Educational Reforms that Foster Ecological Intelligence[1]

By C. A. Bowers

There are powerful forces of resistance that must be acknowledged when introducing educational reforms that foster ecological intelligence. The foremost source of resistance is the paradigm gap that now separates generations. That is, the vast majority of university professors, classroom teachers—and thus the general public that has been educated by them—were socialized to take-for-granted many of the conceptual underpinning that supported the idea that intelligence is the attribute that is the basis of individual autonomy. This included, as mentioned earlier, all the misconceptions that marginalized awareness that the languaging processes carry forward the misconceptions and silences of earlier eras—including the moral values and deep cultural assumptions rooted in the West's anthropocentric traditions of thinking. They were also socialized to think in terms of events, dates, facts, places, characteristics of things and people, what can be measured, and assigned a monetary value—rather than in terms of relationships and mutually supportive or destructive patterns. The dominant mindset reinforced by the educational process also takes-for-granted that change is an inherently progressive process. Indeed, this assumption, which scientists combined with the assumption that the rational process can correct the

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limitations of the natural world, led to the introduction into the environment of the thousands of synthetic chemicals that are now being discovered to be life-altering toxic substances. And learning to think of the characteristics of distinct entities such as individuals, things, and events rather than relationships and interdependencies further reinforced the habit of valuing abstract thinking over awareness of cultural and environmental contexts. This taken-for-granted conceptual and moral orientation helped to perpetuate the myth of western cultures being more advanced and thus having a messianic responsibility for the development of less advanced cultures.

This legacy of late twentieth century thinking continues to frame today's political discourse where a large majority of the public are in deep denial that the ecological crisis will require fundamental lifestyle changes. Scientists and politicians who take the crisis seriously assume that it can be solved by introducing more energy efficient and less carbon producing technologies. The small number of faculty in the social sciences and the even smaller number in the humanities who are introducing their students to environmental issues mostly focus on environmental writers such as Holmes Rolston III, Warwick Fox, Arne Naess, J. Baird Callicott, Aldo Leopold, Wendell Berry—and ecofeminists such as Charlene Spretnak, Susan Griffin, Carolyn Merchant, Val Plumwood, and Vandana Shiva. These writers are important as they challenge from different perspectives the dominant myth of a human and patriarchal centered world. Reading them contributes to a change of consciousness, but they do not provide students with the knowledge and skills necessary for living lifestyles that are less dependent upon consumerism, or on an individual-centered form of consciousness. Little if any attention is given to discussing with students how the new digital technologies, valued chiefly for their personal convenience, speed, and social networking, perpetuate the same cultural patterns that further marginalize awareness of the ecological crisis.

Other obstacles to introducing educational reforms that foster greater reliance upon ecological intelligence include the deepening culture wars where a mix of religious fundamentalism and years of a fragmented educational process that leaves students graduating with only a surface knowledge of the history of ideas, leads to the current violence-prone political discourse. This discourse, which continually degenerates into making the false distinction between friends and enemies is dominated by an Orwellian mix of political slogans. Labeling as conservative the groups that are undermining our traditions of civil rights in the name of patriotism, as well as promoting the elimination of all governmental regulation of a free market system that is now devoid of any moral constraints and sense of social responsibility, is evidence of the need for a radical rethinking of which traditions of knowledge are essential to making the transition to an ecologically sustainable future.

The recursive intellectual traditions survive primarily because of institutional rigidity and the unwillingness of tenured faculty to acknowledge that what they take to be cutting edge thinking in their discipline may not be useful to students in the years ahead. The "green washing" of corporate agendas for putting profits on

a "sustainable" basis further undermines awareness that we are on the cusp of life changing events. And if the rise of political extremism, patriotism, and the increasing craze with professional sports were not enough for environmental/cultural educational reformers to overcome in getting their warnings taken seriously, there is now the reactionary thinking that dominates governmental approaches to promoting educational reforms. The current effort to promote higher levels of educational achievement for all students is based on the same reductionist thinking where the emphasis is on the measurement of learning outcomes. This orientation reduces education to learning isolated facts and events—which further strengthens the myth of the autonomous individual who is being prepared to succeed in college and in the work place.

Unfortunately, the problem of cultural recursion is not limited to the reactionary educational reform policies being pursued in the United States. The ten year effort on the part of UNESCO, which includes the Guidelines and Recommendations Reorienting Teacher Education to Address Sustainability that has had world-wide exposure, promotes individual empowerment and the individual construction of knowledge as the primary means of achieving ecologically sustainable development (UNESCO, 2005). The sub-unit of UNESCO charged with promoting what in the literature is referred to as ESD (education for sustainable development) has established throughout the world regional networks of governmental organizations and cooperating colleges of education. Many of the recommendations for ESD reforms suggest the importance of taking local cultural traditions into account, and preparing teachers for a world of continuing change. However, the process of recursive thinking is clearly evident in all of the recommendations. With the exception of the references to ESD, all the recommendations reflect the same level of generality, such as recommending "life-long learning" that can be found in earlier government documents that address educational reforms. Missing from the recommendations is any mention, even at the most general level, of the fundamental changes that must be introduced into teacher education that will lead to the changes in consciousness and lifestyle that must be made.

The continual references to introducing reforms in teacher education that promote ESD may appear as praiseworthy, but the reality is that unless there is greater specificity about the nature of the reforms that must be introduced the map/territory problem identified by Bateson ensures that there will be little in the way of substantive change—except for the greening of the rhetoric. The professors of education in different countries will simply reproduce the theory frameworks they learned in their years of graduate study—that is, their understanding of ESD will reflect the same silences that were part of their graduate studies ten to thirty years ago when there was little awareness of the environmental crisis. The theories of John Dewey, who was a Social Darwinian and ethnocentric thinker, along with the critical pedagogy theorists who promote critical inquiry without recognizing that it is based on many of the same deep cultural assumptions shared by the promoters of the industrial/consumer-dependent lifestyle can easily be "green washed"

by adopting key metaphors such as "sustainability" and "ecopedagogy" (Bowers, 2009). But their conceptual maps, to stay with Bateson's metaphor, still do not take account of the linguistic differences between cultures. Nor do they focus attention on what can be learned from cultures that have already developed ecological intelligence. They also ignore the nature of the culturally diverse cultural commons and the forces of enclosure, the linguistic colonization of the present by the past, and the linguistic colonization of other cultures.

The emphasis during the last fifty or so years on individual empowerment now being promoted world-wide by the UNESCO project fails to address that critical inquiry must also be used to identify what needs to be conserved. Unless educational reforms that contribute to ESD are based on a radical rethinking of the taken-for granted assumptions of previous generations the rhetoric of ESD will continue to be an obstacle to moving to Level III thinking, and to the ability to exercise ecological intelligence. As an educator attending a workshop in Switzerland on the conceptual underpinnings of ecologically intelligence complained: "what you are presenting to us about educational reforms that address the language, cultural commons, and ecological intelligence issues completely turns my thinking upside down." She recognized that educational reforms that address these issues could not be reconciled with the UNESCO's agenda of promoting the individual construction of knowledge.

The problem is that these issues cannot be learned in sufficient depth in a short lecture or even a two or three day workshop. There are too many layers of assumptions and taken-for-granted practices based on the ecology of good intentions and misconceptions inherited from earlier generations. This problem is magnified by the current habit of assuming complex ideas and reforms can be understood by reading a single article or, at most, a book that presents a radical challenge to current orthodoxies. Both the problem of recursive thinking and the short attention span and willingness to settle for a surface understanding of complex issues need to be taken into account when suggesting reforms that promote the widespread exercise of ecological intelligence. Thus, the challenge is to identify the key concepts that will enable teacher educators and university professors to recognize when they are reinforcing individual or ecological intelligence. When the key concepts that clarify the differences between individual and ecological intelligence are recognized, it will then be easier to understand how current misconceptions and silences perpetuated by the dominant languaging processes reinforce the myth of individual intelligence.

Fritjof Capra's description of systems thinking is a good starting place for assessing which pathway educational reforms are taking us down—pathways that should be recognized by the elementary school teacher as well as by the graduate level university professor. What Capra describes as the characteristics of systems thinking is what has been referred to here as the exercise of ecological intelligence—though I would suggest several additions to his explanation. What Bateson called an elementary idea or bit of information, that is, the "difference

which makes a difference," always is part of a *pattern* of organization, a *structure* that embodies that system's pattern of organization, and a life sustaining *process*. Understanding the interactions of these three elements is what Capra refers to as systems thinking—which I prefer to refer to as exercising ecological intelligence. His explanation of these three components of living systems is as follows:

> The *pattern of organization* of any system, living or nonliving, is the configuration of relationships among the system's components that determine the system's essential characteristics. In other words, certain relationships must be present for something to be recognized as—say—a chair, a bicycle, or a tree.
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> The *structure* of a system is the physical embodiment of its pattern of organization….the description of the structure involves describing the system's physical components—their shape, chemical composition, and so forth.
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> To find out whether a particular system—a crystal, a virus, a cell, or the planet Earth—is alive, all we need to do is to find out whether its pattern of organization is that of an autopoietic network….Autopoiesis (a concept borrowed from Humberto Maturana and Francisco Varela) or "self-making," is a network pattern in which the function of each component is to participate in the production or transformation of other components in the network. In this way the network continually makes itself. (Capra, 1996, pp. 160-163)

What Bateson refers to as the ecology of differences (information circulating through the system), which he also refers to as an ecology of Mind, always involves networks of relationships and the patterns that connect. Isolating and abstracting any part as though it were a complete unit or thing is to impose the old pattern of thinking that assumes that only humans are capable of understanding things and relationships.

I prefer the phrase ecological intelligence over the phrase "systems thinking," as the metaphor "systems" is too easily associated with the mechanical world of interacting parts. Capra avoids making this association by explaining its relevance for understanding biological phenomena. He also acknowledges the importance of Bateson's ideas. Nevertheless, my preference for using ecological intelligence is that it aligns more easily with other core ideas of Bateson's thinking that do not relate directly to understanding biological phenomena: namely, that ecologies—whether cultural or natural—have a history, and that the inability to recognize differences that sustain living systems may be rooted in the role that language plays in carrying forward what will be recognized and ignored, and how it will be interpreted (Bowers, 2010). Another basic difference is that the phrase "systems thinking," unlike the phrase "ecological intelligence," does not suggest the need to engage in Level III thinking where the culture's deep taken-for-granted assumptions need to be questioned in terms of whether they contribute to living within the limits and possibilities of the Earth's ecosystems.

Ecological thinking (to stay with this phrase rather than systems thinking) also has other characteristics. These include an emphasis on understanding the history

and diversity of cultural influences on events. The focus may be on the emergence of a particular cultural approach to creativity, science, technology, dealing with territorial boundaries, how individuality is expressed, the way traditions are understood, and so forth. Just as there is no force of nature called "progress" in Capra's understanding of systems thinking, there is no force of nature that ensures that change inherently leads to progress. Exercising ecological intelligence would focus on the history of cultural forces that led to this taken-granted-pattern of thinking. This is where educating students to exercise ecological intelligence would emphasize the importance of examining the recursive patterns of thinking—which might lead to examining the guiding mythopoetic narratives—including the modern ones that contribute to hiding the cultural impact of technological innovations.

Exercising ecological intelligence requires giving constant attention to economic and religious forces, as well as the different forms of power exercised by elite groups—which in turn would lead to examining their strategies for maintaining their power and privileges. The role that metaphorical language plays in maintaining relationships of power would also be the focus of ecological intelligence. For example, what are the connections between the study of such high-status forms of knowledge as the ideas of Plato and other Western abstract thinkers and the inability of students of these elite thinkers to recognize that there is an ecological crisis—and that its earliest sources of influence can be traced to such thinkers as John Locke, Adam Smith, Rene Descartes, and even John Dewey? How has language helped to sustain patterns of inequality? This question and many others like it, such as why our political leaders persist in pursuing policies that are intended to introduce individualism, democracy, and free markets into cultures based on entirely different assumptions, would lead to examining a wide variety of conceptual antecedents and economic forces.

Overall, the dominant question, which has changed at different periods in Western history, has now become: Do the relationships, as well as the patterns of thinking that guide daily behaviors and national policies, impact the natural ecologies in ways that promote life—or do they, given the current level of addiction to consumerism and the number of synthetic chemicals introduced into the environment and our bodies, alter in fundamental ways the ability of different systems to reproduce themselves and thus to keep alive the food webs of life?

The discussion of making the transition from individual to ecological intelligence a major focus of educational reform that extends from the early grades through graduate school may appear as too theoretical and thus beyond the interest of public school teachers. This would be unfortunate as public school teachers exert a powerful influence on the process of cultural reproduction—particularly by passing on many of the culture's basic assumptions that are seldom examined in the later grades. These assumptions include equating change (especially technologically based changes) with progress, thinking of traditions as sources of backwardness and language as a conduit in a sender/receiver process of communication, and the importance of

elevating self-interest above all other values—which is often expressed as learning to be authentic. The alchemy of the elementary classroom—indeed, of most grades extending through middle school—includes a genuine concern for the well-being of the students, an overwhelming number of explanations that get reduced to isolated facts and events, reified deep cultural assumptions, the teacher's abdication to the magic of computer-mediated learning and the mindset of the people who write the educational software programs, and elements of the teacher's ideological and religious beliefs that frame the explanations that become part of the curriculum students encounter.

The explanations of different aspects of culture that students encounter for the first time are likely to have a lasting influence on the student's taken-for granted interpretative framework. Examples of how many adults fail to question explanations that are learned during their most vulnerable and thus dependent phase of development can be seen in how they reproduce the same explanations that are part of the socialization of the next generation. Textbook examples include how students should understand the nature of the brain (now often explained as like a computer), what constitutes a human resource that can be used to one's own benefit (family and friends according to one textbook), how to think about technology (as a neutral tool), the settlement of the West by pioneers (as though it was not already settled), and so forth. As many classroom teachers and university professors do not question the assumptions that underlie the explanations that are part of the students' earliest period of socialization to the culture's basic categories and assumptions, they are too often taken-for-granted over the students' lifetime . The silences that are part of this process of primary socialization, which are part of the initial interpretative frameworks of the dominant culture, are also influenced by the mis-education teachers receive in their professional courses and from faculty in other disciplines. Like the alchemy of earlier times, this approach to education does not lead to people being able to exercise ecological intelligence, which today would be the equivalent of gold. Instead it is leading to the form of individualism that thinks in slogans, has no accurate knowledge of the culture's history or the history of other cultures, and has little interest in considering which forms of self-limitation are necessary for conserving the natural systems that future generations will rely upon. The dominant ethos is summed up in the Nike slogan, "Just Do It."

Given the current "race to the top" approach to educational reform being sponsored by the federal government, and given the late twentieth century mindset that still dominates in most colleges of education and in the social sciences and humanities, it would be easy to think that the scale of resistance is too great to warrant the effort of promoting the exercise of ecological intelligence. The early feminist, civil rights, and labor activists also faced what seemed as overwhelming opposition to the need to make fundamental changes. If Bateson's important insight is ignored, which is that humans are not independent observers and manipulators of the behavior of natural systems—but are participants in the information networks

that make up the larger ecological system, it is likely that the explanation of systems thinking or even of ecological intelligence will become just one more theory among a host of others that can be more easily marketed.

Granted, making the exercise of ecological intelligence part of the individual's embodied experience will be difficult in a culture where the dominant assumptions are centered on viewing the individual as the source of rationality, democratic decision making, consumer spending, seeker of happiness and personal success, and a candidate for being raptured-up into heaven of eternal bliss, and so forth. Yet, this is exactly the reform that needs to be undertaken. Exercising ecological intelligence needs to become part of the students' culturally mediated embodied experiences—which will engage all the physical senses along with memory, and a heightened aesthetic awareness and moral responsibility. It cannot be experienced as a procedure that is followed in certain situations, such as learning to exercise ecological intelligence in a biology class while reverting back to the old pattern of exercising individual intelligence in other classes and in society generally.

As suggested earlier, we already rely upon ecological intelligence when it is recognized that undesirable consequences will follow if close attention is not given to all the messages (differences) circulating through the context one is part of. Just as in Bateson's example of how the person swinging an ax adjusts the next stroke in a way that takes account of the difference caused by the previous stroke, the exercise of ecological intelligence involves being fully aware of the different information networks—including being aware that cutting the tree may disrupt the habitat that is relied upon by other members of the larger food web. Learning the patterns of interdependencies and to thinking in terms of relationships and continuities in both cultural and natural ecologies is important, as it provides the necessary conceptual framework for recognizing both how past misconceptions and practices have put the culture on the pathway of ecologically destructive practices, as well as how current behaviors are likely to impact the future. This form of learning will have profoundly different consequences than when behaviors and values are based on cultural assumptions about a human-centered world, that natural systems can be thought of in terms of mechanistic processes, that science and technology will find ways to overcome changes in natural systems that are limiting economic growth, and so forth. It's not that the exercise of ecological intelligence requires excluding all previous forms of learning. Rather, learning the history of ideas, social theories, forces of domination and social injustice, forms of addiction and their connections with the dominant economic system, and so forth, are essential to recognizing the misconceptions that have put us on such an ecologically unsustainable path. This background knowledge is essential to being able to recognize which relationships and patterns need to be affirmed and thus supported as part of an eco-justice-oriented democracy.

The important question is not whether the exercise of ecological intelligence is more effective when the individual has been freed of prior conceptual influences—as Paulo Freire and his followers suggest when claiming that socialization represents

a banking approach to learning and thus can be replaced by relying entirely upon critical reflection (Freire, 1971, p. 31). This view of emancipating the student from past influences is echoed in the widespread claim that students should construct their own knowledge. The critical question is: Does what the student learns make it more difficult to exercise ecological intelligence in deciding social policies, in assessing the impact of new technologies, in recognizing when other cultures have taken a more ecologically sustainable approach to development? Several examples may help clarify how to change the traditional approaches to learning that previously marginalized awareness of the cultural roots of the ecological crisis. In the following examples, the traditional content of the discipline is not thrown out, but examined from an ecologically and culturally informed perspective.

The study of Western philosophers is generally held up as essential to being well educated. Yet it is important to consider whether the two dominant approaches to learning about their ideas leave students with a number of conceptual barriers to being able to recognize that they exist within a larger ecological network of information exchanges and interdependencies. One approach is to view the writings of the most prominent philosophers as the source of the most important ideas that have contributed to Western civilization. This is the 100 Great Books approach to learning—which enables the educated person to drop phrases from various philosophers that will inform others at the cocktail party that one has a liberal education and thus a member of a special social class. Other arguments for this form of education are that it promotes the ability to think critically—and thus to be more effective bankers, professors, and problem solvers.

The other approach, which characterizes most departments of philosophy, is to read the arguments made by various philosophers—ranging from the pre-Socratics, Plato, on down to Dewey—on the nature of reality and what constitutes knowledge, on the basis of moral judgment, on the mind/body separation, and on the universal connections between free inquiry and social progress. What is distinctive about this approach, and why it has contributed to many of the ecological and political problems we now face, is that it helped to create a class of elite thinkers who were conditioned to think in abstractions and to impose their abstractions—that is, the supposedly universal truths about property rights, individualism, free markets, and what constitutes knowledge, and so forth—on other cultures as well as their own. Students of Western philosophy were and still are largely unaware of the ethnocentrism of the philosophers they study. Other silences of the major philosophers excluded any discussion of the importance of the cultural and environmental commons and what Shiva calls Earth Democracy. The effect of this legacy can be seen in how the few philosophy courses that now address environmental issues are largely oriented to introducing students to the writings of environmentalists such as Aldo Leopold, Wendell Berry, and ecofeminists. Unfortunately, these writers fail to provide the knowledge and skills necessary for living less toxic and consumer dependent lives. But this limited

exposure does raise consciousness—even to the point of being receptive to a more explicit awareness of exercising ecological intelligence.

The earlier question about the forms of general background knowledge that provide a historical framework for guiding the exercise of ecological intelligence could be answered by taking an entirely different approach to the study of Western philosophers, or to other areas of study such as psychology, sociology, political science, religion, business, education, and so forth. Alternative approaches involve a process of reframing—that is, approaching what is being studied with a different set of questions.

Reframing how to study the ideas of Plato, Aristotle, Hobbes, Locke, Smith, Rousseau, Bentham, Mill, Hegel, Marx, Spencer, Dewey, and others in the pantheon of influential thinkers would involve examining how their abstract theories failed to take account of local cultural practices relating to the cultural and environmental commons, the differences in cultural ways of knowing. Questioning the silences and influence of deeply held cultural assumptions, particularly how they framed how the nature of science and technology was understood, as well as how the prescriptive aspects of the philosophers' theories would impact the patterns of mutual support in local communities and natural systems, would also be part of this reframing process. For example, one of the most fundamental ecologically and community disruptive forces can be traced to the thinking of such philosophers as Locke and Smith whose abstract (that is, culturally uninformed) theories about the universal nature of private property and free markets helped to frame how another aspect of individual autonomy is to be understood: namely, as being free of any moral responsibility for exploiting the environment and other people. This view of individualism, which has recently been extended to corporations, grants the right to establish private ownership over nearly every aspect of daily life that previously was shared and renewed largely outside of a money economy. This process of enclosure also extends to incorporating all aspects of the natural commons (air, water, forests, soil, plants, animals, genes, etc.) into the free market system where private ownership and monetization contribute to the spread of poverty and to the rapid exploitation of the environment.

Nearly every discipline in universities could be transformed if its traditions were examined in terms of how the diversity of the world's local cultural and natural commons were undermined by the religious, ideological, economic, and other sources of abstract thinking that can be traced to earlier philosophers, political theorists, and theologians. How was the distinction established in different historical periods between what constituted high and low status knowledge? What traditions of self-sufficiency were lost when new forms of knowledge and elites emerged and became widely accepted? To what extent was colonization a result of the degraded environments of the colonizing powers—and what were the forces responsible for exploiting the environment? What were the forces at different times in western history that led to undermining the wide range of artisans and craftsmen, and transformed the creative

arts from being part of community life to being divided into the categories of low and high status—with certain arts being accorded high status by the upper classes? Was the commodification of the arts essential to its being accorded high-status? How has the metaphorical language of different cultural groups and in different periods of western history undermined the local practice of ecological intelligence that had been refined over generations of place-based observation and practice?

Given what scientists are reporting on the rapid rate of changes in the Earth's natural systems, and given the current population pressures that have expanded from just over one billion at the turn of the last century to close to seven billion today, we don't have the centuries it took the feminists, civil rights, and labor activists to achieve their goals of social justice—which still have not been fully realized. At most, we may have a generation or two to make the transition to more sustainable patterns of living. Given this possibility, it is necessary for faculty generally to begin asking whether their fields of inquiry and courses, would be more useful to the upcoming generations if they were reframed by focusing on the traditions of unsustainable and sustainable cultural developments.

There is a consensus among scientists that global warming is occurring and that it results from human activity. And there is a growing understanding that minor changes in temperature have fundamental consequences for how biological systems respond. While our industrial system of production and consumption, along with the media, sustains the false picture of the crisis as running short of certain forms of energy and as requiring reducing the carbon emissions, scientists are warning that the time frame for making fundamental changes in cultural practices may be as short as two or three generations. This means that when the students now in the early grades become teachers, professors, politicians, economists, and media experts, they will need to be prepared to communicate in a vocabulary that is not based on the analogs settled upon by earlier thinkers who laid the conceptual and moral foundations for the industrial/consumer-oriented culture that, with the aid of science and technology, promised endless progress. They will also need an education that will enable them to promote practices, technologies, and policies that contribute to revitalizing the cultural commons and protecting the environmental commons—both of which are being undermined by economic, ideological, and religious forces based on the abstractions of earlier eras. If the younger generation now sitting in classrooms, participating in computer-mediated social networking, and addicted to various forms of self-indulgence ranging from junk food to buying the latest peer group approved consumer item, is unable to get the message across to the following generation there will be little hope for the future of humanity. In effect, if the educational process remains as ineffective as it is today in promoting ecologically sustainable communities and lifestyles, the scholarly achievements of past and of current university faculty will be viewed as entirely irrelevant—much as the ruins of previous civilizations. That is, if the search for food, shelter and safety even allows the environmental refugees to consider them.

Practical Steps to Making the Exercise of Ecological Intelligence Part of Students' Taken-for-Granted Experience

Exercising ecological intelligence occurs naturally in many contexts where we are fully present in the sense of being aware of the information (differences) being communicated by the other natural and human participants, including adapting our responses to what is being communicated in response to our actions. Unlike the Cartesian stance of being an outsider, acting on an unintelligent world or where the Other (in Martin Buber's sense) is an object we manipulate, exercising ecological intelligence is a collaborative process. To recall how Bateson put it, "The total self-correcting unit which processes information, or, as I say, 'thinks' and 'acts' and 'decides' is a *system* whose boundaries do not at all coincide with the boundaries either of the body or what is popularly called the 'self' or 'consciousness'; and it is important to notice that there are *multiple* differences between the thinking system and the 'self' as popularly conceived" (1972, p. 319). Of course we can never entirely eliminate cultural influences—in our interpretations, our short and long-term expectations, and how our self-concept is influenced by ongoing interactions. As suggested earlier, many indigenous cultures provide explanatory frameworks that recognize the exercise of ecological intelligence as a normal aspect of daily life. In some instances, this is achieved by a shared belief system that does not represent the natural environment as a source of danger, as wild and thus in need of control. Rather, in many indigenous cultures, the interactions that are part of the collaborative exercising of ecological intelligence are understood as a source of knowledge essential to sustaining the life of the community while not also destroying the sources of life of the Earth community.

The explanatory frameworks of the West, especially those influenced by Western philosophers and theorists who established the tradition of viewing the everyday world of experience as always falling short of the perfections stipulated in their abstract theories, have been carried forward in the metaphorically layered languaging processes that constructed the "reality" of the new members born into the language community. Under the guidance of theologians and philosophers, the idea that the peasant was unintelligent and could not be educated was largely taken for granted. Even more difficult to accept was the idea that many different forms and levels of intelligence operate in natural systems ranging from the behavior of genes to the interdependencies of plants and animals. With the earliest western cultural formulations of the idea that the individual is the basic social unit—as having a soul and a destiny dependent upon living according to certain moral norms, as having the potential of influencing political outcomes, as being free of all traditional forms of knowledge and as existing as an objective and rational observer of an external mechanistic world that needed to be brought under rational control, the West moved in a destructive ecological trajectory.

In effect, the tradition of individuals who experience the world as something separate and exploitable, and thus as unaccountable for what they introduce into the environment in the name of science and material progress, is learned. This self-centered individual has no genetic basis other than the capacity to learn to think and communicate in highly symbolic languages. And as Edward Sapir, Benjamin Lee Whorf, Peter Berger, and Thomas Luckmann have argued, the languaging processes of a culture intergenerationally construct what is taken to be "reality" within the culture. The experience of being an independent observer of an external world, as well as all of the assumptions about human/nature relationships and possibilities, are cultural constructions. And just as recent reinterpretations of what is "real" and "normal" have occurred in the area of social justice, youth can be socialized to experience as "real" and "normal" a different relationship with the cultural and natural ecologies. That is, the process of socialization (education) can be altered through exposure to different narratives (which are now beginning to take place in children's literature), to different vocabularies where the metaphors are framed by analogs that highlight the patterns and relationships that connect rather than the analogs that suggest separation and the need to control.

It is quite possible, indeed likely, that Capra's explanation of systems thinking will be interpreted by others as a strategy for more effectively exercising control over natural systems. That is, the Cartesian form of individualism is not incompatible with systems thinking—especially if the individual still takes-for-granted the main cultural assumptions about the nature of progress, rationality, and a human-centered world. This possibility brings into focus the challenge that confronts public school teachers and university professors who are engaged in expanding the linguistic foundations of what will be experienced and interpreted as "reality." There are many educational contexts where a critical distinction reinforces how the individual will understand her/his relationships to or within the larger system. The distinction may be between when a student is asked to project onto the Other what she/he has previously learned as the culturally sanctioned answer or explanation, and when the student is encouraged to give attention to the patterns that connect—and to the autopoietic networks within which she/he is a participant (including the consequences of the students' action that flow outward and affect other participants in the system). Both explanations are "reality" constructing experiences, and the classroom teacher and university professor play a powerful mediating role—especially when the same patterns are reinforced by others. Hopefully, the patterns will lead to the ongoing realization that all interactions within the cultural and natural ecologies require giving closer attention to the information exchanges flowing through the systems, and to whether the individual's actions strengthen or weaken the viability of the systems as a whole. In short, one of the primary educational objectives is to replace the current taken-for-granted attitude of being an autonomous individual who has a privileged perspective on an external world that can be manipulated or ignored, depending upon the immediate interests of the individual.

One of the most fundamental misconceptions that needs to be overcome is that the individual's own subjective understanding about the ecological crisis is all that matters. This misconception underlies the individual's self-proclaimed right and responsibility to decide whether global warming is occurring, and if so, if it is attributable to human behavior or is part of the earth's historical cycles of warming and cooling. This populist misconception now combines with a friend/enemy approach to political discourse that makes it exceedingly difficult to reach agreement on such issues as the multiple dangers of hyper-consumerism, the excessive reliance upon synthetic chemicals, and the exploitation of aquifers and fish stocks—to cite just a few of our mounting environmental difficulties. Nevertheless, the current failure to agree that there is an ecological crisis, and that it has implications for what is being taught in our public schools and universities, does not mean the crisis will disappear.

Educators at all levels need to begin to introduce reforms that strengthen community self-reliance—which most left and right-wing political activists would have trouble arguing against. One aspect of community self-reliance is that it reduces dependence upon consumerism and the addiction to wanting the latest prescription drugs and mechanical technologies. This is likely to be seen as "un-American" by the market liberals who misrepresent themselves as conservatives. But most communities are not monolithic in terms of guiding mythopoetic narratives, and an increasing number of religious groups are beginning to think about their responsibilities as stewards of God's earthly creation. People already engaged in cultural commons activities will also be supportive of educational reforms that reduce the current unsustainable cycle of work-consumerism-increasing debt and drug dependency that many Americans are trapped in. Other aspects of the curriculum reforms suggested here will be supported by advocates of social justice, particularly after they begin to realize that the middle class interpretation of social justice being promoted by many educational reformers does not take account of how overshooting the sustaining capacity of natural systems will have the greatest impact on the poor and marginalized.

Many teachers expect specific lesson plans on how ecological intelligence can be reinforced in different curriculum units and experiences. That is, the desire to know "how to do it" is too often the central focus of classroom teachers who feel overwhelmed by the many pressures they now must deal with. However, local social contexts, cultural backgrounds of students, and level of experience and intellectual maturity are key elements in deciding how to frame the student's encounter with environmental and cultural issues. Presenting actual curriculum units contradicts the primary characteristics of ecological intelligence—and how to foster it. Rather than reinforcing the tendency to rely upon packaged learning experiences, the stress should be placed upon the teacher's awareness of the issues, misunderstandings being perpetuated in the curriculum, and examples of ecological thinking that can be introduced in different learning settings. Listed below is a summary of the main issues and concepts that can be brought into the discussion at almost any level of

the educational process and in almost every area of the curriculum. If the summary of ideas does not relate directly to helping students understand the differences between individual and ecological intelligence, they relate to reform issues connected with revitalizing the local cultural commons and to recognizing the different forms of enclosure. Learning about the local cultural commons, and becoming actively involved in mentoring relationships is perhaps the most direct and effective way of learning to exercise ecological intelligence. A knowledge of the ideas and issues listed below should be part of the professional knowledge of every classroom teacher and university professor—regardless of specialized areas of teaching.

Educational Reforms That Fosters Ecological Intelligence

(A) Ways in which ecological intelligence is undermined:

1. Reinforcing the idea that the student should seek to be more autonomous—which occurs when students are encouraged to construct their own knowledge and values.

2. Reinforcing the pattern of thinking that describes plants, animals, people, events, data, and so forth as independent entities.

3. Reinforcing the idea that change is inherently progressive in nature, and that critical thinking is the engine of change.

4. Reinforcing the idea that the individual is an independent thinker, observer, and source of action on an external environment (the Cartesian mind/body separation).

5. Reinforcing the idea that traditions obstruct progress, that competition leads to the best ideas and plans of action, and that science and technology will solve all environmental problems

6. Reinforcing the idea that words refer to real things and events, and can be universally generalized—and that there is such a thing as objective knowledge and data.

7. Reinforcing the current over-reliance upon nouns that marginalize the awareness that the world is one of relationships and interdependencies.

(B) Ways in which the exercise of ecological intelligence is reinforced:

1. Encouraging students to recognize that life sustaining processes always involve relationships, including how ideas, values, events, behaviors, policy decisions and so forth are embedded in and influence interacting cultural and natural systems. The "difference which makes a difference" that Bateson says represents a basic unit of information is another way of saying that relationships are an inescapable aspect of life forming and sustaining processes. The nature of the relationships may also be driven by what he refers to as an ecology of life destroying ideas and values.

2. Encouraging students to recognize that the language they take-for-granted is part of a linguistic ecology—that words have a history and the failure to recognize this may lead to relying upon earlier ways of thinking that provided the conceptual basis for the Industrial Revolution that has now entered the digital phase of globalization. There is also a need to encourage students to identify culturally and

ecologically informed analogs that will reframe the meaning of words and thus their ability to consciously recognize the relationships that are ecologically sustainable as well as those that are not.

3. Encouraging students to recognize how abstract thinking marginalizes the need to give attention to the immediate context—and the patterns within different cultural and natural systems that connect.

4. Encouraging students to recognize that critical thinking has a role to play in the exercise of ecological intelligence, but that it should take account both of what needs to be intergenerationally renewed and what needs to be radically changed. Students should be encouraged to examine how a human-centered view of the role of critical thinking leads to critical thinking being used by corporations to bring more aspects of natural systems and the cultural commons under the control of market forces.

5. Encouraging students to consider the differences between oral and print based forms of cultural storage and communication—especially how these differences take account of local cultural and natural systems.

6. Encouraging students to shift from thinking of themselves as autonomous actors and observers of an external social and environmental world to basing their self-identity on how their relationships contribute to the well-being of others in both the cultural and natural ecologies they are embedded in.

7. Encouraging students to assess how their personal state of consciousness, including the need to control, feelings of greed, anger, fear, and the need to belong, marginalize both their awareness of the ecology of relationships and patterns as well as whether their response are destructive—which when reflected upon may increase their personal anxieties.

The Linguistic Colonization of the Present by the Past—and of Other Cultures

Students need to be introduced to two aspects of how the metaphorical nature of most of our words carry forward the misconceptions and silences of earlier thinkers who were unaware of environmental limits. First, students need to learn how many of their patterns of thinking are based on a view of language that too many faculty take for granted—namely, a conduit view of language that is based on a sender/receiver model of communication. This leads to the idea that words refer to real things, that words have universal meanings, and that language is the means for communicating objective facts and information. Second, students need to be able to recognize the following if they are to become more critically aware of how they may be relying upon the same patterns of thinking that are now overshooting environmental limits:

1. That most words are metaphors.

2. How the choice of analogs by earlier thinkers and the influence of events continues to frame the current meaning of words—such as freedom, individualism, progress, tradition, markets, and so on.

3. That words (metaphors) have a history and thus may carry forward misconceptions and silences of earlier thinkers who were influenced by the cultural assumptions of their era.

4. That interpretative frameworks that organized social life over hundreds of years, influence behaviors and values, and marginalize awareness of aspects of experience, are based on root metaphors. Root metaphors such as patriarchy, human-centeredness, individualism, mechanism, progress, etc., illuminate certain ways of understanding while hiding other possibilities.

5. That it is possible, indeed necessary in light of the ecological crisis, to reframe the meaning of much of the modernizing vocabulary by identifying analogs that are culturally and ecologically informed—words such as progress, individualism, intelligence, community, technology, poverty, wealth, etc..

6. That the analogs based on the culture's understanding of the attributes and thus the meaning of words such as woman, weed, wilderness, uncivilized, resource, and so forth carry forward how moral behavior is governed by the cultural understanding of the attributes of the other—person, plant, and physical environment.

7. That the conduit view of language, along with the idea that words stand for real things and thus have a universal meaning, are the academic version of the Trojan Horse that is part of the colonizing process of other cultures. This process of linguistic colonization, along with the economic and technological forces of colonization, undermine the intergenerational knowledge developed over generations of how to live more community-centered and less environmentally destructive lives.

Educational Reforms That Contribute to Revitalizing the Local Cultural Commons and to an Understanding of the Modern Forms of Enclosure

Many of the metaphors we rely upon today, and whose meanings were framed by analogs chosen in the distant past and by current evocative experiences (such as experience with different technologies or world shaping events), continue to marginalize an awareness of the ecological importance of the local cultural commons—as well as the diversity of the world's cultural commons. The following represents a highly simplified overview of key concepts and issues:

1. The cultural commons are largely the intergenerational knowledge, skills, and mentoring relationships that exist in every community—and that are less dependent upon consumerism and a money economy.

2. The cultural commons vary from community to community according to the traditions of ethnic groups and bioregions.

3. They include the knowledge, practices, and intergenerational processes of sharing and renewal in the areas of food, healing, ceremonies, narratives, languages, creative arts, craft knowledge and skill, games, volunteering and community activism, civil liberties and social justice movements, and so forth.

4. The networks of relationships and mentoring in each of these areas has a smaller carbon and toxic footprint—as they involve face to face relationships and a different scale of economic exchange.

5. In an era of downsizing, automation, and outsourcing, the cultural commons provide ways in which people can discover their talents, interests, and experience of community while becoming less dependent upon a money economy.

6. Not all expressions of the cultural commons meet current standards of social justice and ecologically responsible citizenship-thus the cultural commons generally should not be romanticized.

The pedagogical and curricular implications include the following:

1. Introducing the cultural commons must include descriptions of the various local activities, how they are culturally diverse, and how they are being enclosed—which can lead to in-depth analysis of modern forces that are market oriented and driven by misconceptions and silences in the educational process.

2. The students' introduction should also be experienced-based—where they are encouraged to do auto-ethnographies of their own cultural commons experiences, as well as engage in surveys of the largely non-monetized activities and relationships in the community. Participating in these groups will lead to mentoring relationships that will contribute to students acquiring many of the competencies essential to an ecologically sustainable future.

3. The approach should be based on a phenomenological description of embodied experiences rather than reliance on print based descriptions. It is also more a matter of identifying mentors, the complexity and interdependency of social networks, as well as making explicit the student's experience of community when involved in different cultural commons activities.

4. Helping students become explicitly aware of the differences in their embodied experiences (including discovering interests, developing talents, participating in community supportive relationships) as they move between engagement in some area of the cultural commons and in a monetized and industrialized work setting is essential to their developing the language necessary for clarifying the differences and for exercising communicative competence in resisting further forms of enclosure of the cultural and environmental commons.

5. Teachers need to understand their mediating role in helping students become explicitly aware of the difference between experience in the cultural commons and in monetized relationships. This involves being aware of what questions to ask because of the taken-for-granted nature of experience. It also avoids prescribing what the students should think. Instead the teacher's mediating role is to encourage the examination of the relationships and ecological impacts—which may lead students to recognizing aspects of the scientific/industrial culture that are making positive contributions to humankind and to living more ecologically sustainable lives.

6. Creating close alliances with different groups engaged in sustaining different

aspects of the cultural commons will help to provide mentoring relationships that will contribute to the students' competencies—which teachers need to prioritize as to whether they are community and environmentally enhancing or whether they contribute to the basic skills and values necessary for being engaged in the money/work-oriented economy.

7. Teachers need to acquire a balanced way of thinking about how to ensure that the students' understanding of the tensions between the cultural commons and the market and other sources of enclosure do not become ideologically driven. Students need to develop the ability to think critically about how technologies and other aspects of the industrial/monetized cultural influence the cultural commons, and how the cultural commons can be promoted as alternatives to the ecologically destructive impacts of these market liberal globalizing forces. That is, they need to learn that they stand at an important ecological juncture where knowing what to conserve is as important as knowing what needs to be reformed or abandoned entirely.

Understanding the Cultural Transforming Characteristics of Computer Mediated Learning and Communicating

Computer mediated thinking and communication reinforce the conduit view (the sender/receiver) view of language. Thus, computer mediated thinking makes it difficult to recognize that words are metaphors, and that they have a history rooted in specific cultural ways of thinking that can be traced to the past. The current idea being promoted in some countries is that students should use computers as the primary resource for constructing their own knowledge. This approach to educational reform ignores that the culture/metaphor/thought connections are hidden by the conduit view of language (the sender/receiver pattern of communication) that computers reinforce.

1. The educational uses of computers, as well as in other settings, involve the encounter of the user (e.g., the student) with the interpretative framework and value system of the people who write the program. It is not an encounter with an objective representation of some aspect of "reality."

2. Only explicit forms of knowledge can be digitized—and these will reflect the interpretive framework of the observer. That is, the aspects of cultural experience that are taken for granted, as well as tacit understandings and the lived context of human with human, and human relationships with the natural environment, cannot be digitized. Even videos of experience are unable to represent personal memory, taken for granted patterns of thinking, and other internal states of consciousness. In a twist in the Cartesian mind/body separation, the visual and audio dimensions of experience that can be digitized are limited to the aspect of embodied experience that are accessible to the outside observer, which will be influenced in turn by the assumptions that the observer brings to the relationship. What the outside observer cannot digitize are the internal states of consciousness—including the Other's experience of self-identity.

3. Computer mediated learning and communication carries forward the gains and losses associated with the tradition of print-based storage and communication. Like other uses of print, computers reinforce abstract thinking and communication which easily leads to assuming that print-based representations of reality can be generalized across cultures.

4. Educational software programs are based on the taken-for-granted patterns of thinking of the people who create them—and often reinforce the assumptions that further impede the process of relational thinking that is an aspect of ecological intelligence.

5. There are many ways in which computers can be used to map green spaces, represent energy and toxic flows in the environment, and connect members of the community who are engaged in sustaining the local cultural commons.

6. Teacher education programs need to introduce future teachers to the cultural mediating characteristics of computers. This would include the issues already mentioned. This should lead in turn to introducing students to the questions they should ask about the cultural assumptions being reinforced in software programs, as well as to considering how the increased reliance upon computers leads to greater dependence upon the money economy, increases demand on sources of energy, and increases exposure to the toxic chemicals when computers are discarded.

Learning to Exercise Ecological Intelligence

If classroom teachers and university professors have not learned to think in terms of the interconnected world of cultural and natural systems, it will be exceedingly difficult for them to reinforce this way of thinking among students. The tendency will be to reinforce the old patterns that make the individual the center of political, moral and lifestyle decisions. It is for this reason that educators at all levels need to become better informed about the changes occurring in the chemistry of the world's oceans, the amount of synthetic chemicals that are altering the reproductive capacity of both humans and other members of the biotic community, the changes in weather patterns that are melting glaciers and releasing more green house gases into the atmosphere, the expansion of deserts and the loss of topsoil—and the number of people that are becoming environmental refugees as a result of these and other environmental changes. If classroom teachers and university professors do not keep these environmental changes foremost in mind, the tendency will be to reinforce the patterns of thinking and values that have been major contributors to the modern, western approach to progress that is ecologically unsustainable. That this approach to progress is now being globalized in a world of nearly seven billion people means that the crisis will deepen at an accelerating rate—and as the crisis deepens the politics of national and individual self-interest will lead to increased conflicts that will, in turn, further marginalize constructive approaches to addressing how to mitigate both human suffering and the further destruction of natural systems.

This scenario does not have to occur as there are many cultures, especially in the Third World, that are working to recover their traditions of community self-sufficiency and environmental stewardship. There are also many cultures where the dominant religious/cultural practices do not equate progress and well-being with the accumulation of material wealth and the exploitation of other people and the environment. And in many communities in the West there are people whose lives are focused on participating in different community-building cultural commons activities. Thus, as suggested earlier, there is no need for intellectuals to create an abstract model of how people should learn to live within socially just and ecologically sustainable communities. However, the many examples of people practicing ecological intelligence are a distinct minority and, perhaps more importantly, they do not occupy positions of power within corporations, in the dominant political establishments, and in the military.

The challenge for educators is to help ensure that the next generation will be educated in ways that makes them receptive to learning from other cultures as well as the community/cultural commons—centered groups in their own culture. This is essential if the cycle of mentoring of one generation by the next is to continue. How to encourage faculty to take these issues seriously, and to avoid hiding behind the tradition of academic freedom that justifies ignoring the ecological crisis on the grounds that their chosen scholarly field of inquiry takes priority over all else, is a problem that is not amenable to a technological fix—just as the moments of awakening that leads to a transformed state of consciousness cannot be forced.

While keeping the above problems in mind, it is important to return to the question of how classroom teachers and university professors can use this list of issues and ideas summarized above to reinforce the students' ability to think and act in ecologically responsible ways. Given the four areas in which all teachers/professors make critically important decisions—in the areas of linguistic colonization, cultural/environmental commons lifestyle issues, differences between oral and technologically mediated communication and thinking, and the exercise of individual or ecological intelligence—there is little in the way of existing courses that provide text-book type answers to the questions that might come up in classroom discussions—or in power-point presentations. If as Bateson, Capra, Maturana, and Varela point out, ecological thinking involves observing and adapting one's responses to the differences which make a difference—that is the patterns that connect within and between different systems (including cultural and biological systems) then when the teacher/professor asks a question about how the analogs settled upon in the distant past influence current thinking as well as what is being ignored, answers will emerge from an examination of the myriad cultural patterns of the past, an examination of the earlier cultural assumptions, the cultural approaches to natural systems, and so forth. The learning process will require examining relationships, patterns, and impacts that connect the past to the present. And it will also bring into focus moral values and democratic decision making that reinforce different

patterns and relationships. The question about the history of words can be raised in a very preliminary way in the early grades, and explored in much greater depth at the graduate level. At both levels a key idea is being introduced that, hopefully, will stay with the student into adulthood: namely, that words have a history and carry forward ways of thinking that may be ecologically problematic.

To take another example, asking student about the differences between their experience in some activity of the cultural commons and in a consumer relationship leads to an examination of the patterns that connect—perhaps between the guiding economic ideology and the behaviors and values that the students should pursue if she/he is to have a positive self-image. The patterns that connect might lead to exploring the difference between learning a skill and discovering a talent that leads to a mentoring relationship with others, and being a consumer that has a toxic footprint. Deep cultural assumptions, questions about protecting the cultural and environmental commons from being privatized and monetized by the market system (such as the corporate ownership of human genes, etc.), and auto-ethnographies that map what remains of the local cultural and environmental commons, all reinforce the exercise of ecological intelligence. It is possible to make the same case for all the other issues and ideas listed under the four categories of teacher/professor decision making. Whether the focus is on questions relating to how computers reinforce abstract thinking and thus individual intelligence (which is itself is an important question to explore), or on considering the appropriate and inappropriate uses of communication technologies as they relate to sustainable cultural and natural systems, the field of inquiry is as wide-open as the complexity of cultural and natural ecologies. In these and other examples that can easily be cited from the above list, the outcome is not a list of facts, objective data, or objective knowledge that is to be memorized and reproduced on a test required by the bureaucrats' "race to the top" governmental policy.

Educational reforms need to make a genuine break from the industrial approach to public education and from the academic imperialism that is at the root of economic and technological globalization. Adapting pedagogical and curricular decisions to what is required by packaged curriculum units and measurable test scores may appear as freeing the teacher from the task of reframing the boundaries and focus of a curriculum that will engage the interest of students, but it becomes repetitive and personally unfulfilling after a few years—just as working on the assembly line that encodes the intelligence and assumptions of the experts who designed the system becomes repetitive. The industrial approach to public education and, to a lesser extent, a university education does not prepare students for democratic decision making as participants in the cultural and natural ecological systems, or for clarifying the ecologically sustainable values that represent alternatives to the individually-centered industrial culture that is the source of increasing poverty and environmental destruction. The ideas of Bateson provide the conceptual framework for judging whether the educational process is reinforcing an ecology

of unsustainable ideas and values. Hopefully, others will begin to take seriously how his ideas help clarify the cultural roots of the ecological crisis, how the West's recursive conceptual traditions have contributed to the cultural colonization that is at the center of increasingly global-wide conflicts, and how to revitalize local economies, local decision making, and approaches to education.

Note

[1] This article appears as Chapter 7 in the book *Perspectives on the Ideas of Gregory Bateson, Ecological Intelligence, and Educational Reforms* by C. A. Bowers.

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