Visions Lost and Dreams Forgotten:
Environmental Education, Systems Thinking, and Possible Futures in American Public Schools

By John A. Cassell & Thomas Nelson

The contributions to this special issue of *Teacher Education Quarterly* introduce the reader to a powerful analytical framework through which one can reflect upon the meaning and role of environmental education, teacher education and professional development, and salient aspects of the quintessence of the human experience on planet Earth. In a very real sense, the articles herein were brought together so as to provide an interlocking array of intellectual and practical perspectives through which we can better understand our elemental human nature and the various socio-cultural and economic overlays which have served to insulate humanity from that nature and, in the process, from a workable relationship with the world environment to which the fate of the human animal is inexorably bound. These articles also raise very real, compelling, and urgent implications for the practice of teacher education and professional development, classroom instruction in public schools, and how these can lead Western civilization toward a more intelligent and workable relationship with our planetary home.

John A. Cassell is a doctoral candidate and Thomas Nelson is a professor, both with the Benerd School of Education at the University of the Pacific, Stockton, California.

The authors of these articles present a number of insightful observations and thought-provoking ideas that warrant further scrutiny and reflection as

the human family confronts some of the most daunting challenges it has ever encountered during its long and arduous sojourn on planet Earth. At the core of all the contributions to this special issue is the compellingly urgent realization that humanity is facing, and must deal with, enormous ecological and social problems and challenges. This situation has created an urgent and compelling need centered on how the future citizenry of the industrialized West will be prepared relative to addressing and dealing with these problems and challenges.

Competing Paradigms:
The Current Influence of Past Realities

In essence, the analytic framework and perceptual perspectives mentioned above give rise to the vision of competing paradigms in the conception of public education's purpose and role in contemporary American society. The paradigm that currently dominates the thinking of policy-makers in American public education—and forms the backdrop for much of the discussion in this special edition of *Teacher Education Quarterly*—dates from the late 19th century as the United States transitioned from an agrarian and small-scale manufacturing economy to a large scale, mechanized industrial economy. Ultimately, it is the product of a long tradition of Western thought born in the intellectual formulations of the Copernican Revolution, honed in the course of the Age of Reason and the Enlightenment as the pan-global mercantile empires of the West grew to dominate the world scene, and then given more mature form and new purpose during the socio-cultural reformulations attendant with the Industrial Revolution. In the United States of the late 19th and early 20th centuries, these powerful trends in Western thought led political and business elites to combine and create a new *scientifically managed* comprehensive public school system based on the most pervasive business model of the time and employing standardized native intelligence testing and ability tracking (both in-class ability grouping and class cohort ability grouping) so as to create a *factory model* of education capable of both sorting and socializing a large immigrant labor force into the developing industrial system of production (Emery, 2007).

This new educational *platoon system* was intellectually legitimized by the emergence and rise of the new science of educational psychology. E. L. Thorndike was central to the development of this discipline and infused it with a thick patina of operant conditioning which stressed repetition, memorization, and teacher-centric didactic instructional methods in which students were passive receptors of information batches designed to assimilate, acculturate, and pacify. The objectives of public education policy-making in America increasingly focused on the elimination of cultural, ethnic, and linguistic diversity and its replacement with a new *standard issue* American citizenry suitable for working in, and commercially supporting, the rapidly expanding industrial-corporate infrastructure.

A similarly rapidly expanding public education system was increasingly called

upon to train this new generation of Americans to be culturally mainstream as well as passive and obedient to the will of economic and political elites dedicated to the perpetuation of their own power and the steady expansion of an unbridled, resource greedy, commoditized, and consumerist-driven economic machine. Further, this machine, for better or for worse, rapidly became the foundational symbol for what has come to be termed *American exceptionalism*. In a very real sense, it supplanted the core documentary roots of the American representative republic and became the end which freedom served—the machine became the repository in which an entire nation placed its dreams, hopes, and ambitions for the future. The goal of public education was, then, to prepare a new citizenry to take on certain roles in society, based largely on their socio-economic status and cultural background—in the manner of the Prussian public school system on which it was largely based (Gatto, 1994, 2003). Immigrant working class students were placed into vocational tracks and Anglo middle class students were placed into a course of study designed to produce a management cadre for the rapidly expanding corporate entities of the new economy. Ironically, the homogenization imagined by the factory model of public education was carefully drawn around extant differences in class and ethnicity.

The standardized testing and tracking-based education system which developed during America's gilded age has adjusted for changes in the political and economic landscape over the decades and still informs educational policy at the national, state, and local levels. Tests have evolved to become measures of learning accomplishments rather than of native intelligence, but the ultimate objectives behind their administration remains much the same. By way of culturally loaded and linguistically biased presentations of highly selective constructs, such tests work to reproduce the extant stratifications of American society—they not so much test as they sort, categorize, classify, and label.

We now face a situation in which students of color are being resegregated into low performing schools and subjected to extremely narrowly focused stripped-down drill-and-skill curricula designed to impart data and information required to pass state standards-based and district benchmark-based tests (e.g., *Success for All*). The teachers of these students are called upon to function in the manner of de-skilled, scripted one-way disseminators of basic data and information for regurgitation on mandated paper and pencil tests (Emery, 2007; Kozol, 2005). The operational hallmark of this educational paradigm is the image of students working in isolation from one-another in a system of high stakes social competition set within the oppressive context of what is presented to them as an intimidating zero-sum game of *all or nothing*-based success or failure. The dark specter looming over everyone and everything in this conception of public education is an illogical, unworkable, and draconian concept of school and teacher accountability in which educators are tasked with ensuring outcomes largely beyond their control—they are given an onerous responsibility for that over which they have virtually no operative authority.

Ironically, to a great extent, students and teachers toil in vain. As Parkison

(2009) so adroitly points out, test scores have become the central commodity of the political economy of education in the United States. They have, in fact, replaced the intellectual attainments they were originally designed to represent. Cognitively separated from what they are supposedly measuring and developed by political and economic elites to reflect the values, experiences, and symbolic systems of one small sub-group of American society, these tests are now a powerful engine of social reproduction. Through their administration and use as vehicles for categorizing and separating, a repetitive cycle has emerged wherein the people for whom the tests are created, the people whose life circumstances and habitus are reflected in the tests, tend to score well, move on to college and graduate school, and then on to continuing and secure membership in the middle and upper classes of the social order. Many of them eventually move into positions of authority from which they perpetuate the predominant socio-cultural bias in the public education system that ensured their privileged position in the social order. In doing so, they ensure that academic standards, and the tests tied to them, continue to legitimize their privileged social status and protect the sources of their power while marginalizing those who do not share their socio-economic, cultural, and ethnic backgrounds (Emery, 2007; Parkison, 2009; Solorzano, 2008).

Competing Paradigms:

Points of Cognitive Disjunction and the Need for New Constructs

C. A. Bowers (in this issue, see pp. 9-31) and Daniel Goleman, Zenobia Barlow, and Lisa Bennett (in this issue, see pp. 87-98). make the point that the situation we now confront with regard to both the institutional environment in contemporary public education and, more broadly, the relationship between Western society and the natural environment, are the result of human behaviors set into motion by the socio-cultural and intellectual framework of the Age of Reason, Enlightenment, and the Industrial Revolution and relate directly to the intellectual history of the West. This intellectual tradition has maintained that human habitation of the Earth—and related levels of resource consumption—could be based upon an infinitely expanding growth in economic productive capacity juxtaposed against the physical framework of a distinctly finite planetary environment. Over time this has created a serious misalignment between the intellectual formulations upon which Western civilization came to be based and the physical world upon which it has relied for its survival.

The authors in this issue point out the important contribution of Bowers in positing that this form of thinking is based upon root metaphors passed down through generations and used to describe analogs in the form of words and other symbols that become powerful codes through which we come to understand and interpret the world. These root metaphors become ideological sources from which human cultures draw strength and reproduce themselves across generations. These codes are, therefore, mechanisms for the social reproduction of deeply embedded

preferences and attitudes upon which we make life decisions for ourselves, our fellow humans, and the natural world that surrounds us.

The historical nature of our linguistic formulations—that is, the metaphorical nature of our words—serve to invest them with the misconceptions of the earlier thinkers who created them and who were unaware of the environmental limits we now confront. As a result, modern Western culture views the natural environment as an externalized mechanistic entity in need of being brought under rational control for the betterment of the human condition. Seen from this perspective, the natural world is something separate from humanity—malleable and exploitable. This, then, forms the basis of what the Western world is pleased to term material progress as understood through the legacy of Baconian thought and interpreted through the writings of Thomas Hobbs and Adam Smith.

However, as is pointed out by the authors in this special issue of *Teacher Education Quarterly*, science and technology—in and of themselves—cannot save humanity from the impending environmental disaster now closing in on it. What is required at this juncture in history is a transformation of a particular way of life that has resulted in planetary degradation and the wholesale destruction of natural environments and entire species. What is required is a fundamental transformation in support of the development of a new paradigm, a new lens through which the Western mind can adjust its view of society, education and learning, citizenship, and the nature of human habitation on Earth. There is no doubt that formal education has a role to play in this transformation from the standpoint of important shifts in broad cultural and individual attitudes and intellectual orientations. It is also clear that these shifts in attitudes and orientations are of critical importance because modern industrial-capitalist market economies carry value systems with them that tend to undercut forces and values associated with sustainable socio-economic structures and related principles of ecological intelligence. It is posited by the authors in this issue that modern industrial-capitalist market economic systems are not sustainable over the long-term and that this casts doubt on the survivability of the Western industrial civilizations tied to them—especially in light of the anachronistic intellectual tradition that currently shapes the world view of the industrialized West. In essence, then, what we see when we read these authors is a powerful process of exploration for, and consideration of, new paradigms in Western thought, American culture and society, and American public education.

They advance the idea that formal education is capable of exploring foundational social, cultural, and economic issues associated with the conceptual framework that currently dominates the American scene, as well as raising questions about the future of these deeply embedded—and now dangerously outdated—structural paradigms of Western civilization. However, both Paul Hart (in this issue, see pp. 155-177) and David Greenwood (in this issue, see pp. 139-154) remind us that questions about what is seen as "counting" in education are typically based on historical concepts of culture and society and, therefore, captive to the anachronistic trap elucidated by

Bowers. Hart makes the point that education is always ideological, subject to the interests of power elites and aimed at replicating the basis of their power, privilege, and position. Hence, traditional educational formulae are, in effect, aimed at sustaining certain social values based upon particular ideological and socio-cultural perspectives. They are dedicated to the reproduction of current socio-cultural and economic structures. Public schools in America tend to reproduce these ideas in the service of the power elites within the political class and business community upon whom they depend for funding, curriculum content, and policy direction and whose value system they represent and advance. Hence, as currently structured, schools work to reproduce socio-cultural and economic structures and hierarchies which serve to sustain behavioral and attitudinal patterns that exacerbate the very problems we as a society need to address and solve.

Greenwood points out that teacher education has been marked by an established set of norms and "ways of doing business" highly reminiscent of Pierre Bourdieu's concept of habitus—that is, deeply embedded assumptions, points of view, and preferences that form the basis of foundational choices and actions—that make it very difficult to deeply examine the practices of the field and the assumptions upon which they are based (Croll, 2004; Dika & Singh, 2002; Nash, 1990). Hence, through a largely unexamined cultural logic and habit of mind that underlies teacher education and the institution of public education and teacher training in the United States, our current educational system reproduces arcane intellectual viewpoints and modes of analysis and understanding that actually contribute to the problems of socio-cultural and socio-economic unsustainability and tend to obscure our view of these problems and our ability to effectively address them.

Although we see clear evidence of growing environmental, social justice, and civil rights movements in the Western world, the ultimately counterproductive mechanisms described above have resulted in teacher education vainly focusing on improving scores on standardized tests and getting students up to "at grade" reading levels. Hence, teacher educators and K-12 classroom teachers find themselves mired in an increasingly narrow field of focus, compulsively fixated on prescribed and generalized definitions of achievement and homogenized content mastery-obsessed curricula. The resulting emphasis in educational practice and reform resides in increasingly dense measurements of learning outcomes and serves to reduce education to the learning of isolated facts and events. This further strengthens the myth of the autonomous individual being prepared to succeed in the workplace by mastering atomized elements of skill-based knowledge clusters through a process of individual construction of knowledge and purely personal empowerment. In addition, we are warned that in quantifying complex qualitative outcomes, educators are misled into defining what matters in education solely by what can be measured—entirely ignoring what are arguably far more important parts of the mission of public education. We come to overlook the vital role public education should play in the creation of truly empowered citizens as originally envisioned by

Thomas Jefferson, John Adams, and James Madison. We are deluded into ignoring the role of educators in shaping the public character of the nation—as opposed to the teaching of rudimentary academic skills which cannot, in and of themselves, speak to deeper issues related to equity, access, and social justice.

In line with these observations and insights, Greenwood advances the idea that the discourses, practices, and habits of schooling, along with the myriad processes of "state" control inherent in the institution of public education, serve to severely limit the possibilities for genuinely impactful educational change. This proposition becomes all the more significant when understood in combination with the observations of Gregory Smith (in this issue, see pp. 47-54) and Michael Capurso (in this issue, see pp. 71-86) that the somewhat chauvinistic scientific and socio-cultural paradigms of Western civilization tend to ignore the possibility that other cultural formulations may, in fact, include perspectives and points of view that could clearly assist in the creation and implementation of ecological intelligence and more environmentally sustainable social and economic structures. What has been lost in the West is, in point of fact, the ongoing intellectual legacy of other peoples and cultures whose sensibilities were not forged on the hot anvil of post-Copernican intellectual formulae—namely, the instinctive recognition of the fact that the world is not a machine made up of distinct and separate parts, but a complex system made up of tightly interrelated and interdependent components which exist in a relationship of reciprocity and mutual dependence. Knowledge, understood through the lens of more environmentally sensitive cultural perspectives is, then, not a dizzyingly disparate array of separate and distinct data points swirling around each other in isolation within assiduously compartmentalized subject disciplines—rather, it is a holistic concept that ties informational and conceptual elements of a vast planetary system together to form a complex and fully integrated whole.

Competing Paradigms:
New Ways of Thinking and Acting in Public Education

As alluded to earlier, the authors invited to participate in this special issue of *Teacher Education Quarterly* propose that the Western world needs a new cognitive and epistemological approach appropriate to a new time in history. This includes a 21st century educational structure that matches 21st century physical realities. Goleman, Barlow, and Bennett, as well as Meg Riordan and Emily J. Klein (in this issue, see pp. 119-137) and other contributors to this special issue challenge public education to create a culture of civic engagement in schools. They call upon educators to create a new type of active citizenry by helping students to see patterns and connections, raise questions, and act on knowledge for the benefit of the world around them. Ultimately, teachers must help students develop as citizen stewards, able to grasp and promote concepts of healthy ecological and social systems. As Orr (2004) puts it, educators must teach students the ways in which they are part of the

natural world and help them gain an understanding of self and a mastery of their personhood so as to use knowledge well in the world, for the benefit of the world.

The proposition is advanced herein that through the use of such techniques as interdisciplinary studies, education can help Western civilization rediscover aspects of traditional thinking that can serve to reintroduce basic tenets of ecological knowledge that, over time, we have lost. Ominously, these aspects of the Western mindset have faded as the modern nation states of Europe and America came into being and developed the ability to effect wholesale transformation of the natural environment and, at the same time, expanded their geographical presence around the globe through the military and mercantile conquest of other more ecologically intelligent and sensitive cultures. In supporting this journey of rediscovery, the process of formal education can serve to break down the current dogmatic atomization of knowledge inherent in both K-12 and higher education. It is possible, then, that formal education can lead us away from the historically engrained paradigms of Western thought and move us toward a transition from individual to ecological intelligence—it can guide us through a process of questioning cultural assumptions and explanations that we would otherwise take for granted and, thereby, allow us to understand the nature of the historical patterns of learning and knowledge acquisition that form the cultural roots of the ecological crisis now upon us.

This process of questioning will be at least partially based on the confrontation of the underlying socio-cultural structures that have created the ecological challenges now upon us. Western civilization must now face the *a-priori* assumptions upon which these cultural and economic formulations are based. Ethan Lowenstein, Rebecca Martusewicz, and Lisa Voelker (in this issue, see pp. 99-118) tell us that principal among these is the assumption that humans and human society should be entirely separated from the wider natural world in which they exit and on which they depend for their continued existence, and the assumption that human beings have the right to exploit, manage, and control the natural world and the non-human creatures that inhabit it. Lowenstein and colleagues present this socio-cultural formulation as the "logic of domination" and describe it as resting upon a hierarchical from of viewing the world—a world view based on hierarchical relationships which holds that more value and purpose should be attached to some human lives and less to others and that human life and communities should be considered superior to, and more important than, the natural systems around them.

However, we are given hope for alternative futures in the assertion that environmental education, the application of ecological intelligence and the implementation of the concept of eco-justice, can work to turn formal education away from this traditional frame of mind and turn Western civilization toward a more sustainable and efficacious way of perceiving the world—concentrating on a point of view focused on local places and the interconnections that tie them to the larger community and culture around them. Life, then, comes to be seen not from a hierarchical perspective, but from the perspective of interlocking living matrices linked together

by the concept of community-based learning and centered on living creatures in ecosystems and the interconnections among and between them.

Goleman, Barlow, and Bennett point out that schools can directly contribute to this new approach to life on the planet. However, they make the point that, as Howard Gardner has advocated, educators must cease to base instruction on a narrow concept of intelligence rooted in a few academic skills historically viewed as central to school success (i.e., reading, writing, and computing). Rather, they need to teach with a wider spectrum of intelligence in mind. This will include emotional and social intelligence which, as Goleman has explained over many years, allow us to connect, feel empathy, and see situations from the perspectives of others. It will also involve the active use of ecological intelligence that serves to support the extension of this sense of connectedness to all life on Earth so as to develop the ability to see complex patterns of interconnectedness, cycles and limitations of which humanity is a vital part.

The contributors to this special issue plainly state that the implementation of this educational vision will require the creation of an expanded interdisciplinary curriculum that reflects a genuine sense of the interconnectedness of life and the importance of place in a complex global system of reciprocal interdependence. Obviously, this will entail a fundamental shift away form our current forms of understanding and knowing. We need to base new ways of understanding and knowing on ecological principles. Michael K. Stone (in this issue, see pp. 33-46) asserts that we need to look to examples of human societies that have lived in a state of intelligent balance with the natural environment and have done so for centuries—ultimately, we need to pattern human society on the principles of existence inherent in natural ecosystems. Stone, Bowers, and Goleman, Barlow, and Bennett all propose that we apply systems-based thinking to the human condition and the human socio-cultural dynamic.

These authors believe that such a shift in intellectual paradigm will require a foundation in ecological literacy—that is, a deep understanding of ecological principles, the conviction to act on that understanding, and the development of values and skills that support taking such action. As Hart, Bowers, Goleman, and Orr have pointed out over many years, formal education can assist in this effort by organizing the *process* of education so as to consistently reinforce this form of literacy as an on-going habit of mind. Ecological literacy becomes, then, a key component in the educational process. In order to make this a reality, American educational institutions will need to implement a curriculum and pedagogy that supports issue investigation, problem solving, interdependent action, mutual respect, and systems-based approaches to life. This will, in its most mature form, extend well beyond the *content* of curriculum *per se*.

Fulcrums for Progress:
The Role, Education, and Professional Development of Teachers

Riordan and Klein advance the position that this reformulation of the educational mission and attendant instructional processes and praxis will require teachers to be ever more interdisciplinary, community oriented, problem/inquiry oriented, and active-learning oriented. Teachers must guide and instruct students in developing skills for issue investigation and public decision-making because an empowered citizenry now needs to make decisions about complex issues, including those involving resources and population. This will require interdisciplinary study and related curricular structures designed to identify and capture connections between thought structures that define the social environment in which we live. Classroom teachers need to actively engage in investigating and questioning the historical and cultural foundations of the root goals and purposes of education. Educators will need to equip their students to confront deeply embedded *a-priori* assumptions about the world in which they live. This will require that they themselves—the teachers—enter into critically reflexive processes so as to look at how disciplines and broadly ranging modes of thought have been socially and educationally constructed for certain socio-cultural purposes and ends. Hence, reflective practice in teaching will become an ever more important aspect of professional praxis.

Bowers makes an important point in this regard which seems particularly applicable to teacher education and professional development. The sort of reflective practice discussed by Riordan and Klein should not be seen as a Cartesian exercise in purely internal introspection and self-exploration. Rather, for educators, it must be reflection undertaken within an open and collaborative work space in which the personal narratives, experiential learning, and acquired wisdom of practitioners is shared and discussed in a dynamic process from which consensus views of best practice can emerge. In other words, professional reflection as a tool for honing practice should be increasingly understood from a true systems perspective. That is, it must must emerge from a coherent group of interrelated and interdependent persons all working together to jointly contribute to a complex process of open reification in which the professional and personal identities of teachers are constructed, deconstructed, and reconstructed in an atmosphere of positive cognitive dissonance. In this way the community of practice can both create identities of practice and competence and, in turn, itself be augmented and recalibrated by the various acts of individual identity-creation it makes possible (Wenger, 1998). Teachers must learn to leverage reflection within the dynamic context of a professional community and, in the process, cease conceiving of themselves as autonomous agents operating alone and in isolation behind the closed doors of their classroom. Reflection becomes an instrument through which they can encourage their students to shift to a mode of thinking which supports, as Bowers puts it, "… 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."

Hart and other authors in this issue make the point that to pursue this form of educational theory and practice, we must pay closer attention to the process through which we construct teacher and learner identities. This requires the use of action-oriented relational teacher education and professional development. These learning dynamics serve to support the disruption of *a-priori* assumptions about the intellectual framework we must engage as part of any serious investigation of the root metaphors that trap us in Bowers' cognitive time-warp as well as the deeply-embedded habitus regarding the process of teaching, teacher and student roles, and the configuration of classrooms and pedagogical practice. The challenge, as Hart points out, is to link theory to lived experience in order to move from ignorance and habit to critical reflection. We must thoughtfully consider and reevaluate habitus as opposed to blindly acting on the basis of it, something Greenwood warns against.

Lowenstein, Martusewicz, and Voelker tell us that this, in turn, requires the holding of a developmental perspective. This means, in practice, that teacher education and professional development should move learners through periods or stages of defending prior understandings, reflectively considering new understandings, and, finally, integrating new ways of seeing the world into the core of their identities as teachers—leading to a complex sequential process of structuring and restructuring their professional identities. Teachers will, then, move through a sequence in which they progress from places of safety and commonality to places of discomfort and disequilibrium, and, finally arrive at places of reformation and sustainability. Teachers who experience this can, and should be expected to, lead their students through the same process in age-appropriate ways—a process of identity construction that attaches value to interactive association within local and global communities.

Contributors to this special issue posit that teacher education and professional development need to provoke tension and challenge taken-for-granted assumptions about the role of teachers and the dominant discourses of education. Ultimately, this is a process of deep reflection, the purpose of which is to uncover core assumptions about what knowledge is—to uncover what one author describes as "webs of belief" regarding theories and philosophies embedded in one's habits of thought and action. Teachers must come to see themselves as cultural mediators—that is, they must help students see and address the historical and socio-cultural roots of current economic and environmental crises—roots long buried by the *a-priori* assumptions of an ancient and now deeply engrained habitus. They must help students ask *why* and *how* and not just *what* and *when*.

Operating within this professional scenario, teachers are called upon to engage issues related to the historical efficacy of complex ideas and real-world issues along with, and in partnership with their students. Teachers and students work together as *co-authors*, *relational agents* who are committed and accountable to each other. Teachers are asked to take on a very specific role which may be new to them—the role of guide and facilitator. They must guide inquiry, let questions emerge from the

active engagement and participation of students, and learn to be more comfortable with complexity and uncertainty as they assist their students in doing the same.

Fulcrums for Progress:

Systems-Based Thinking and Holistic Intellectual Constructs

It is asserted by these authors that paradigms in education such as those discussed above will only become generalized realities when we see pervasive shifts in curriculum, pedagogy, and our own underlying attitudes and belief systems. Goleman, Barlow, and Bennett assert that we must impact school culture—reconsider the relationship between schooling and education—in order to effect these changes. They go on to state that school culture can be productively viewed as a "community of practice" in which both teacher and student identities can be constructed and reformulated.

Stone posits that, ultimately, we need to view nature as the teacher, and in so doing, view life as a process of systems architecture. We need to think in terms of such systems in order to see the connections and patterns that make up the world around us. We need to perceive schools in the same way and approach their function from the standpoint of systems dynamics. Goleman, Barlow, and Bennett assert that what they refer to as ecological awareness is the basis for this systems approach and is, in turn, based upon the integration of emotional, social, and ecological intelligence.

As noted above, foundational to this state of mind is the development of a systems-based thought process. From this perspective, humanity comes to see itself as a fully integrated element within a planetary system, both subject to, and at one with, the patterns and interconnections inherent in such systems—impacting them and being impacted by them. This level of knowledge about ourselves and our planet, and the skills and proclivity for acting on the new forms of awareness associated with it, lay the foundation for a new way of learning, a new type of education and —underlying both—new socio-cultural forms regarding the human relationship to the environment.

Living systems theory as enunciated and explained by Capra is a lens through which individual beings and objects in nature and/or society can only be fully understood in conjunction with the systems in which they exist. Vital to this point of view is the understanding that all systems—both natural and human—develop and evolve. In the process, they generate "emergent properties" that are not predictable from the properties of their individual parts and result from embedded processes of change, transformation, and reformulation. This view holds that human beings need to begin to see themselves as fully integrated into a complex matrix of nested systems—a structural configuration which underlies the natural environment of the world. In this structure, changes in one system affect the sustainability of those nested within it and those within which it exists. This foundational concept holds

for natural systems and human systems that exist within natural systems (i.e., ecologies). Schools can be described and understood as human systems which contain various smaller systems and, in turn, exist within larger ones: Individual students—student work groups—classrooms—schools—school districts—cities—states—regions—nations—ecosystems—the planet.

The Potential Impact of Systems-Based Thinking and New Intellectual Constructs on Teaching and Learning

One inescapable conclusion that emerges from many of the contributions to this special issue of *Teacher Education Quarterly* is that systems thinking has major implications for pedagogy and for organizational decision-making and instructional practice in schools. It also brings with it a determined move away from the intellectual traditions of Western science and analytical thought. In doing so, the operative dynamics of systems can provide a powerful platform for innovation by way of fundamental processes of developmental change through which systems adjust to the constantly unfolding alterations in, and shifting relationships among, the various elements of their environmental situation.

Stone presents the idea that systems—both natural and human—tend to exist in stable states while matter, energy, communications, and ideas flow through them. They resist change in their natural state. He—along with Goleman, Barlow, and Bennett—goes on to state that, occasionally, systems hit points of instability and this often leads to breakdown and reformulation which results in the development of new forms. If the system cannot integrate these new forms, it will collapse or change its structure to accommodate them. The process of accommodation is, in fact, a process of emergent change and will result in the adoption of new structures, practices, or beliefs. Persons in leadership roles in human systems can facilitate this emergent change by establishing constructive processes of instability by facilitating climates of trust, mutual respect, and innovation. However, to do this, leaders will need to loosen control and share it with group/system members. Capra describes this in terms of creating conditions as opposed to giving directions. In terms of education specifically, this leads us to the image of teachers using their authority to empower and, thereby, creating conditions in which students can function as thinkers and contribute as co-authors and relational agents.

We can infer from these various observations and insights that this sort of mindset and operational dynamic in public schools could lead the West toward the type of new planetary community discussed by Richard Kahn (in this issue, see pp. 53-68)—a planetary community in the form of a new *science of the multitude.* As conceived by Kahn, this is a distinctly educational concept in which society as a whole is converted into a gigantic school through which the closed and "sanctified" reification of the Enlightenment is replaced with a new form of human thought

and life more fully integrated with the natural world so as to create a more virtuous state of being. We come to understand that the exercising of ecological intelligence is a collaborative process that functions both as an intellectual tool and as a source of knowledge essential to sustaining the life of the human community. One powerful conclusion that emerges from the contributions to this special issue is that all interactions within cultural and natural ecologies require close attention to the information exchanges flowing through systems. This, in turn, requires that a prime objective for education must be the radical reformulation of the taken-for-granted attitude that we are autonomous individuals who can view the world as a disembodied externality that exists totally apart from ourselves and our personal concerns. Ultimately, then, Goleman's (2009) concept of ecological intelligence is a process of systems-based thinking through which one can recognize patterns of organization and structures of interlocking systems—systems that serve to sustain life on Earth. This form of thinking and perceiving focuses on networks of relationships and patterns of connection rather than self-contained parts moving independent of one-another.

Another critical conclusion that emerges from the work of the contributors to this special issue is that, increasingly, the connections between cognitive processes, core learning modalities, and instructional designs should be examined from the perspective of broader issues related to the structure of human society, the fragile ecology of our planetary home, and the essential nature of the human condition. As the authors point out, the modes of educating classroom instructors, and the nature and form of classroom instruction itself, can play a powerful part in reformulating key *a priori* assumptions about learning and one another that have formed the basis of increasingly unworkable intellectual formulations relative to the shape and purpose of human society and culture.

As alluded to above, Bowers notes that we speak of the world as if it is a machine that we can manage, run, and repair. We live our lives through the outdated and worn metaphor of the machine and we implement this metaphor through a linguistic tradition based upon the concepts of individualism, progress, freedom, mechanism, and economism. Unhappily, this point of view is the product of a world that no longer exists and reflects intellectual indulgences that humanity can no longer afford. What is called for in a world of critical scarcity is a new root metaphor—one based on ecological precepts. In a very real sense, this special issue of *Teacher Education Quarterly* sets forth a foundational principle in advancing the notion that this ecological root metaphor can be productively understood as a systems theory-based worldview. Authors herein suggest a new linguistic tradition in support of this worldview, a vocabulary for life lived within, and as part of, a complex global system—as opposed to life lived overseeing and tinkering with a global machine. The construct for a new way of perceiving the world inherent in Goleman's conception of ecological intelligence can, then, be seen as one possible form of the new ecological root metaphor that Bowers believes is so vitally important for the future of the human race.

The intellectual vantage points provided by the contributors to this special issue lead us to the realization that there is a pressing need to rethink and restructure the form and substance of institutionalized learning and formal education in the West. Ideally, educators should look at ways to redirect the current emphasis on abstract, disembodied theoretical knowledge and the search for answers to formulaic inquiries. Orr (2004) agrees with this point of view and suggests that education should, instead, be centered on an examination of values, the consequences of actions, penetrating questions, and the situation of humanity in the world. We must move away from the guiding principle that we can manipulate the environment through the application of the scientific method to the condition of human society. We must abandon the naïve proposition that we can use scientific knowledge and technical skill in order to bend nature to our will in an effort to create a perfect political, social, and economic order—"perfection" being defined as the ability to generate an ever growing basket of goods on which to ever more lavishly engorge our lifestyle.

We must begin to seriously consider how to design and establish an educational system that allows us to escape from the mindset of Francis Bacon. The authors herein propose a redirection away from the thought systems of the Age of Reason and its arcane intellectual architecture that separated the spirit from the mind and internalized the focus of human thought. In the face of this perilous disjunction between mentality and reality, Orr (2004) asserts that our educational system has made our precarious environmental situation more dangerous by replacing *true knowledge* which is holistic and long-range in its interests and goals with *cleverness* which is short-range and centered on breaking reality into small, distinct pieces (i.e., disciplines), acquiring subject mastery over one of them, and then practicing it within an intellectually isolated professional cocoon. He states that this atomized and scattered orientation to formal education makes it virtually impossible to forge the necessary connections between and among the vast array of moving parts which are now gathering to form an ominous global crisis, much less tackle the huge problems associated with that crisis.

In response to this urgent state of affairs, we are presented with a new approach to education. Students should be introduced to the idea that they themselves are part of a complex planetary system. Students should be taught to use knowledge and ideas to forge their own identity as a participant in a larger world community. Education must be seen as a developmental process of change through which the person is truly transformed—he/she becomes something different from what they were at the outset. They acquire new identities—new ways of thinking and new ways of acting—ultimately, new ways of being (Wenger, 1998). Students should develop an understanding of their connection to the wider world and a desire to use what they learn for the benefit of that world.

It naturally follows, then, that form and substance in education must be brought together in an effort to convey to students that they are nothing more and nothing less than vital nodes in a vast global network of intertwined relationships. They

should be trained to think in terms of whole systems, ask penetrating questions, find and identify patterns, make connections, and isolate root causes of complex phenomena. Education cannot be allowed to remain a process of simple information/data acquisition and technical skill development. It must be centered upon the ability to recognize, analyze, and fully understand the complex reciprocal interdependencies that make up the interlocking webs of multiple systems in which the "human fly" is forever caught—for better or for worse. This requires that we develop what Orr calls *a more inclusive rationality*. We need to define and instill a more expansive form of knowing in which empirical knowledge is joined with personal/emotional knowledge in a way that brings us closer to a holistic and intimately engaged worldview. We have to move away from the Cartesian vision of a disembodied, purely abstract, and entirely internal form of knowing that leads us to the dangerous assumption that a carefully organized and minutely segmented accumulation of knowledge and the technical skills associated with it guarantees our future on this planet—a future in which we can continue to adjust a planetary machine in support of our pleasures, whims and wants.

The Call to Action:
Next Steps for Educators and Scholars

Redesigning the content coverage of formal education is an essential part of this effort, but this will, ultimately, be—in and of itself—insufficient to effect the sort of change advocated and described by the authors herein. To implement this type of sweeping change, the core substance of the *process* of teaching must change as well. We must address the hidden curriculum in the form of the social and physical organization of the classroom and the interpersonal role of the teacher in that classroom. Potentially useful instructional approaches and techniques must be explored and examined in depth from the perspective of the high stakes game in which we find ourselves at this particular juncture of history. This will require restructuring the learning environment in schools so as to build an awareness of coherence, community, shared fates and destinies, and the inherent value of every person in the from of that person's unique talents and abilities. However, increasingly, we need to perceive individual potential and worth from the standpoint of the unique contributions that every person can make in asking important questions and solving complex problems as a fully integrated part of a complex process of distributed intelligence and genuinely collaborative discourse and action.

It would behoove us, therefore, to design and conduct serious research focusing on the ways in which curriculum and pedagogy can be informed by systems-based thinking. We must study and carefully consider the ways in which general systems theory and group systems theory inform and enrich pedagogical thinking and practice. If we are to instill in students a useful appreciation for the true structure of the world in which they live (i.e., the complex systems architecture of the

world) and move them toward a new intellectual paradigm for life on Earth, then we must explore how the functional dynamics of the classroom can be structured so as to reflect that paradigm on a visceral and operational level. Practitioners and the academy must come together in creative research partnerships dedicated to the exploration of these issues and the testing of alternative approaches to the task of recreating learning venues in American schools.

We must work to develop the concept and structure of classrooms as group systems and teachers as system monitors, managers, facilitators and leaders. Ultimately, the teacher must become the force through which the group system of the classroom achieves optimum functionality. The key to this effort will be to frame future research from the perspective of the operational dynamics of general and group systems theory. Only by having students experience a purposefully designed classroom system dynamic in which they function as a fully integrated and interdependent component within a communal process of distributed cognition can we hope to realize in practice what Bateson referred to as the *ecology of the mind.* Only in this way can we hope to instill in them a deeply felt, visceral appreciation for the reality of the system dynamics of which they are part in the world beyond the classroom. However, to be successful and compelling, this sort of communal learning system must make an important and functional place for all the learners in the classroom—all types of learning styles, intelligences, socio-cultural and economic backgrounds, races, ethnicities, gender identifications, and languages. Each one of these variables brings invaluable social and human capital to the classroom that must find a genuinely contributory place in it if we are to find our way out of the impending global cataclysm.

The End Game:
Systems-Based Thinking, Ecological Intelligence, and the Move toward Social Justice

This call to equity, access, and optimal levels of participatory inclusion is the challenge that must be addressed in future scholarship and action research in the field of teacher education and educational practice in general. We must consider how to more effectively operationalize the theoretical propositions of Dewey, Piaget, Vygotsky, and Sternberg. We must search for effective ways to utilize cognitive dissonance in order to effect constructive instability in group systems so that we might destabilize and reformulate the cognitive schema that impede our ability to see the true value in one-another and the value in leveraging together our individual gifts and skills in a true community of practice based upon a genuinely open process of reification. What has always been the unshakable right of every human being on the face of the Earth (including children in school)—the right to stand up and say "this is what makes me special," "this is what makes me valuable," "this is what I bring to the table," "this is what I know how to do," "this is my gift, the bright glow

of my human dignity"—has now been transformed into a pan-societal necessity by the dire ecological straights in which we find ourselves. More than ever before, we need every mind, every skill, and every original thought that can be brought to bear on the global sustainability crisis now upon us. However, individuals and their gifts must increasingly be seen as a special gift given to others who, in turn, give of themselves so as to create a thundering chorus of combined, integrated, and mutually respectful knowledge and power. The historically quant isolationist myth of rugged individualism must now give way to a collaborative and cooperative model of human endeavor which stresses the free exchange of human and social capital in socio-cultural structures unfettered by now long antique distinctions based on secondary physical characteristics. Public education must lead the way and teachers must serve as primary agents for change and enlightenment. It is in school classrooms that a new world must be born, if it is to be born at all.

Ultimately, viewing the world through the lens of systems thinking can give social justice a powerful rationale that connects the fate of every person to that of every other person in a way that needs no philosophical or ethical overlay. It is no longer a matter of intellectual subtlety; it becomes a matter of personal and community survival. Orr (2004) sees the ultimate goal of education as "survival with decency." However, in reality, the true goal of education is survival *through* decency. It's ultimate objective is the creative application of intellect through kindness, understanding, and love.

We are called upon to create school environments that reflect the system structures of the world in which we live and in so doing give rise to a new concept of citizenship that empowers in new ways based upon new ecological metaphors. Hence, systems-based thought processes can be given operative expression in ways that give rise to the "planetary community" discussed in submissions to this special issue.

We are left finally to ponder the challenging proposition that if we can, as many now do, view democracy as a form of secular religion, then public school teachers can be seen as its priests and the gentle ritual they lead their students through day in and day out is nothing more and nothing less than the ritual of citizenship—it is the liturgy of freedom. Systems thinking utilizing holistic intellectual processes rooted in ecological metaphors can serve as a powerful platform for taking us to a higher form of socio-cultural awareness—a new and more powerful form of citizenship and empowerment. This is, in point of fact, the true undiscovered country in which humanity may very well find its hope, its salvation, and its future.

References

Bowers, C. A. (2008). *The linguistic colonization of the present by the past*. Retrieved March 15, 2010, from http://cabowers.net/CAPress.php

Bowers, C. A. (2009). *Educational reforms that foster ecological intelligence*. Retrieved March 15, 2010, from http://cabowers.net/CAPress.php

Bowers, C. A. (2010). *Reflections on teaching the course "Curriculum Reform in an Era of*

Global Warming." Retrieved March 15, 2010, from http://cabowers.net/CAPRess.php

Croll, P. (2004). Families, social capital, and educational outcomes. *British Journal of Educational Studies, 52*(4), 390-416.

Dewey, J. (1897). My pedagogic creed. *The School Journal*, *LVI*(3), 77-80.

Dika, S. L., & Singh, K. (2002). Applications of social capital in educational literature: A critical synthesis. *Review of Educational Research, 72*(1), 31-60.

Emery, K. (2007). Corporate control of public school goals: High-stakes testing in its historical perspective. *Teacher Education Quarterly, 34*(2), 25-44.

Gardner, H. (1993). *Frames of mind: The theory of multiple intelligences*. 10th anniversary edition. New York: Basic Books.

Gardner, H., & Hatch, T. (1989). Multiple intelligences go to school: Educational implications of the theory of multiple intelligences. *Educational Researcher, 18*(8), 4-10.

Gatto, J. T. (1994). The tyranny of compulsory schooling. *The Educational Forum, 58*(2), 276-281.

Gatto, J. T. (2003, September). Against school: How public education cripples our kids, and why. *Harper's Magazine*, 33-38.

Goleman, D. (2009). *Ecological intelligence: How knowing the hidden impacts of what we buy can change everything.* New York: Broadway Books.

Kozol, J. (2005, September). Still separate, still unequal. *Harper's Magazine*, 41-54.

Nash, R. (1990). Bourdieu on education and social and cultural reproduction. *British Journal of Sociology of Education, 11*(4), 431-447.

Orr, D. W. (2004). *Earth and mind: On education, environment, and the human prospect.* Washington, DC: Island Press.

Parkison, P. (2009). Political economy and the NCLB regime: Accountability, standards, and high-stakes testing. *The Educational Forum, 73*(1), 44-57.

Piaget, J. (1954). *The construction of reality in the child* (M. Cook, Trans.). New York: Basic Books.

Piaget, J. (1963). *Origins of intelligence in children*. New York: Norton.

Piaget, J. (1970). *The science of education and the psychology of the child*. New York: Orion Press.

Solorzano, R. W. (2008). High stakes testing: Issues, implications, and remedies for English language learners. *Review of Educational Research, 78*(2), 260-329.

Sternberg, R. J. (1985a). Teaching critical thinking, part I: Are we making critical mistakes?, *Phi Delta Kappan*, *67*(3), 194-198.

Sternberg, R. J. (1985b). Teaching critical thinking, part II: Possible Solutions. *Phi Delta Kappan*, *67*(4), 277-280.

Sternberg, R. J. (1988). *The triachic mind: A new theory of human intelligence.* New York: Viking Penguin.

Vygotsky, L. S. (1978). *Mind in society: The development of higher mental process*. Cambridge, MA: Harvard University Press.

Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. New York: Cambridge University Press.