the consequences experienced by marginalized social groups. Other uses of critical inquiry are more oriented to solving problems that exist for individuals and social groups—many of which have economic and ideological agendas that perpetuate various forms of injustice.

Both social justice and non-social justice practitioners of critical thinking share a common characteristic that has its roots in the reductionist way Enlightenment thinkers understood the nature of tradition, as well as the assumption about the nature of progress that took hold during this same period. Along with the growing reliance on empirically-based problem solving in the sciences, critical rationality became associated with overturning traditions that stood in the way of progress. As I have pointed out in other writings, equating the overturning of traditions with progress has served as one of the sources of conceptual and moral legitimation for the rise and spread of the industrial culture that has exploited humans and the environment for the sake of profits. What the promoters of the industrial culture, and its scientific/technological support systems, overlooked in the past as well as in the present are the traditions of mutual support and non-monetized practices within different cultures that are being overturned in the name of progress. It has only been in the last few years that the various groups traditionally supportive of the industrial/consumer-oriented cultural approach to progress have turned their attention to how this culture is changing the world's ecosystems in ways that expose the myth of progress. But this has not altered their goal of turning more aspects of daily life into new market opportunities —which is the main agenda of economic globalization.

Making the analogy between the role of DNA and RNA and the role of the symbolic traditions of human cultures carries with it the risk of misinterpretation. What they share in common is that the former carries forward from the past the life-forming chemical information that influences the survival potential of succeeding generations, while the symbolic traditions of human culture carry forward both the genuine achievements as well as the prejudices and other misconceptions of earlier generations. Given that there is always variation in what is passed on to succeeding generations, it would be wrong to interpret this analogy as suggesting some form of biological or cultural determinism. How symbolic traditions rooted in the distant past are still part of people's taken-for-granted patterns of thinking will be explained in the later discussion of linguistic issues relating to ecological intelligence. What is important here is to reiterate that the networks of interdependent relationships that are the sources of information and energy exchanges that now bind together the fate of both cultural and natural ecologies need to be considered when assessing the role of critical thinking.

As Bateson points out, the autonomous individual we mistakenly assume to be the agent of reflection is actually part of the larger system of information exchanges within the natural and cultural ecologies. Bateson sums up this point by noting that "ecology, in the widest sense, turns out to be the study of the interaction and survival of ideas and programs (i.e., differences,

complexes of differences, etc.) in circuits" (1972, p.483). Critical thinking is what separates the role of DNA and RNA in natural systems from the role of traditions in cultural systems. The nature and role of critical thinking is misrepresented when the individual is assumed to be uninfluenced by the traditions of the past. When this happens the individually-centered interpretation of critical thinking reproduces the same errors found in how critical thinking is used by groups who take-for-granted the deep cultural assumptions that underlie the industrial form of consciousness that is putting our collective futures at risk. These shared cultural assumptions include the idea of the autonomous individual, the progressive nature of change, an ethnocentric understanding of critical thinking, a Social Darwinian view of non-Western cultures, and a secular messianic drive to convert others to a Western way of thinking and lifestyle.

Many scientists and technologists are now focusing on what needs to be conserved, with some corporations now beginning to recognize that improving their profits requires "greening" their products and including the word "sustainable" in their marketing campaigns. Unfortunately, social justice advocates are still reluctant to include the words "tradition" and "conserving" as a legitimate part of their emancipatory vocabulary. Thus, the long tradition continues of socializing students in public schools and universities to the idea that an individually-centered form of progress is the ultimate purpose in life. Unfortunately, public school teachers and university professors continue their silence about the need to adopt an approach to critical thinking that takes account not only of what needs to be changed, but also what traditions need to be intergenerationally renewed. Evidence of this failure can be seen in the widespread indifference on the part of the general public to how the Constitution and the tradition of civil rights have been undermined in recent years by the government. The increasingly widespread use of surveillance technologies also has been met with indifference by a large segment of the general public who still appear mesmerized by the myth that change, including changes in surveillance technologies, is always progressive in nature.

One of the tasks of classroom teachers and university professors is to model how to exercise critical thinking in ways that take account of how to conserve the life-supporting networks of interactive and interdependent relationships within the local cultural ecologies and that exist between the cultural and natural ecologies they depend upon. Only this more balanced and less ideologically driven approach to critical thinking is consistent with the exercise of ecological intelligence. Making the individual who is ignorant of past achievements the primary agent of critical thinking violates what should be understood as the ecological contract that humans have with their heritage and with their responsibility for limiting their impact on the life-sustaining larger ecosystems upon which they and future generations will be dependent. This may be a contract that has been so violated that any human effort to restore it will be overwhelmed by the rate and scale of environmental changes now underway. Unfortunately, the high-status accorded to abstract thinking, which is being further reinforced by the increased reliance upon computer mediated communication and thinking, may be too ingrained as part of people's natural attitude for them to make the necessary fundamental changes.

Ecological intelligence can only be intergenerationally renewed when the meanings of words are framed by analogs informed by a deep understanding of cultural and environmental processes that contribute to a sustainable future

As I have written extensively about the myth of the conduit view of language, and how words carry forward the insights and misconceptions of earlier thinkers, I will only summarize the changes that need to be made by public school teachers and university professors if we are to begin using a vocabulary that does not undermine the exercise of ecological intelligence (Bowers, 2008, pp. 33-48, 74-154). Michael Reddy was one of the first linguists to identify what most public school teachers and university professors take-for-granted: namely: reinforcing the idea of language as a conduit in a sender/receiver process of communication (1979, pp.284-323). It was only later that Gregory Bateson explained another misconception about the nature of language that enables us to recognize how past and current mistaken ideas about language undermine the possibility of achieving a form of intelligence that takes account of the characteristics of the cultural and natural ecologies we participate in on a daily basis. Bateson referred to this as double bind thinking (1972, pp. 206-212).

Double bind thinking can most easily be understood as the colonization of the present by the past. This process of colonization can also be understood as the linguistic colonization of other cultures. Both forms of colonization result when today's meanings of words were framed by the choice of analogs by earlier thinkers who were unaware of environmental limits. Widely accepted analogs for such words as "individual", "tradition", "technology", "progress" ,"data", "development", "illiterate", "property", "wealth", and so forth, continue to reproduce the prejudices and taken-for-granted culturally specific assumptions of the era in which the analogs were established. That is, double bind thinking perpetuates the pattern of thinking that has contributed to the ecological crises that we are now beginning to recognize. Unfortunately, the ecologically and culturally informed analogs that are necessary for a vocabulary that makes it possible to thinking ecologically have not yet become accepted by educators, media pundits, and other agents of mass socialization. The linguistic colonization of other cultures occurs when the analogs are derived from another culture, such as when Third World cultures accept the West's analogs for understanding "development", "illiteracy", "individualism", "progress", and so forth.

The conduit view of language, like so many aspects of culture that are part of taken-for-granted daily experience, may appear as too difficult to recognize and change. Nevertheless, it needs to be understood that both educators and the educational role played by the media not under the control of reactionary political groups have participated in the process of popularizing new analogs for words such as "woman", "wilderness", and "environment". Today, the word woman is associated among certain segments of the population in the West with a wide range of possibilities. The new analogs include scientist, engineer, doctor, artist, and so forth. Wilderness, until recently in the West was associated with wildness and thus a source of danger that had to be brought under human control. Within environmental and conservation circles wilderness is now associated with healthy ecosystems and what needs to be conserved. The metaphor, "environment", while still being associated with what needs to be economically exploited, is increasingly being associated with what sustains life—which leads to clarifying the differences between healthy and degraded environments.

The key point is that if educational reforms are to foster greater reliance on ecological intelligence on the part of today's citizens, it will be necessary to give greater attention to the many ways in which language continues to reproduce the earlier forms of intelligence that took-

for-granted the cultural assumptions that can be traced back to earlier thinkers such as Plato's emphasis on abstract ideas, John Locke's analogs for establishing how to understand individual ownership of property, Rene Descartes' understanding of intelligence and human/nature relationships, Adam Smith's misinterpreted idea of free markets, Herbert Spencer's analogs for the linear ordering of the development of cultures from primitive to civilized, and the reliance by some scientists upon mechanistic analogs for understanding ecological systems. The list of historical sources of today's silences and misconceptions can be extended, and when the impact of the linguistic colonization of other cultures is taken into account, the need to do an archeology of linguistic colonization will become more evident. A good place to start in clarifying the nature of the linguistic colonization of other cultures can be found in the essays in Wolfgang Sachs' edited book, *The Development Dictionary: A Guide to Knowledge as Power* (1992) and in Peter Muhlhausler's *Linguistic Ecology: Language Change and Linguistic Imperialism in the Pacific Region* (1996).

How to become aware of the cultural and natural ecologies we participate in on a daily basis

Learning to think ecologically will require, as stated above, relying upon a vocabulary that has been informed by analogs derived from current understandings of the different forms of information exchange that sustain the cultural and natural systems—or to use Bateson's phrase, becoming aware of the"patterns that connect". But the grip of the past is difficult to shake off. The legacy of Western philosophers and political theorists can still be seen in how the idea that we are autonomous observers of and thinkers about an external world is still taken-for-granted by most university graduates. The idea that change is inherently progressive can be seen in the current expectation that as soon as the economic downturn is reversed, everyone—including corporations—will get back to achieving more progress for themselves. Which will mean more progress in consumerism and the accumulation of personal wealth.

One of the characteristics of being born into a language community that makes explicit only a limited range of its taken-for-granted patterns and ways of thinking is that what others take-for-granted often becomes part of one's natural attitude. And the ongoing languaging processes continue to reinforce the stock of knowledge (including prejudices and silences) that others take-for-granted. This process of socialization goes on in every classroom, even in graduate level classes. Contrary to what some educational reformers want to believe, not all of what the student is socialized to accept at the taken-for-granted level of awareness is oppressive. Indeed, this judgment cannot be made until the taken-for-granted cultural patterns are made explicit and examined in terms of whether they strengthen community mutual support systems, traditions of moral reciprocity, and contribute to lifestyles that have a smaller ecological footprint. Unfortunately, ideology as well as the limitations in the classroom teachers' and university professors' own knowledge of the patterns and interdependencies of the local cultural and natural systems too often lead to the idea that socialization should be done away with—as if this were a possibility. Even the educational goal of emancipating students from the influence of their culture, and thus from history itself, is based on western Enlightenment assumptions.

This double bind remains a problem that needs to be recognized at all levels of the educational process, including classrooms, talk around the dinner table, through the media and video games, in churches. As long as learning from the different forms of information exchange within the local cultural and natural systems is marginalized by the old beliefs about the primacy of the individual's ways of seeing and knowing, the idea that progress is inevitable, and that abstract knowledge and ways of communicating (cell phones, text messaging, email, books) are the only sources of individual empowerment and social progress, we will be unlikely to make the transition to a culture that is based on ecological intelligence. As some readers may jump to the conclusion that I am saying we must abandon the idea of individualism, progress, and the use of print and other forms of de-contextualized communication and learning, I must emphasize that this is not what is being suggested. Rather, we need to recognize how these long-held cultural assumptions need to be made explicit and modified in ways that take account of how we are participants in cultural and natural systems where the former is dependent on the self-renewing capacity of the latter. We also need to recognize what can be called the cultural amplification characteristics of different technologies, as well as the aspects of culture they marginalize. Similarly, we need a better understanding of the advantages and limitations of both print and oral based communication.

Suggestions for educational reforms that foster ecological intelligence

I know I am inviting the kind of judgment that reflects the very mind-set that we have to move beyond when I suggest that many oral cultures that have developed ecological intelligence have been shaped by their bioregion and their mythopoetic narratives. However, I am not suggesting that we should copy the ecological intelligence of different oral cultures. When I first introduced the idea of the cultural commons into the discussion of the priorities that should guide educational reforms, some readers suggested that I failed to understand that we cannot return to the 15th century. A British critic even suggested that I needed to recognize that the commons were enclosed at the beginning of the Industrial Revolution. These critics failed to understand that the cultural commons are part of everyday life in urban communities across North America —as well as in every community in the world. Moreover, their lack of understanding led to thinking in terms of a linear pattern of cultural development—thus their association of the cultural commons with backwardness. In learning about the different ways in which some oral cultures have developed ecological intelligence, it is possible to recognize common characteristics that we may be able to learn from. I say "maybe" as the dominant ways of knowing in the West, which have emphasized understanding human/nature relationships, cultures and social classes, and approaches to knowledge in terms of hierarchies, may be so deeply entrenched as part of our taken-for-granted reality that anything associated with the so-called "primitive" oral cultures will be rejected as romantic nonsense.

Sean Kane has also observed a common trait among oral cultures that must become part of our approach to achieving a form of ecological intelligence that goes beyond the instrumentalities of western science and technologies. In *Wisdom of the Mythtellers* (1994) he writes that

> Beyond community, but not far behind it, there is nature. For the oral societies that live by hunting and fishing, nature was the very source of voices. It was like a huge, infinitely resonant drum….Thus the discourse of the mythtellers is ultimately the discourse of nature overheard in something of their indigenous organization. That discourse has since narrowed itself to a condition that best be called *homophony*. The term denotes the reduced sound of human language when it is used under the assumption that speech is something belonging only to human beings, and when 'other-than-human persons, both animal and plant, have been disenfranchised—defined or spoken out of discourse into dumb brutes or unconscious vegetable matter, each depersonalized by man the cosmic orator, the name caller" (pp. 190-192).

That other oral cultures share essentially the same idea that the natural environment communicates in ways that are vital sources of information and wisdom of how humans should live can be seen in the title of an exchange between Derek Rasmussen (a Euro-Canadian working in the north) and Tommy Akulukjuk (born in Iqaluit, Nunavut). Heading the introduction to their joint article on "Arctic Environmental Education in the Language of the Land" is Akulukjuk's statement that "my father told me to talk to the environment first before anything else".

In explaining the Quechua understanding of interspecies communication, Grimaldo Rengifo Vasquez (co-director along with Jorge Ishizawa of PRATEC, which is translated in English as Andean Project of Peasant Technologies) describes the nature of communication that is central to the Quechua approach to ecological intelligence. "Conversation," he writes,

> requires, as everything in life, to be nurtured and stimulated, in order for life to be re-created. A prerequisite in this nurturance is that we all be disposed to listen perpetually and in each circumstance to the 'speaking', to the sign of each one. Since Andean life does not repeat an archetype but is instead capricious, it is necessary for everyone to be attentive to the often unpredictable signs that emanate from all the others—signs that will not be spoken again in the way expressed in a particular moment….Each one in every moment is saying something, and one has to converse with this 'sign' that indicates something to us and says something at the same time that invites us to give an answer. (Apffel-Marglin, 1989, p. 105-6).

Keith Basso's book, *Wisdom Sits in Places: Landscape and Language Among the Western Apache* (1996) is part of a revival of the interest in how the vocabulary of indigenous languages has been influenced by intergenerational observation of the ecology of signs that circulate and sustain the natural systems that humans interact with daily, and the stories that pass on the place-based wisdom of earlier generations. When the place-based wisdom acquired over many generations of careful observation is replaced by the industrial model of thinking what is left is a language that leads to attributing to plants and animals attributes that reflect a concern with their market value and human usefulness. In effect, the language reproduces how the culture understands the attributes of the Other—and the nature of the attributes, in turn, influences what

is regarded as moral behavior toward the Other. For example, the act of naming a plant as a weed or a desert as being empty carries with it the culture's moral categories and judgments that in turn become the basis of human action. A weed carries the connotation of being not only useless but also a threat to neighboring plants—and thus must be uprooted or exterminated with a pesticide. The desert, which is understood as empty and thus lacking in value, can be turned into an atomic test site or used as a garbage dump. The culture's moral codes that are reproduced in its vocabulary too often legitimate behaviors that have ecologically damaging consequences, as well as reinforce the mistaken idea that plants, animals, and other features of the environment can be understood as discrete entities—and not interactive participants in the larger web of life.

By way of contrast, a study of the languaging processes of many oral cultures reveals that indigenous languages influenced by interspecies communication are ecologically moral languages. In the case of the Quechua and Aymara of the Peruvian Andes, this moral language is responsible for the ecological diversity of plants that is under assault in regions of the world where western instrumental and profit-oriented approaches to agriculture have become dominant. The practice of ecological intelligence among the Quechua and Aymara, where interspecies communication plays a prominent role, is summarized in Jorge Ishizawa's explanation of how cultural affirmation is practiced. As he observed,

> … cultural affirmation is the process by which peoples who live in a place remember and regenerate the practices of their ancestors nurturing their *pacha* (local world) and letting themselves be nurtured by it. Since in the case of the central Andes, this local world is agrocentric, nurturance is the mode of being of the Andean *pacha*. Andean cultural affirmation is the continuous regeneration of this mode of being….An expression…found in both languages (Quechua and Aymara) is 'we nurture while being nurtured' (2002, p. 4).

In Bateson's language, the "difference which makes a difference" which constantly circulates among all the participants within the *pacha* are sources of information that must be responded to with a nurturing attitude—as the life of humans, plants, and animals are mutually interdependent. In effect, these cultures that may go back over eight thousand years have been able to sustain life in a wide variety of ecological niches by practicing a form of ecological intelligence influenced by a cosmovision that makes nurturing rather then human domination the central feature of life renewing processes.

Given that the dominant mythopoetic narratives in the West have represented humans as superior and thus in control of the natural environment, it might be assumed that this major obstacle to developing ecological intelligence can be overcome by promoting outdoor education. There is no doubt that there are often character changing benefits from outdoor experiences, but too often outdoor education, like so many other characteristics of public and university education, reinforces a number of assumptions that are seldom examined. One of these assumptions is that learning about the various natural systems can be kept separate from what is being learned in other parts of the curriculum that are based on the deep cultural assumptions that support the individualistic / consumer / industrial-oriented lifestyle. Another assumption is that students will use their outdoor experience for constructing their own ideas, values, and stories—all of which

are quickly replaced by the next experiences the students move onto. A third problem is that these experiences, even when they involve participating in environmental restoration projects, usually fail to address the reforms that will reduce the ecological footprint of individuals and communities that have been shaped by the ideological requirements of the industrial/consumer oriented culture. The environmental education projects I have observed in public schools and in universities introduce students to some of the basic elements of ecological thinking. But they also reinforce thinking in categories that perpetuate the long-standing tradition of keeping the environment and culture as separate domains.

Educational reforms fostering ecological intelligence must introduce students to a more complex understanding of culture—including the environmental consequences of the different ways in which cultures encode and reproduce their knowledge systems. Students need to learn how the languaging processes that range from the spoken and written word to built environments carry forward earlier forms of cultural intelligence and the ecologically problematic moral values of the past. They also need to learn about the ecological and community enhancing differences between the local cultural commons and the forces that transform everyday life in commodities and monetized relationships. Other cultural approaches to ecological intelligence should also be studied. This will require a break from two traditions in education that have failed to engage students in a deep understanding of the cultural patterns that most students (and as adults) take for granted..

The dominant tradition in western education has been to provide students in the non-science areas of the curriculum with abstract explanations about events, other people's beliefs and practices, and so forth. The assumption has been that the printed word (or talk based on knowledge acquired through the printed word) provide accurate representations of the external world that students need to learn about. But abstract words, framed by the assumptions that co-evolved with the ascendancy of print over oral patterns of encoding and passing on knowledge, generally do not lead to a careful consideration of the student's own cultural experiences. Reading textbooks, listening to lectures, and now computer mediated learning which also carries forward the tradition of thinking that is divorced from cultural contexts and the culturally mediated embodied experience of the student, were and continue to be the dominant features of this approach.

Another approach to education found mostly in the public schools involves a combination of abstract learning and, now, an emphasis on students constructing their own knowledge. While there is always an element of interpretation that is influenced by the students' previous experiences and taken-for-granted ways of thinking, the emphasis on students constructing their own knowledge has too often been based on the assumption of autonomous individuals who are free of cultural influences. The classroom teachers who promote this so-called discovery approach to learning are, like the students themselves, largely unaware of the importance of making explicit the otherwise taken-for-granted cultural patterns.

There are exceptions that can serve as models for breaking from the old patterns of thinking. For example, classroom teachers and university professors demonstrated how to make explicit otherwise taken-for-granted cultural patterns when they began to take seriously racial and gender discrimination. Unfortunately, with few exceptions, they have not made the cultural patterns that are deepening the ecological crises part of their curriculum and pedagogy.

Recycling programs and school gardens, while important, fall far short of addressing the cultural roots of the double bind thinking where we continue to emphasize a consumer-based economy while at the same time receiving scientific report after report that the viability of natural systems is being rapidly degraded.

Making explicit the patterns and systems of information exchange that are part of the students' cultural ecology is the first step toward fostering ecological intelligence. It is also the step that needs to be taken if we are to replace the ecologically and culturally uninformed analogs of earlier eras that still influence much of today's language and thinking. The analogs that are consistent with the life and community sustaining patterns of natural and cultural ecosystems are part of everyday experience but go largely unnoticed because of the knowledge status system still perpetuated by public schools and universities. Current culturally and ecologically informed analogs are also being ignored for another reason. That is, most classroom teachers and university professors share the same cultural assumptions discussed earlier as providing conceptual direction and moral legitimacy for the industrial/consumer-oriented culture that is being globalized. Most also share the reductionist Enlightenment thinking about the nature of tradition, along with the bias against the knowledge systems of oral cultures that are not driven by the unending quest for progress. Given this mindset, it is understandable why the educational process, except in a few disciplines such as anthropology and cultural linguistics, has not developed a tradition of helping students understand the connections between different bodies of knowledge and local cultural contexts—including the student's own culturally mediated experiences.

The key to exercising ecological intelligence is being able to recognize how one's own cultural patterns are part of a larger field of cultural patterns being reenacted by others—patterns that have also been passed along for generations. The other main feature of ecological intelligence is in recognizing how one's ideas and behaviors introduce changes that circulate throughout the network of social relations. It also involves recognizing the impact of these changes on the natural systems that are also part of the larger field of experience. The curricular changes that need to be introduced from the early grades through graduate studies is to focus on the tensions and contradictions between what is intergenerationally passed along as part of the legacy of abstract ideas and values (encoded in the context-free printed and spoken words—such as in lectures) and the interactive patterns that constitute the cultural and natural systems that the individual is always participating in. Hopefully, the following examples will clarify how reframing the meaning of words by identifying new analogs is essential to making the transition to an ecological form of intelligence. The following examples can be multiplied many times over.

The current ways in which students learn to think of themselves as autonomous individuals is reinforced in many areas of the market-oriented culture. In classrooms they are continually being told to make up their own minds, to think for themselves, to choose their own values, to acknowledge when they borrow ideas from others, to respect copyright laws, to own their own property, to continually preface their sentences with the personal pronoun "I", as in "I think", " I see" and so forth. Given these historical cultural cues of how to think of oneself there is little inclination to give attention to the cultural patterns that are mostly learned at a taken-for-granted level of awareness. The challenge for the classroom teacher and university professor is

to help students focus attention on the ecologically problematic cultural patterns, and to become aware of how interacting with significant others influences their own sense of self identity and what they will take for granted. Giving attention to the history of words that would otherwise be taken-for-granted would help illuminate how they unconsciously reproduce earlier ways of thinking—whether it is the subject, verb, object patterns of expressing themselves, how they perpetuate the same silences of earlier generations, and rely upon the analogs settled upon by earlier thinkers. Focusing the students' attention on the mutual dance of non-verbal communication that is an integral part of how they participate in the ecology of information exchanges would help make explicit the myth of their autonomy as culture-free individuals.

Having students describe the many ways they are dependent upon natural systems would also help reframe their understanding of self as interacting with and dependent upon both cultural and natural systems. As the students become more aware of the cultural patterns that are part of daily experience it then becomes possible for them to question the cultural and historical origins of the idea of the autonomous individual. This line of inquiry also needs to take into account not only the connections between the historically influenced idea of individualism required by the environmentally destructive Industrial Revolution but also how this idea of individualism has led to positive developments such as in the area of civil liberties and in challenging various forms of oppression.

As students progress in the educational process and acquire a wider range of experience it then becomes possible to trace the origins of different views of individualism both in the West and in other cultures. How different western ideologies represent the rights of the individual also needs to be considered. What has to be kept in the forefront is how different views of individualism contribute to living within environmental limits and improving on the heritage that will be left for future generations. This issue of how an ecological perspective alters the self-image of the individual and raises the question of the nature of her/his intergenerational responsibility is dependent upon a careful mapping—or what can be called an auto-ethnography —of the cultural and natural systems that are part of the individual's culturally mediated embodied experience.

The language issues discussed earlier should be the focus of the curriculum that fosters an understanding of the differences between the student's exercise of ecological intelligence and the forms of intelligence inherited from earlier non-ecologically aware thinkers such as Rene Descartes and John Locke. The key issue in the early grades is to focus on the simple yet ignored insight that words have a history—and then to introduce examples of analogs carried forward from the past. Also, students from different cultural backgrounds should be encouraged to identify the analogs that their culture associates with the meaning of words. At the university level, the study of the cultural influences on how the meaning of words were understood in the past would include examining the cultural contexts that earlier thinkers were responding to, such as John Locke's attempt to establish a basis for private property as the transition was being made from the property systems of feudal cultures. Also, the university needs to promote an in-depth study of cultures that have developed a form of intelligence and metaphorical language that takes account of the sustainable characteristics of natural systems in their bioregion.

The development of ecological intelligence will not occur if another linguistic legacy of Enlightenment thinkers remains unchallenged. A more complex understanding of the word

"tradition" is essential if students are to learn how to participate in the local cultural commons that needs to be revitalized if they are to become less dependent upon a consumer-based lifestyle. It is also essential to recognizing the political traditions that safeguard against the rise of the modern political phenomena of fascism—safeguards now under threat from radio demagogues and politicians who appeal to the large segment of the public that associates patriotism with being told how to think. Tradition is an especially important word in this era of global warming, thus the extended treatment being given here. For most public school and university teachers, the word "tradition" carries forward the political/moral agenda of earlier Enlightenment thinkers that still influences the thinking of today's social justice advocates. Many of them identify with the word "progressive" in order to communicate their view that traditions impede rational thought, the introduction of new ideas and technologies, and protect the interests of exploiters and other anti-social groups. This view is widespread in both public schools and universities.

When I was teaching a class of future teachers I would ask how they would explain the nature of traditions to students—and most would identify traditions with holidays. Jewish as well as students from other cultures who had not yet been fully socialized into the progressive way of thinking explained tradition in more complex ways. By recognizing that the mistake of Enlightenment thinkers was in identifying traditions only with what were horrifically unjust practices, it is possible to recognize that as a metaphor it is inclusive of the temporal aspects of culture. Unfortunately, the unexamined way in which contemporary thinkers accept the insights and reductionist thinking of earlier times has led to many students being socialized into thinking that traditions, except for holidays, stand in the way of progress—even though most of their daily lives are dependent upon the re-enactment of traditions that are sources of empowerment, as well as sources of behaviors that are socially and environmentally problematic. The bias perpetuated in public school and university classrooms can be seen in the way critical thinking continues to be explained as leading to progress, but seldom associated with identifying the traditions that need to be conserved—such as all the intergenerational knowledge and skills that enable people to be less dependent upon consumerism, and the civil liberties now threatened by progress in the development of surveillance technologies.

The curriculum that introduces students to a more complex understanding of how their lives involve the re-enactment and modification of traditions—even traditions that limit self-discovery of talents and interests as well as having a destructive impact on natural systems—is essentially the same as the curriculum for developing the ecologically informed vocabulary essential to ecological intelligence. Instead of introducing students to the abstract word "tradition", along with all the analogs that represent it as a source of backwardness and injustice (some of which are real), students should be asked to do an auto-enthnography of the daily experiences that involve the re-enactment of traditions.

As most of cultural traditions are part of the everyday background of taken-for-granted experiences, the extent that people re-enact traditions can be made explicit by inviting into the classroom craftsmen and women as well as representatives from various professions. Asking the local plumber, carpenter, and organic gardener what ideas, skills, and technologies they have discovered for themselves and what traditions within their trade they have learned from previous generations will provide concrete examples of how traditions are carried forward as sources of empowerment. A lawyer can be asked the same question, and students will start obtaining an

understanding of the complexity and importance of the traditions that underlie the rule of law and their Constitutional rights. Social justice advocates, along with the others invited to share with the class, will be able to identify traditions that are exploitive and sources of silences—as well as the traditions that help to justify needed reforms. This approach to nurturing ecological intelligence stands in sharp contrast to presenting the word tradition as an abstraction that has a singular and universal meaning. The expanded meaning comes from giving attention to the analogs derived from the auto-ethnography of the students and others in the community. The auto-ethnographies can be focused on the ecologies of the cultural commons as well as on the ecologies of consumer/industrial relationships with the natural environment. The further along the student is in the educational system, the more that complex issues surrounding different traditions can be introduced—such as the role of traditions in the areas of science, technology, ideologies, religious beliefs, the cultural commons, and the forces of enclosure.

The meaning of other words in the modern Western vocabulary can be reframed by exploring the tensions and silences between their abstract use and the meaning they take on from a careful mapping of life experiences in the cultural/natural ecosystems. Textbooks and other sources of the printed word (including electronically printed words) that purport to pass on knowledge may be useful as examples of historical misconceptions and ethnocentric thinking, but they are no substitute for learning to recognize the "patterns that connect", to recall Bateson's phrase, in culture and natural systems that students interact with.

Lectures and the teacher-talk that often frames the students' experiential learning are not likely to be entirely replaced by computer-based learning—which is itself a powerful source of indoctrinating students to the taken-for-granted assumptions of the people who create the software programs. These traditions are not likely to disappear—even with global warming and the changes taking place in the chemistry of the world's oceans. Hopefully a new tradition can be started, one that involves the classroom teacher and university professor playing the role of mediator in helping students become explicitly aware of the differences between their non-monetized experiences in the local cultural commons and their monetized relationships and activities. The role of the mediator is not to provide the explanations for how students are to think, but to ask questions about the issues and impacts on community and natural ecosystems as students move between the cultural commons and the increasingly monetized culture. As many students move between these two profoundly different realms of the culture they often are unaware of what is being taken for granted. Thus, the need for the mediator who can raise the questions that would not otherwise occur to most students, especially when they have become addicted to consumerism. The questions will help bring to the attention of students how they are embedded in the web of taken-for-granted cultural patterns. This is necessary if students are to learn how to think ecologically.

The mediator's role also involves encouraging students to learn about the different forms of enclosure of the non-monetized and intergenerationally connected cultural commons—including how these different forms of enclosure (or transformation from what is shared largely outside of a money economy into what requires dependence upon a money economy) contribute to poverty and increased dependency upon forces over which individuals and communities have little control. Encouraging students to learn about the traditions of community self-sufficiency

and mutual support, as well as the traditions of enclosure that can, in some cases, be traced back centuries, is also a responsibility of the mediator (Bowers, 2008, pp 57-74).

Ecological intelligence can be summarized as learning from the complexity of the interactive cultural and biological patterns and dependencies, and to making decisions that contribute to the mutual support and moral reciprocity within the community. Another criterion that ecological intelligence must meet is that it does not further degrade the viability of the natural systems. It also involves not being limited by earlier ways of thinking that are based on the myths of unending progress, the ability of rational thought to bring nature under technological and economic control, and the quest for greater individual autonomy. Unfortunately, most of what is being learned in public schools and universities involves perpetuating these myths, which are made more difficult to recognize as myth because of the emphasis on fostering the critical thought of the student and the need for emancipation from the past. As mentioned earlier, these seemingly laudable goals are also what the promoters of the consumer-dependent/industrial culture want to achieve by transforming what remains of the cultural commons (which includes our civil liberties) into the new markets that serve the interests of market liberals. What has escaped the attention of the proponents of student initiated critical thinking is that it is difficult to think critically about what is taken for granted. This holds for adults as well as students. Students in the early progressive schools of the Deweyian era did not become aware of racism and sexism, and students in the free classrooms of more recent times did not become aware of how their patterns of thinking contribute to the ecological crises. The teacher's and professor's role as a mediator is to ask the questions that will lead students to recognize the cultural patterns and silences they would otherwise ignore—and thus continue to be controlled by.

There are two other sources of resistance that impede the fostering of ecological intelligence. The first relates to the difficulty of classroom teachers and university professors to become aware of the deep cultural assumptions they learned as they became members of the language community. That these assumptions were further reinforced in an educational process that was falsely represented as contributing to a life of rational self-direction, as well as by colleagues within their discipline, creates the double bind of relying upon the interpretive cultural frameworks responsible for the distinction between high and low-status knowledge. Few recognize that what has been relegated to low-status knowledge is the intergenerational knowledge and skills that enable people to be less dependent upon the monetized and commodified culture. And few recognize that the high-status knowledge being promoted in the curriculum underlies the consumer-dependent/industrial culture that is, over the long-term, ecologically unsustainable.

The other source of resistance will be equally difficult to change, mainly for reasons having to do with the fact that it is regarded as one of the highest values within the academic community. What now enables the majority of the non-science and non-technologically oriented faculty to pay only lip service to the environmental crises, or to ignore it entirely, is the tradition of academic freedom. This tradition has led to many genuine contributions in achieving greater social justice, improving the quality of daily life, and in allowing some faculty to examine environmental issues that seemed initially to be outside of the legitimate boundaries of the discipline. In suggesting that academic freedom has now become a source of resistance to fostering the ecological intelligence, I am not promoting the idea that it should be done away

with. It is needed more than ever in this political climate that has seen a major segment of the voting public supporting the loss of civil liberties, the use of torture, the unprovoked invasion of Iraq that has led to the deaths of tens of thousands, and aggressive efforts to restore the traditions of placing profits above a concern with the well-being of workers and the environment.

The problem is that academic freedom is now being used by many faculty to ignore the nearly daily scientific reports that the world's cultures are moving toward a tipping point in terms of global warming and thus toward a scale of human catastrophe that cannot be reversed if the world's oceans and sources of potable water continue to be degraded. Scientists are warning that fundamental cultural changes must be undertaken even though the changes may be too late to slow the rate of global warming and to limit the changes taking place in the chemistry of the world's oceans. Many departments in the social sciences and humanities now have a faculty member or two who are engaging their students in a discussion of environmental issues—mostly by having them read the writings of environmentalists. This raises awareness but falls far short of enabling students to learn how to live more community-centered and less consumer-dependent lives. Unfortunately, a majority of faculty in these departments continue to teach the same courses and to pursue the same research as though the environmental crisis does not exist. If asked why they are ignoring the need to begin asking how the traditions within their discipline may have contributed to the multi-layered crisis we now face, they will claim that the tradition of academic freedom, which is based on the assumption of an inherently progressive world, safeguards their right to exercise their own judgment about what will be taught in their classrooms and what they will publish.

As finding a solution to this double bind is especially daunting, perhaps we can learn from how faculty who were equally recalcitrant in recognizing that gender bias permeated every aspect of the university, ranging from whether women were qualified to teach in areas traditionally dominated by men, the issue of unequal pay, to the exclusion of women's scholarship and voices, were forced to rethink what was previously taken for granted. If we consider the history of the changes that have taken place on the issue of gender bias, we can see that students as well as the threat of lawsuits and federal legislation played an important role. Sexist professors were often openly challenged and their courses boycotted. Their biases were held up against the social justice standards to which they gave lip-service, and the exposure eventually led to change. Perhaps students now need to ask their professors how learning about the ideas of Plato, Descartes, such contemporary thinkers as Richard Rorty and John Dewey, the latest findings in brain research, and the literature of the past, contributes to understanding the many ways in which taken-for-granted cultural patterns of thinking are complicit in deepening the ecological crises. If faculty took seriously the ecological crisis as a crisis in cultural ways of knowing, what they now teach could be reframed in a way that allows thinking about the traditions that have contributed to the problems we now face or made positive contributions—as is the case with our assumptions about progress and individualism. People who are committed to addressing the interconnections between cultures and environments need to start focusing attention on what is being taught in public schools and universities—and not accept the current thinking that new technologies and the findings of scientists will avert the catastrophe that lies ahead. The ecological crisis is inextricably linked to the crisis in culture—which is linked to the crisis in education.

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