

Why Should We Teach Sustainability . . . and How Should We Do It?¹

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May you live in interesting times! Some say this ancient Chinese proverb is actually a curse or a challenge. The Chinese word used for “interesting times” is the same as the word used for crisis, which is commonly interpreted by scholars to mean both danger and opportunity. Scholars tend to agree on the “danger” half of the Chinese symbol for crisis, but some suggest the second half of the symbol is most accurately interpreted as “a critical point in time.” A crisis then is a point in time when we are forced by perilous circumstances to make choices and changes that will change the future, for either better or worse. A crisis may be viewed as either as a challenge or an opportunity. Regardless, we most certainly are living in interesting times.

Thankfully, we are able to accommodate most crises with fairly minor changes in our day-to-day habits or lifestyles. On the other hand, some crises can be accommodated only by revolutionary changes in both thoughts and actions. In fact, every two hundred years or so throughout human history, society has gone through great transformations that required changes our understanding of how the world works and our place within it, and eventually changed virtually every aspect of life. I believe today's “interesting times” represent a time of revolutionary change. I believe the transformation we are experiencing today is at least as important as the Industrial Revolution of the late 1700s, and perhaps as important as the beginning of science in the early 1600s. I'm an old man and I have seen many changes during my 70-plus years. But, the changes I've experienced are not even remotely comparable to the changes I believe today's young people will see during their lives. People who are born in the mid-21st Century won't even be able to imagine the world of today.

This “great transformation” is being driven by questions of sustainability. Sustainability asks: how can we meet the needs of the present without diminishing opportunities for the future? It asks whether we can keep doing what we are doing. When we ask this basic question of sustainability earnestly and honestly; we come to the inevitable conclusion: what we are doing now isn't even meeting the needs of most of people today, and most certainly isn't leaving equal or better opportunities for those of the future. We can't keep doing what we have been doing. Our current way of life is not sustainable. Change is not an option; it is an absolute necessity.

This is not just a personal opinion. It is based on some of the most fundamental laws of science. Ultimately sustainability is a matter of energy. Our houses, clothes, cars, our food, require energy to make and energy to use. In fact, all material things are simply concentrated

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forms of energy. Human imagination, creativity, and labor also require energy - the brain requires something like 20% of the energy used by the human body. In addition, we are not born as productive individuals; we are born as helpless babies. We must be nurtured, cared for, socialized, civilized, and educated by society before we become useful to society. All of this requires human energy, specifically, biological energy.

According to the first law of thermodynamics, energy can neither be created nor destroyed; so sustainability might seem inevitable. We could just keep using energy over and over to meet our needs. However, the second law of thermodynamics states that whenever energy is used to do anything useful, some of its usefulness is lost - the law of entropy. Whenever energy is used, it always changes in form, specifically from more concentrated organized forms to more dispersed disorganized forms. For example, when gasoline is ignited in the engine of an automobile, it is freed to follow its natural tendency to disperse and disorganize. The resulting explosion or expansion process rotates the engine and powers the car down the road. The energy in the gasoline is not destroyed, but it is less concentrated and less organized, and thus, is capable of doing less "work" than before; it is less useful. So, no matter how efficiently we use and reuse energy, some of its usefulness is inevitably lost to entropy.

So what does this have to do with the great transformation? The economic growth of the past 200-years, the industrial era, was made possible by an abundance of cheap concentrated energy - first the old growth forests, then surface veins of coal, and for the past 100-years, by shallow reservoirs of oil and natural gas. But the old growth forests are gone, we are blowing the tops off mountains to get the remaining coal, the remaining oil and natural gas is deep beneath the ocean floors often in most remote corners of the world. We are not out of fossil energy, at least not yet, but we are quickly running out of abundant and cheap energy. The remaining sources of fossil energy, mostly coal, are also major contributors to greenhouse gasses and other pollutants which are threatening the ability of the earth's natural ecosystems to support human life. The days of cheap, abundant fossil energy are over.

The only sustainable source of energy is solar energy. However, energy from all the sustainable sources combined - wind, water, solar panels, biofuels - in total, will be less plentiful and far more costly than fossil energy. Solar energy is dispersed, disorganized energy that must be captured, concentrated, and stored to increase its usefulness. All of this requires energy, which then cannot be used to do anything else. The industrial era was an aberration in human history that is not likely to be repeated. We can't continue doing what we are doing. It is not sustainable. We are in a time of crisis. Change is no longer an option; it is an absolute necessity.

A growing number of today's young people understand the necessity for change. They are not locked into the old mechanistic ways of thinking or the industrial paradigms of economic development. They don't believe the so-called economic experts who tell them the current recession is just a minor bump along the road of unending economic progress. They may not have all of the statistics on fossil energy depletion or global climate change, but they know something is fundamentally wrong in our relationships with nature. They may not know about the unprecedented concentration of economic and political power, particularly among a few ultra-rich individuals and families, but they know something is fundamentally wrong in our relationships with each other. They may not understand that all economic value is ultimately

derived from nature and society, both of which have been seriously depleted and degraded, but they now something is fundamentally wrong with our economy.

Many young people know they are going to live most of their lives in a world very different from the world in which their parents and professors have lived. The challenges of the future will be fundamentally different from the challenges of the past. The opportunities of the future will be fundamentally different as well. Those involved with higher education have a specific responsibility to help prepare today's young people to meet today's challenges and to realize the opportunities of a world that does not yet exist. If they are to realize their opportunities to create a fundamentally better world of the future, we must help them break the intellectual bonds of the outdated worldview and paradigms that have dominated Western thinking for the past several centuries and dominates global thinking today.

The dominate worldview of today is that the world works like a giant complex mechanism, and human beings being apart from it, can manipulate and manage its living and nonliving resources for their unique benefit. This is much the same worldview as that of the earliest scientists, such as Newton and Descartes. Over time this view of the world had led to giving priority to individuals over both society and nature and to a preoccupation with the industrial development strategies of specialization, standardization, and consolidation of control.

The forces of industrialization have been driven by the quest for ever-greater economic efficiency of extraction and exploitation, motivate by the prospects for endless profits and ever-greater wealth. We now see the effects of this way of thinking in the degradation and depletion of fossil energy and other natural resources, the exploitation of workers and other societal resources, and the concentration of economic wealth and political power in the hands of a few at the expense of the many. The industrial era has brought almost unbelievable progress in tangible, material benefits to much of humanity. No one would willingly return to the pre-industrial world when most people led lives of hunger, depravation, disease, and drudgery leading to an early death. However, we now know continued industrial development is simply not sustainable.

We cannot solve today's problems using the same thinking we used when we created them, paraphrasing Albert Einstein. Finding answers to the questions of sustainability will require a fundamentally different worldview and a new and different paradigm of *sustainable* economic development. Whereas the dominant worldview of today is mechanistic, the worldview of sustainability is organismic.

The world does not function like an inert, inanimate mechanism but instead as a dynamic, living organism. Only living organism are capable of capturing, transforming, and storing the solar energy necessary to renew and regenerate the physical and social energy inevitably lost to entropy. Healthy living systems are holistic, diverse, and interdependent. Relationships among the functions of the diverse parts of healthy living systems are mutually beneficial, making the wholes greater than the sums of their parts. Unlike mechanism, organisms have emergent properties that are not present in their individual parts. Their essence is lost when living wholes are reduced to their parts, as in scientific analysis or industrial organization.

In healthy living systems, relationships matter: Relationships between humans and nature and relationships among humans within societies. Humans are not apart from nature but instead are parts of nature, and human society is wholly contained within nature - a subset of nature. The economy in turn is a subset of society, created by society. It is wholly contained within society and thus is also a part of nature, including human nature. Nature, society, and economy are all integrally interrelated elements or aspects of the same inseparable whole. Healthy living economies, like other healthy living systems, are capable of functioning efficiently without destroying the social and ecological integrity of the natural and human resources upon which they ultimately depend. Sustainability is not about maximizing or minimizing but maintaining harmony and balance among the economic, social, and ecological dimensions of life.

Furthermore, today's dominant scientific paradigms have no answers for essential ethical or moral questions of sustainability. The question of how to meet the needs of the present without diminishing opportunities for the future, the fundamental question of sustainability, is ultimately an ethical or moral question. Economic value is individual, impersonal, and instrumental. There is no economic value in doing anything for the sole benefit of anyone else, certainly not someone of some future generation. Economic relationships are a means to an end, and there is no way of receiving anything from future generations in return. Unlike economic value, social value is inherently personal, and thus cannot be traded among persons or bought and sold. Social values evolve into community or common values, but there is no social value to be gained from intergenerational equity.

Ethical values are neither personal nor instrumental; they are an end, not a means. What is right and good for one person is right and good for others, including others of future generations. The benefits of ethical actions are not instrumental and thus are not deferred to sometime in the future; they are realized immediately. Meeting the needs of all today are economic and social challenges, but ensuring equal opportunities for those of the future is ultimately a challenge of ethics or morality. We must do it simply because it is the right and good thing to do. Without some sense of purpose, however, concepts of right or wrong and good or bad have no meaning. The existence of purpose or meaning in life cannot be proven by the "scientific method." A science that ignores or denies the existence of purpose, and the ethic of stewardship derived from it, is of little value in meeting the challenges or realizing the opportunities of sustainability.

Sustainability will not only require new ways of thinking but also new ways of teaching and learning. Many sustainability educational programs are still struggling with definitional issues. "How can we teach it if we can't agree on how to define it?" As a consequence, the word sustainability is often misunderstood, confused, misused, abused, and intentionally perverted to support continued extraction and exploitation. However, the really big and important issues, such as sustainability, are never simple or easy to define and are routinely abused and misused. For example, few would deny that love is an important aspect of human life. Perhaps because of that, love is one of the most confused, misused, abused words in the English language. It is twisted and perverted to suggest something completely contrary to its real meaning, which most people actually understand. No one would seriously suggest we abandon love, just because we cannot agree on how to define the word. Neither can we afford to abandon sustainability, just because we can't agree on how to define it.

In reality, there is a generally accepted definition of sustainability, a universal definition that applies in all situations: Sustainability is the capacity of meet the needs of the present without diminishing opportunities for the future. It is about permanence, which include both the present and the future. It is about creating an enduring, lasting, economy and society not only for the benefit of ourselves but for the future of humanity - indefinitely into the future. The three essential dimensions of sustainability - ecological, social, and economic - are derived directly from this definition. Everything that is necessary to meet the needs of people in the present and future is derived from nature, by means of society, relying on some form of economy. The words used may be somewhat different, but any definition of sustainability that lacks these essential elements is not authentic sustainability. Most people understand what sustainability means, intuitively if not explicitly.

The confusion arises because the means of achieving sustainability depend on one's particular ecological, social, economic, temporal circumstances or situation. Thus, a wide range of *situational* definitions of sustainability have been proposed for specific applications, such as sustainable development, sustainable agriculture, and even sustainability education. Situational definitions go beyond the basic ecological, social, and economic dimensions of the universal definition. They define what would need to be done to achieve sustainability for a specific person or group of people perhaps involved in a particular occupation at a particular place or location at a particular point in time.

Further confusion arises because the means particular individuals or groups in particular situations are willing and able to implement at a particular time may be different from the means actually required to achieve sustainability. So, different corporations, farmers, and educational institutions often have different *operational* definitions of sustainability. There seems to be a strong tendency in the corporate world to redefine sustainability to make the concept acceptable to corporate stockholders. For example virtually all of the large food corporations, including Walmart, Kraft, and Monsanto, have developed sustainability programs. Economists tend to define sustainability in ways that allow them to avoid dealing with social and ethical values that cannot be converted into dollars and cents. However, this does not mean that what they are doing is actually sustainable.

Those who take the issue of sustainability seriously must purposefully avoid the natural tendency to redefine sustainability so as to avoid the necessity for fundamental change. Change is threatening to those who are benefitting from the status quo. The primary value of situational definitions is to illuminate, rather than obscure, the gap between what appears to be operationally feasible today and what is actually needed to achieve authentic sustainability. Definitional questions and distinctions can and should be used by educators to help students understand the significance and importance of meeting the challenges of today while preparing to realize the opportunities of the future.

Meeting the educational challenges of sustainability will require rethinking the concepts of disciplines or areas of academic specialization. Specialization, standardization, and consolidation are characteristics of the thinking that created today's problems, not the thinking that will solve those problems in the future. All living systems are defined by cells, organs, and organisms that have definable boundaries. However, the boundaries of healthy living systems are always semi-

permeable or selective. Academic disciplines in educational institutions of the future must have these selective boundaries that promote rather than restrict creation and sharing of knowledge. As in living systems, there is value in academic specialization, but not when it limits access to knowledge or understanding that might be of mutual benefit to those outside and inside disciplinary boundaries.

Academic excellence must be redefined to reflect an excellence in understanding the context, the ecological, social, and economic environment, within which one's discipline exists, not simply excellence in understanding one's own discipline. Specialists in one field of inquiry or education must have sufficient knowledge of other disciplines to understand the critical connections that are relevant to particular questions and issues. Those who excel must acquire the breadth of understanding necessary to integrate key aspects of other disciplines of importance to their own, while maintaining depth in their own discipline. Academic collaboration must be redefined to move beyond interdisciplinary teams where each discipline assumes responsibility for their particular area of expertise but each remains a specialist. Collaboration for sustainability requires an integration of understanding on the part of each team member as well as among team members. A true collaboration, like living a system, must be made up of interdependent wholes within interdependent wholes, rather than dependent parts, which inevitably form co-dependent, dysfunctional wholes.

Educational programs for authentic sustainability must reflect new ways of learning as well as thinking. The worldview of sustainability is one of the world as a complex, interdependent, living system: A nested hierarchy with the economy nested within society and society nested within nature. The principles and paradigms that apply to sustainable social and economic relationships are laws of nature because societies and economies are parts of nature. Everything is interconnected with everything else. All economic transactions have social and ecological impacts, not just some select subset. All public policies have economic and ecological implications. Cause and effect relationships are nonlinear and characterized by continuous feedback loops which can create patterns of acceleration, decay, and oscillation. Every effect is the cause of another effect. Thus, living systems are inherently unpredictable, but they have the capacity to learn, function, and to evolve according to principles and with purpose.

Collaborative learning is an essential means of stimulating and cultivating the new ways of thinking necessary for the radical redesign of our economic and social institutions necessary for sustainability. Collaborative learning goes beyond “group think,” where groups try to minimize conflict and reach consensus without critically testing, analyzing, and evaluating ideas. It fosters “group intelligence,” by creating a culture of openness and sharing of ideas. It encourages self-organization and an open flow of knowledge and ideas both within groups and with those outside of groups. It creates and augments intelligence, involvement, imagination, integration, and intuition. It also supports and promotes honesty, humanity, harmony. Collaborative learning honors collective intuition, supports collective action, and creates a community of abundance where people feel free to share their intellectual, emotional, and spiritual gifts in a collaborative process of teaching and learning.

“Just in time teaching” is one means of facilitating collaborative learning. In a conventional course, students are first taught the basic theory or concepts, then how the theory is applied by

using examples or case studies, and finally how they can apply the theory to their lives or in novel situations. With just in time learning, teachers first expose their students to real world situations. They bring in guest speakers, go on field trips, or design other activities that put students in situations that begin to raise questions in the minds of the students about the subject of the course. As questions arise, the teachers provide insights, information, and basic principles the students need to understand and explore the ideas raised through exposure to real world situations. Conventional lecturing is used only to fill in the gaps left by students' questions and to organize and summarize basic concepts and ideas. Some subjects still require a measure of rote memorization of facts but much less than required for most other approaches to learning.

Another promising approach to sustainability education is “service learning,” which typically integrates learning with community service. It creates opportunities for mutually beneficial relationships in which both students, as the knowledge recipients, and clients, as the service recipients, are treated with respect. The needs of both students and clients must be met in an environment of mutual respect. Because of this emphasis on reciprocity, service-learning can help students internalize core moral or ethical values. It can help build social networks while helping students internalize the principle that people are ends, in and of themselves, and they should be treated with dignity and respect. Respect for other human beings and respect for the environment are the building blocks for a sustainable future. Human beings must consciously consider the needs of future generations when making decisions for current generations. This requires both an understanding of the nature of reciprocity and an appreciation of the interdependent nature of the global community.

Higher education no longer has the luxury of “value free” research and education. Researchers and educators can no longer continue the myth of ethical and social neutrality. The technologies being used to extract and exploit the resources of the earth are based on scientific discoveries that supposedly were objective and “value neutral.” Scientists claim to seek truth, without regard to how their findings may be used. Even social disciplines, such as economics, claim “value neutrality.” However, scientific discoveries are being used in economic systems that systematically extract and exploit the earth and its people. Neither physical scientists nor economists have any reason to believe that the ultimate outcome of their work will be otherwise. In the name of scientific objectivity, institutions of higher learning have removed themselves from the normal human processes of validating, rejecting, and reshaping the ethical and moral values of society. In the process, they have become passive, yet knowing, participants in the exploitation of humanity and the earth.

The ethics of sustainability are not religious or political but instead are philosophical. Philosophy is ultimately about questions of right and wrong, good and bad. Yet for decades, Doctors of Philosophy have been reluctant to “philosophize” about anything of significance, allowing philosophy to degenerate into a study of the history of philosophy. Those searching for answers of questions of right and wrong have been left “uneducated” and vulnerable to religious, political, and economic dogma. We can no longer afford the luxury of a “value free” education.

The basic purpose of education is to help students understand how the world works and to find their place within it so they can gain their full measure of happiness or quality of life. It's time for educators to return to the historic purpose of human life; to the pursuit of happiness.

People throughout history have known that beyond some fairly modest level of material well-being there is no relationship between further increases in income or wealth and increases in happiness or overall quality of life. Once our basic material needs are met - food, clothing, shelter, health care, - the quality of our life depends far more on the quality of our relationships - friends, family, community, society - than on the quantity of income or wealth. We are social beings; we need to love and be loved. We are also moral beings. Our happiness depends on our having a sense of purpose and meaning in life. We need to feel in our heart that what we are doing is significant; that it's right and good. A multitude of social science studies related to wealth and happiness confirm our common sense. Once our individual, tangible needs are met, the pursuit of happiness is about developing the social and spiritual dimensions of our lives, rather than striving to acquire more income or wealth.

This is not some New Age utopian vision that is unattainable. The ancient Greek philosopher Aristotle believed that happiness was a natural consequence of “right relationships” among friends and within families and communities. Alex Des Tocqueville, in writing about democracy in America in the early 1800s, termed concern for the well-being of others as “self-interest rightly understood.” The Dali Lama calls it being “wisely selfish” - understanding that our well-being is dependent on the well-being of the other living and nonliving things of the earth. All we need to do is return to those things people have always known to be right and true. We need only return to learning and teaching things that are relevant and of value in the pursuit of happiness.

Why should we teach sustainability? Because the essential dimensions of sustainability are identical to the essential dimensions of human happiness. Certainly we should strive to care for ourselves - not just for ourselves but to be able to care for others. We must also realize that it is not a sacrifice to care for others because it makes our lives better. We need to love and be loved to be happy. Neither is it a sacrifice to care for the earth, even for the sole benefit of future generations, because it adds purpose and meaning to our lives. A life of purpose is a life of happiness. How should we teach sustainability? We should engage our students in the real world around them. They first need some sense of the whole so they can see the relevance of the parts, including their part in helping to create a new and better world for the future. This type of education is not only necessary for the future of humanity; it also creates the opportunity for a life of happiness today - for students, their teachers, and for society. What could possibly be a more important opportunity than meeting the educational challenges of sustainability.