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Kindergarten Through Twelfth-Grade Education for Sustainability

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> The worth of education must now be measured against the standards of decency and human survival—the issues now looming so large before us in the 21st century. It is not education, but education of a certain kind, that will save us.[1]
>
> —David Orr

Seen from the lofty perspective of life in these United States, the current world seems to function pretty well. The Cato Institute recently published a book, *It's Getting Better All the Time*, in which they detail a vast array of statistics that point to increasing human well-being.[2] Air and water in the United States are increasingly clean, and the cost of many goods (food, clothing, electronics, telecommunications) continue to decline as their quality increases. Why, then, do we need to think about changing our ways and our educational practices in order to assure a good life for future generations?

The reasons for doing so are accumulating, globally and regionally. Even in this country, if you scratch a little deeper, different truths emerge; other indicators paint a grimmer picture of contemporary American life. Many Americans are caught in a consumption treadmill—during the 1990s, economists and the media constantly bewailed our low savings rate, high personal bankruptcy rate, and historically high rate of credit card debt. Gallup polls and educators both provide evidence of the remarkable, and unprecedented, pessimism of our youth with regard to the future and to their future; this pessimism seems bleakest amongst inner-city, at-risk youth, but many American youth from all classes and all places seem to feel this way.[3] The costs of such despairing views are high: many youth never reach their full potential and don't contribute their full talents and energy to the growth and development of our society.

In many places outside our borders, of course, the evidence of a sustainability crisis is more readily visible: declining ecosystems, disease-ravaged societies, declining food security and standards of living, widening inequality, looming water scarcity, and disruptively rapid climate change. The list is extensive and terrifying in its implications for the future of human well-being in all nations. Success in the United States in fostering sustainability is crucial for the entire world, as U.S. consumption fuels much of the planet's environmental damage. Happily, U.S. resources—the tangible and the intangible, the financial and the human—could be instrumental in solving these problems. Primary through secondary (kindergarten through the 12th grade, or K-12) education is a major shaper of the truths, attitudes, ethics, concepts, and behaviors of American society. By reshaping K-12 education in the United States so that it systematically and effectively fosters sustainability, we will be able to make great progress toward the achievement of a sustainable world.

Our potential contribution to sustainable development is great. Our nation attracts the best and brightest in the world who come here to develop their talents in our free, open, and opportunity-rich society. Our businesses and our government are important shapers and determiners of what happens in the world. It is crucially important, therefore, that educators manage to attain the goals of Agenda 21, Chapter 36 in the United States.

Chapter 36 of Agenda 21, crafted from a world's hopes and dreams in 1992, promulgated many educational reforms and practices to help advance education for sustainability.[4] This document inspired in the mid-1990s some ma-

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[*Editors' Note: In June 1992, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, the nations of the world formally endorsed the concept of sustainable development and agreed to a plan of action for achieving it. One of those nations was the United States. In August 2002, at the World Summit on Sustainable Development, these nations gathered in Johannesburg to review progress in the 10-year period since UNCED and to identify steps that need to be taken next. Prof. John C. Dernbach has edited a book,* Stumbling Toward Sustainability*, that assesses progress made by the United States on sustainable development in the past 10 years and recommends next steps. The book, published by the Environmental Law Institute in July 2002, is comprised of chapters on various subjects by experts from around the country. This Article appears as a chapter in that book. Further information on* Stumbling Toward Sustainability *is available at www.eli.org or by calling 1-800-433-5120 or 202-939-3844.*]

1. David Orr, Earth in Mind 8 (Island Press 1994).
2. Stephen Moore & Julian L. Simon, It's Getting Better All the Time: 100 Greatest Trends of the Last 100 Years (Cato Institute 2000).
3. The Sustainability Education Center has worked over the last eight years with educators from all kinds of communities, from all over the country; in our experience, and in the experience of all the other sustainability educators consulted in creating this Article, teachers almost unfailingly cite disconnection and lack of hope as the chief problems they see in the youth they teach.
4. United Nations Conference on Environment and Development, Agenda 21, U.N. Doc. A/CONF.151.26 (1992), ch. 36 [hereinafter Agenda 21].

jor national entities, conferences, and coalitions in the United States: the President's Council on Sustainable Development (PCSD), an Office of Education for Sustainability at the U.S. Department of Education, and a U.S. Environmental Protection Agency (EPA) Department of Sustainable Ecosystems and Communities. Sadly, this national mobilization is at an end,[5] yet communication, mobilization, and educational framework development for U.S. sustainability education continues in a few dedicated nongovernmental organizations (NGOs), some far-sighted school districts, and independent schools, as well as an evolving understanding of the principles, skills, knowledge, and practices that constitute appropriate education for sustainability for K-12 students in the United States. There exist independent efforts to teach students the ecological literacy, systems thinking, multiple perspectives, connection to place, sustainable economics, citizenship, and the creativity and visioning they will need to fashion a more sustainable world.

While our educational system works to develop many of the discrete skills that future problem solvers will need to diagnose and solve our global problems, as a nation we lack the systemic understanding that explains these complex threats to sustainability. Our educational system, moreover, is often inappropriately focused on basic literacy and easily testable knowledge, which does not adequately prepare future citizens to understand current world problems and issues or to craft solutions for them. We do not prepare teachers to create experiences for students that help them engage with the rich, complex, interdisciplinary world in which they live. We do not fund the infrastructure needed to support a sustained and nationwide implementation of an educational program that educates students for sustainability and that connects schools to real-world issues, problems, and social change efforts.

Thankfully, educators are beginning to find support and guidance in teaching for sustainability in emerging real-world practices. Changes in thinking and behavior that foster sustainability are already underway in our society. Increasingly, far-sighted leaders in business and government, gleaming the truths of sustainability from their experiences and from nascent trends in the thinking and practices of their fields, are making the connections and taking the steps that enable them to design and implement long-term solutions to our current sustainability crisis.[6] Our schools need to prepare students to join this quest by giving them the knowledge, skills, beliefs, and the "habits of the heart" that will enable them to fashion a sustainable world. Some hard work has to take place if schools are to be able to adopt this mission. We need to prepare teachers to understand sustainability and to see its relevance and importance to what they teach and to their educational mission; we need to persuade society to formally acknowledge the importance of education for sustainability in its educational goals; we need to connect students to real-world efforts to bring about sustainability; we need to create a national infrastructure to develop and support the nationwide practice of education for sustainability in all our schools; and we need to fund the effort and research needed to educate for sustainability. If we do this, we may succeed in successfully providing U.S. citizens with the knowledge, the skills, and the attitudes needed to foster sustainability in their personal, community, and work lives.

Some impressive on-the-ground efforts to educate our youth for sustainability have been taking place over the last 10 years, which could serve as excellent starting points for this much-needed national mobilization for sustainability education. With some changes in our educational systems and practices, the amazing engine of innovation and productivity of our resource-rich and remarkable country could be producing a new and desperately needed product: sustainability. This redirecting of our national purpose could play a vital role in stimulating visions of hope, opportunity, responsibility, and love of place in our young people, reversing current trends of disconnection and hopelessness and broadening the options and resources available to future generations. What better goal could education have?

History of Sustainability Education in the United States

With the publication of *Our Common Future*, also known as the Brundtland report, in 1987, sustainability (with its close correlate, sustainable development) began to emerge as a useful concept for understanding and tackling a broad array of social and environmental issues.[7] The Brundtland report and the resultant United Nations Conference on Environment and Development, or Earth Summit, held in Rio de Janeiro in 1992, were landmark events in the development of efforts to educate for sustainability in the United States. The Brundtland report and the Earth Summit elaborated a conceptual framework to explain contemporary ecological and development crises as inextricably interlinked phenomena. However, preexisting organizations, understandings, fields, and educational endeavors nourished the new, post-Rio efforts to educate our nation's children for sustainability. Many of the content areas and associated education specialities that contribute to an understanding of sustainable development had already become established academic fields and disciplines prior to the pivotal Earth Summit.

5. Vice President Al Gore, author of *Earth in the Balance*, closed the PCSD during his presidential campaign—one aspect of his broad retreat from advancing pro-environment policies and practices.

6. There is a thriving and increasingly revolutionary sustainable business movement: witness the Global Reporting Initiative (further information about this effort is available at the Global Reporting Initiative's website, http://www.globalreporting.org), and the increasing number of businesses that acknowledge, through "triple bottom-line" reporting, their need to attain social, environmental success as well as financial success (SustainAbility, developers of the Triple Bottom Line, give details about it at SustainAbility, *The Triple Bottom Line*, *at* http://www.sustainability.com/philosophy/triple-bottom/default.asp (last visited Mar. 27, 2002)). In government, states and local communities are convening multi-stakeholder groups to create and implement plans to foster sustainability locally. *See* the Sustainable Communities Network (http://www.sustainable.org); the International Council for Local Environmental Initiatives (http://www.iclei.org); New Jersey Interagency Sustainability Working Group, *Governing With the Future in Mind* (New Jersey Department of Environmental Protection, 2001) (New Jersey's "sustainable state" report), *at* http://www.state.nj.us/dep/dsr/governing/ (last modified Jan. 22, 2002); Oregon Solutions (http://www.oregonsolutions.net/oregon/index.cfm); and Sustainable Seattle (http://www.scn.org/sustainable/susthome.html).

7. World Commission on Environment and Development, Our Common Future (Oxford University Press 1987). The World Commission on Environment and Development defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." *Id.* at 43.

Environmental education, in the wake of Rachel Carson's 1962 *Silent Spring*[8] and the first Earth Day in 1970, had already become a fairly common element in American education, resulting in the 1990 passage of the National Environmental Education Act.[9] Environmental curriculum, frameworks,[10] and national environmental education organizations[11] were already in existence by the early 1990s. Examining environmental issues, e.g., pollution, species loss, recycling, from multiple perspectives (the natural and human elements and systems involved in an environmental issue) had become common, if not ubiquitous, practice in American K-12 science classes.

Global and development education were also becoming widespread aspects of K-12 social studies education in the United States. By the end of the 1980s, the education departments of most cities and states had either mandated or recommended global education, often involving year-long courses and statewide assessments.[12] The American Forum for Global Education,[13] Global Learning,[14] the Stanford Program on International and Cross-Cultural Education,[15] the Choices Program[16] at Brown University, and the Center for Teaching International Relations[17] at the University of Denver are among many prominent global education NGOs already in existence in the early 1990s, developing frameworks, materials, and professional guidance for effective teaching of multiple perspectives, cross-cultural understanding, historical and world cultures, development, and the interdisciplinary teaching of global systems and issues.

A multitude of other fields, each with its own educational mission and cadre of professional practitioners, also were poised prior to Rio to contribute to a comprehensive effort to educate for sustainability. Ecological design and architecture education, holistic education, futures studies, system dynamics, organizational learning and change, environmental ethics and philosophy, ecological economics, and ecological psychology all existed prior to Rio. All have continued to develop synergistically, and all continue to contribute to sustainability education in the United States.

The 1992 Earth Summit proved a galvanizing event for sustainability education. Educators, together with their colleagues in other fields, elaborated a systematic and comprehensive agenda to create a more sustainable world; the understandings and concepts in the Brundtland report informed a comprehensive action plan that became known as Agenda 21. Chapter 36 of this document detailed new actions required for "Promoting Education, Public Awareness and Training."

Chapter 36 clearly states that "education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues."[18] Education is also stated to be an indispensable means of "achieving environmental and ethical awareness, values and attitudes, skills and behavior consistent with sustainable development and for effective public participation in decision-making."[19] The document put forth comprehensive and new goals for education to "achieve environmental and development awareness in all sectors of society" and to "promote integration of environment and development concepts . . . in particular the analysis of the causes of major environment and development issues . . . ."[20] The document urged integrating environment and development as a "cross-cutting issue," covered through a "multidisciplinary approach."[21] It also urges the creation of national, interdisciplinary coordinating bodies (composed of environment and development interests), pre-service education for future teachers on environment and development issues, strengthening program development and education research in environment and development education, and cooperation/coordination with NGOs at work in environment and development.[22] The document implicitly and explicitly acknowledges that human well-being and the health of the planet are inseparable, and it seeks to reform educational systems and practices so that students understand and can act upon this truth.

Agenda 21 and the Earth Summit sparked some major policy and organizational efforts in the early 1990s to implement education for sustainability in the United States. On the national level, these events were catalytic in inspiring several independent and simultaneous conferences, meetings, and forums around the country. At the federal level, they inspired the creation of the PCSD. The 25-member council, created by an Executive Order in June 1993,[23] brought together leaders from industry, government, education, and civil society and developed policy recommendations to enhance the nation's economic, environmental, and social sustainability. One of the PCSD's task forces developed a policy framework, *From the Classroom to Commu-*

8. Rachel Carson, Silent Spring (Houghton Mifflin Co. 1962).

9. At the time of this writing, President George W. Bush's proposed federal budget would transfer all environmental education funds to the National Science Foundation, which concerns educators who fear the loss of relationships with informal educators and environmental NGOs and the loss of a strong interdisciplinary, real-world component in funded projects. *See* Office of Management and Budget, *Environmental Protection Agency*, *at* http://www.whitehouse.gov/omb/budget/fy2003/bud.html (last visited May 2, 2002).

10. For example, the concepts and policy recommendations that emerged from the UNESCO Tbilisi Declaration in 1978. *See* U.S. EPA, Environmental Education Advances Quality Education (1999) (EPA-171-98-016), *available at* http://www.epa.gov/enviroed/pdf/16advancequality.pdf (last visited Mar. 27, 2002). *See also* Donella Meadows, Harvesting One Hundredfold: Key Concepts and Case Studies in Environmental Education (United Nations Environment Program 1989).

11. The North American Association of Environmental Educators, for example. Visit their website, http://www.naaee.org, for further information.

12. Jaimie P. Cloud, The State of Global Education in the U.S. (American Forum for Global Education 1988).

13. Further information about this organization is available at its website, http://www.globaled.org.

14. Further information about this organization is available at its website, http://www.globallearningnj.org.

15. Further information about this organization is available at its website, http://spice.stanford.edu.

16. Further information about this organization is available at its website, http://www.choices.edu.

17. Further information about this organization is available at its website, http://www.du.edu/ctir/.

18. Agenda 21, *supra* note 4, ¶ 36.3.

19. *Id.*

20. *Id.* ¶ 36.4.

21. *Id.* ¶ 36.5.

22. *Id.*

23. Exec. Order No. 12852, 58 Fed. Reg. 35841 (June 29, 1993), as amended by Exec. Order No. 12855, 58 Fed. Reg. 39107 (July 19, 1993), Admin. Mat. 45058.

nity and Beyond: Educating for a Sustainable Future, to enable all learners to become educated for sustainability.[24]

The PCSD also sponsored a demonstration project in the fall of 1994 in conjunction with the National Science and Technology Council (NSTC). The PCSD and the NSTC convened a forum for national leaders from education, the business sector, government, and NGOs to explore strategies for building effective partnerships to support education for sustainability. The "National Forum on Partnerships Supporting Education About the Environment," held at the Presidio in San Francisco, brought together more than 100 individuals with a broad range of expertise to work on this issue, including corporate leaders, university administrators, professionals in the field of environmental education, state and federal officials, as well as teachers, scientists, and students.

This national forum developed a blueprint for education for sustainability: *Education for Sustainability: An Agenda for Action*.[25] This document detailed a plan of action to integrate education for sustainability into broader educational curricula and to develop partnerships, cooperative relationships, and the involvement of nonformal educational organizations to attain this goal.

From these two parallel processes—the National Forum and the PCSD—came a clear recognition that creating effective education for sustainability would require new educational content and processes and the involvement of a broad set of stakeholders in setting and accomplishing educational goals. The PCSD's report, *From the Classroom to the Community and Beyond*, developed goals and recommendations and detailed examples of promising practices and programs. *An Agenda for Action* charted a clear course for a new spirit of collaboration and focused on the interconnections among the natural and built environment and the changing and fluid ecological, social, economic, and political forces that influence the world around us. Unfortunately, these two policy documents did not send forth ripples that revolutionized our educational system. They remain, however, beautifully crafted recommendations on the content, skills, and policies needed to educate Americans for sustainability.

In addition, an Office of Education for Sustainability was formed by the U.S. Department of Education. Carole Wacey and Lynn Mortensen, of the White House coordination office for the PCSD, while lacking a budget to fund or develop programs or curriculum, heroically worked to network existing efforts at education for sustainability. The office was disbanded after less than two years in operation. EPA's Department of Sustainable Ecosystems and Communities also arose as a national response to Rio; it remained in existence until the late 1990s and funded several educational programs and curricula.[26]

The Earth Summit, the National Forum, and the PCSD have inspired several educational organizations to undertake the work of fostering education for sustainability in the United States. Most post-Rio K-12 sustainability organizations, however, are small, although a few are medium-sized and some are connected to county agencies or university centers. While these organizations often strive to create material suitable for a national audience, they are in different parts of the country and often work regionally. Others focus on specific services or issues. The Sustainability Education Center[27] works in New York, primarily New York City; the Center for a Sustainable Future[28] works in Vermont and Georgia; Global Learning[29] works intensively with New Jersey schools; the Northeast Initiative, a three-year funded project,[30] focused on independent schools; Creative Change Educational Solutions[31] works in Michigan, as does the Sustainable Futures Group,[32] which also offers an online K-12 sustainability curriculum clearinghouse; Second Nature,[33] primarily a higher education sustainability education organization, also included K-12 sustainability curriculum in their online curriculum database. Facing the Future[34] focuses on population issues; the Center for Geography and Environmental Education[35] conducts research and develops programs, frameworks, and models to support geography, environmental, and sustainability education; Science Education for Public Understanding Program (SEPUP)[36] focuses on the science and public policy aspects of sustainability.

Many areas in the United States lack a local sustainability education organization, and the United States no longer has national forums, specialized government agencies, conferences, or colloquia to refine and advance education for sustainability per se. There is no large-scale source of funding at the federal or state level to support the work of these NGOs. These organizations have functioned as the sole specialized providers of the expertise to help schools and communities learn about sustainability and to help them create ways to implement education for sustainability in their programs. In the fall of 2000, a fledgling Sustainability Educator's Network (SEN) was formed to foster the understanding and practice of sustainability amongst North American K-12 educational organizations.[37] Currently an unfounded

24. PCSD, Public Linkage, Dialogue, and Education: Task Force Report, From the Classroom to Community and Beyond: Education for a Sustainable Future (1997), *available at* http://clinton2.nara.gov/PCSD/Publications/TF_Reports/linkage-top.html (last visited Mar. 27, 2002).

25. PCSD, Education for Sustainability: An Agenda for Action (1996).

26. The Sustainability Education Center's workshop on ecological economics, for example. Sustainability Education Center, *Ecological Economics for Life*, *at* http://www.sustainabilityed.org/ecoeco/ (last modified Mar. 5, 2002).

27. Further information about this organization is available at its website, http://www.sustainabilityed.org.

28. Further information about this organization is available at its website, http://csf.concord.org.

29. *See supra* note 14.

30. This effort was housed at the White Mountain School in New Hampshire. Further information about the White Mountain School is available at its website, http://www.whitemountain.org.

31. Further information about this organization is available at its website, http://www.creativechange.net.

32. Further information about this curriculum clearinghouse is available at its website, http://www.urbanoptions.org/SustainEdHandbook/index.htm.

33. Further information about this organization is available at its website, http://www.secondnature.org.

34. Further information about this organization is available at its website, http://www.facingthefuture.org.

35. Further information about this organization is available at its website, http://eerc.ra.utk.edu/divisions/cgee/.

36. Further information about this organization is available at its website, http://www.lhs.berkeley.edu/SEPUP/.

37. Contact the Sustainability Education Center (http://www.sustainabilityed.org) or Education for a Sustainable Future (http://esf.concord.org) for further information on SEN.

effort facilitated by the Sustainability Education Center and the Center for a Sustainable Future, SEN seeks to facilitate communication and the exchange of ideas and experience between members and strives to educate the broader K-12 educational community about education for sustainability.

Individual educators, schools, and school districts also have worked since Rio to foster the understanding and practice of sustainability amongst their students. Several educational reform networks, e.g., Coalition of Essential Schools and Expeditionary Learning Outward Bound,[38] elaborated programs that foster the kinds of interdisciplinary projects and higher-order thinking skills that are central to sustainability education. In addition, some independent and charter schools (publicly funded schools with some autonomy in setting programs and practices), whose central missions focused on environmental education and/or sustainability education, arose after the Earth Summit.[39]

Quality environmental educational work also continued throughout this period in the United States, fostering many of the crucial understandings, skills, and habits needed in a population that can work toward sustainability. National, state, and local networks of environmental educators, many involving collaboration with informal educators and environmental professionals, are numerous.[40] Project WET (Water Education for Teachers), Project WILD, and Roots and Shoots are just a few popular programs that have widespread national participation.[41] Reputable educational organizations and NGOs, e.g., World Wildlife Fund, World Resources Institute, have also created curricula and worked in many ways over the last 10 years to foster education for sustainability in the United States.

This same period also witnessed the widespread development and implementation of standards for student learning. In part spurred on by the alarming conclusions found in *A Nation at Risk*,[42] educators mobilized to put in place systems to raise the quality of learning in U.S. schools, focused (as the report suggested) on standards, assessment, and accountability.[43] Experienced teachers, education academicians, and various national associations dedicated to the teaching of various subjects in schools, usually composed of subject-area experts, published lists of the specific concepts and knowledge that students should have and when (at what grade) they should have them. State education bodies then implemented local processes to adopt standards of learning for their state, based to varying degrees on these national, subject-area standards. Some of these processes involved a broad range of community members,[44] and each state organized its own standards development and implementation process. Some large school districts, New York City, for example, developed their own set of standards. In addition to these "content" standards, many educational jurisdictions also adopted "performance standards," a collection of skills students should be able to demonstrate and a timetable for their achievement.[45] Many of these standards advance the goals of sustainability education. National science standards mandate teaching about ecosystems and the connection between science, technology, and society,[46] and national social studies standards are organized into sections on "Science, Technology, and Society," "People, Places and the Environment," "Production, Distribution, and Consumption," and "Global Connections."[47] Performance standards, moreover, often build capacity for understanding sustainability in the thinking, skills, and abilities students are asked to demonstrate.[48]

Most states then crafted or adopted tests to measure student achievement of some of these standards—some even tying promotion or graduation to successful test outcomes, and others making decisions about principals, teachers, and schools based on these test scores.[49] Throughout the 1990s, the implementation of government-sanctioned standards

38. Expeditionary Learning Outward Bound (http://www.elob.org) stresses real-world immersion and learning from experience; the Coalition of Essential Schools (http://www.essentialschools.org) believes that schools first and foremost should help their students "use their minds well" (Coalition of Essential School, *Ten Common Principles*, *at* http://www.essentialschools.org/aboutus/phil/10cps/10cps.html (last visited Mar. 27, 2002)).

39. *E.g.*, Unity Charter School in Morristown, New Jersey (visit its website for further information at http://www.unity-nj.org/); *see also* Keith A. Wheeler & Anne Perraca Bijur, Education for a Sustainable Future (Kluwer Academic/Plenum Publishers 2000). In Gerald A. Lieberman & Linda L. Hoody, Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning (State Education and Environment Roundtable 1998), *available at* http://www.seer.org/pages/GAP.html, (last visited Mar. 27, 2002), research is reported from scores of schools from more than a dozen states for whom environmental education is central.

40. New York City, for example, has the Environmental Education Advisory Council (visit its website at http://members.aol.com/wleou/eeac.html); the State Education and Environment Roundtable (SEER) works at the state level, for 12 states, to foster systemic adoption of environmental education in schools (its website is http://www.seer.org).

41. For more information about Project WET, visit its website at http://www.projectwet.org. More information about Project WILD is available at http://www.projectwild.org/, and learn more about the Jane Goodall Institute's Roots & Shoots program at http://www.janegoodall.org/rs/.

42. Commission on Excellence in Education, A Nation at Risk: The Imperative for Educational Reform (1983), *available at* http://www.ed.gov/pubs/NatAtRisk/ (last visited Mar. 27, 2002).

43. North Central Regional Educational Laboratory, *A Nation at Risk*, *at* http://www.ncrel.org/sdrs/areas/issues/content/cntareas/science/sc3risk.htm, (last visited Mar. 21, 2002).

44. Vermont, in particular, is to be commended for the inclusiveness of its standards development process, which may explain why it is the only state with explicit standards to teach sustainability. *See* Vermont Community Works, *Creating New Partnerships: Educating for Sustainability*, *at* http://www.vermontcommunityworks.org/vcwtools/programtools/edsustain/edsustain.html (last visited Mar. 27, 2002); Consortium for Policy Research in Education, *Developing Content Standards: Creating a Process for Change*, *at* http://www.ed.gov/pubs/CPRE/rb10stan.html (last visited Mar. 27, 2002).

45. For example, a student should be able to "think logically and reflectively in order to present and explain positions based on relevant and reliable information." Alaska State Board of Education, *Alaska Writing Performance Standards*, *at* http://www.educ.state.ak.us/tls/PerformanceStandards/writing.pdf (last visited Mar. 27, 2002).

46. National Research Council, National Science Education Standards (National Academy Press 1996).

47. National Council for the Social Studies, Curriculum Standards for Social Studies (National Council for the Social Studies 1994).

48. For example: "The student produces evidence that demonstrates understanding of big ideas and unifying concepts, such as order and organization; models; form and function; change and constancy; and cause and effect." 3 New Standards, Performance Standards: English Language Arts, Mathematics, Science, Applied Learning (National Center on Education and the Economy & University of Pittsburgh 1997).

49. *See* Kathy Swope & Barbara Miner, Failing Our Kids: Why the Testing Craze Won't Fix Our Schools (2000) (presents arguments and real life examples to support the point that standardized tests are currently being misused and misapplied in education).

in K-12 classrooms became a ubiquitous occurrence, as did the shifting of emphasis and curriculum in order to prepare students for "high-stakes" tests that would have important implications for students and for schools. Sustainability education, like all K-12 education, would be shaped by these developments.

Alongside standards and standardized tests, new ideas about how students learn, how to teach, and how to assess learning began to percolate through the U.S. K-12 educational system. These ideas increasingly dominated schools of education and increasingly took center stage in state and district school reform efforts.[50] Many schools, for instance, came to embrace constructivism—the idea that learning takes place when learners transform preexisting understandings—as their educational philosophy. New learning, in this theory, is a modification of a model rather than the acquisition of a fact. The spread of constructivism has generated a new set of classroom practices; instead of teaching discrete facts, constructivist teachers use creative problem solving, cooperative learning (in which students use each other as resources for understanding), inquiry-based learning (in which students research answers to important questions), critical thinking and analysis, and project-based, student-centered learning that affords students opportunities to construct the desired knowledge. Student work, in these classrooms, is more likely to be a project, a presentation, a paper, an essay, or a journal than a multiple-choice test. These new kinds of student work still need to be assessed; thus, an accompanying reform in assessment also has been occurring in conjunction with these changes in classroom practice. These new assessments can involve performance, writing, demonstrations, presentations, portfolios of student work, and rigorous rubrics that define varying degrees of success for particular assignments. These new ideas and practices also would have implications for sustainability education in U.S. schools.

Emerging Understanding of Education for Sustainability

Simultaneously, and synergistically, an elaboration of an understanding of what sustainability education should be has developed alongside efforts to implement sustainability education in the United States. The essays, thoughts, and opinions of Orr have been instrumental in shaping the emerging American understanding of education for sustainability.[51] Each one of his many essays has informed some particular aspect of education for sustainability: its content, its institutional aspects, and its connection to the current, real world. Also influential have been *Education for Sustainability* and *Education for a Sustainable Future*, both of which are comprised of articles that contain case studies, research, and proposed frameworks.[52]

More specific frameworks, some tied to particular projects, have arisen. Various organizations have evolved and refined their own set of principles and standards for sustainability education.[53] Through all this work over the last 10 years, what has emerged as an understanding of the necessities and characteristics of an ideal education for sustainability? A broad consensus can be seen among the goals of sustainability education theoreticians and practitioners on some key student outcomes and some essential knowledge, skills, and dispositions.

Ecological Literacy

Ecological literacy includes an understanding of carrying capacity; the basic facts about how the planet works encapsulated in *The Natural Step*[54]; the resilience and yet the vulnerability of the earth's many self-regulatory systems and cycles; the value and irreplaceable nature of biodiversity; the management of renewable and nonrenewable resources; the reliance of humans upon precious and irreplaceable ecosystem services; and the interconnectedness of humans and all the earth's systems.

Sustainability educators value and utilize all the concepts, techniques, frameworks, and standards developed by environmental educators. In addition, sustainability educators concentrate on the elaboration of the connection between human and natural systems. Though most if not all educators for sustainability would agree that ecological literacy and love of place and nature should be at the heart of education for sustainability, sustainability educators believe that the social and economic dimensions of our impact on

50. The federally sponsored National Clearinghouse for Comprehensive School Reform produces a catalog of school reform efforts that merit special federal funding. *See* Northwest Regional Educational Laboratory, *Models Listed by Type*, *at* http://www.nwrel.org/scpd/catalog/modellist.asp (last modified Aug. 30, 2001). The majority of these national and state-sanctioned programs embrace constructivism to some degree or another. Some, by contrast, are based on "instructivism," the direct teaching of specific facts. *See also* David Tyack & Larry Cuban, Tinkering Towards Utopia: A Century of Public School Reform (Harvard University Press 1995); Personal Communication with Giselle Martin-Kniep, Founder and Director, Learner-Centered Initiatives and the Center for the Study of Expertise in Teaching and Learning (Mar. 23, 2002) (Giselle Martin-Kniep has worked with many state education boards and a national array of school districts).

51. David Orr, Ecological Literacy (SUNY Press 1992); David Orr, Earth in Mind (Island Press 1994).

52. Education for Sustainability (Johnathan Huckle & Stephen Sterling eds., Earthscan Publications 1996); Education for a Sustainable Future, *supra* note 39.

53. The following skills and concepts have been distilled from the following sources: Orr, *supra* note 51; Education for Sustainability: An Agenda for Action, *supra* note 25; Education for a Sustainable Future, *About ESF: Theme Descriptions*, *at* http://csf.concord.org/esf/AboutESF_Themes.cfm (last modified June 23, 2000); The Sustainability Project, Gathering Hope: A Citizen's Call to a Sustainability Ethic for Guiding Public Life (1995); Willard Kniep, Global Education Framework (American Forum for Global Education 1987); Robert Hanvey, An Attainable Global Perspective (University of Denver 1976); Harlan Cleveland, The Global Commons: Policy for the Planet (University Press of America 1990) Paul Hawken, *A Declaration of Sustainability*, Utne Reader Sept./Oct., 1993, at 54-61; Learning for a Sustainable Future, Learning for a Sustainable Future: A Cross-Curricular Planning Guide (1995); The Natural Step, *The Basic Science Behind the Natural Step's System Conditions*, *at* http://www.naturalstep.org/framework/framework_science.html, (last visited Mar. 27, 2002); The Natural Step, *The Natural Step's Systems Conditions*, *at* http://www.naturalstep.org/framework/framework_conditions.html, (last visited Mar. 27, 2002); and Partnership for a Sustainable Future Report, Proceedings of the National Forum on Partnerships Supporting Education About the Environment (1994).

54. More information about The Natural Step can be found at its website, www.naturalstep.org. The Natural Step features a distillation of some crucial scientific facts about how matter and energy behave on the planet and establishes four "Systems Conditions," dictated by these facts, that should govern all human actions and decisions. The science behind the natural step has a broad consensus of support and many mainstream businesses are attempting to modify their practices so that they follow the four Systems Conditions.

the planet need extensive exploration as well. The goal is to develop practical, workable, upstream solutions that will move us toward sustainability, to interest and involve all sectors of society in making the vast array of human activities more sustainable, and to meet human needs more sustainably.

System Dynamics and "Systems Thinking"

System dynamics and systems thinking includes the ability to conceive of and model complex, interrelated "systems of systems," with complex feedback loops and dynamic equilibria; the ability to see beyond short-term benefits to long-term (seventh generation) consequences of an action; the ability to understand the connection between ecological, economic, and social systems in human history and human actions; and the ability to understand the complex, interconnected aspects of globalization and the relationship between science, technology, and society.

Multiple Perspectives

Multiple perspectives includes the ability to truly value and learn from the life experiences and cultures of others; the ability to profoundly understand and respect, if not agree with, the conclusions of others, and to see the relationship of those conclusions to the person's experiences, needs, values, and goals; the ability to uncover the reasonable human needs that underlie many seemingly unreasonable human demands and behaviors; and the ability to work with people who present different perspectives and to synergistically communicate and cooperate to create shared visions, understandings, and policies far richer than anything that could have been achieved alone.

Place

The knowledge of place includes understanding the profound and complex way that the geography and ecology of a place interact with the people who live there and their culture; knowledge and appreciation of the many ways that people have lived in places, with an ability to analyze those ways of living through the lens of sustainability; abandoning the idea that we can always move on if a place seems too boring or damaged to provide a good life; valuing the local knowledge of a place; and becoming committed to restoring and improving the beauty, integrity, and health of one's native place.

Sustainable Economics

Sustainable economics includes an understanding of appropriate and accurate indicators of well-being; an understanding of market dynamics, market failures, and common-pool resources; life-cycle analysis and full-cost accounting; a rich understanding of progress and capital (natural, social, human, manufactured, and financial), the ability to see the human needs that underlie modern market behavior, and the ability to envision more sustainable ways of meeting those needs; understanding the resources and constraints the earth's natural systems provide to our economy; understanding the importance of equity and universal human development as a human right but also as a crucial necessity if humanity is to attain sustainability; and understanding the wisdom of honoring the precautionary principle when implementing new human technologies and innovations.

Citizenship

Citizenship includes the disposition to work with others to develop effective solutions, informed by the knowledge, experience, and needs of a broad array of stakeholders, to social and environmental problems; the ability to be a catalytic and participatory leader; the ability to conceive of multifaceted, upstream solutions to problems, instead of single-issue, short-term "band-aids;" the ability to rationally negotiate trade offs between ecological, economic, and social goals; the ability to place local problems in a national and global context; the ability to network with others to find larger, more lasting solutions to problems; having a concern for injustice; and having an understanding of the urgency of our current environment and development problems.

Creativity and Visioning

Creativity and visioning includes the ability to creatively combine knowledge from different fields to craft more sustainable human practices and institutions; the ability to work with others to create rich, complex, and hopeful visions of our future; and the ability to understand what we know and what we need to know in order to live more sustainably.

An Evaluation of Current U.S. Efforts to Educate for Sustainable Development

Overall, as of 2002, the United States has not adopted sustainability education as a clearly stated, broadly applied, national goal. Very few K-12 educators in the United States have ever heard of any sustainability education policy efforts, and few educators have worked explicitly to implement education for sustainability in their classrooms. The institutional support for K-12 sustainability education is poor. There are no journals, associations, state or federal agencies, national conferences, or other communications or networking activity to spread or support education for sustainability in the United States apart from the individual efforts of select NGOs and disparate dedicated schools and educators. Agenda 21 is not a "household word" in the United States and it is hardly referred to in any official documents at the federal or state levels. Agenda 21 has had virtually no official influence over the goals or operations of U.S. K-12 public or private schooling. Only a single state, Vermont, has educational standards that explicitly address sustainability.[55] Even environmental education, an important and well-established component of sustainability education, is increasingly eclipsed in importance and increasingly slighted in funding: in early 2002, President George W. Bush's proposed federal budget offered no funds for environmental education.

Like most developed nations, our country faces a challenge in developing environmental and ethical awareness:

55. Vermont Department of Education, Vermont's Framework of Standards and Learning Opportunities, Standards 3.9 (Sustainability) & 4.6 (Understanding Place), *available at* http://www.state.vt.us/educ/stand/framework.htm (last visited Mar. 26, 2002).

we are buffered from many of the consequences of unsustainable development. The consequences of stark global inequality do not appear on our doorstep and do not dominate the image of the world served to us by our media. In addition to our challenge of awareness and knowledge, we face the challenge of citizen apathy. Education for sustainability requires not only abstract knowledge, but also the energy and the will to examine and change social and economic practices to bring them more in line with the long-term needs of society and the planet. This necessitates a certain amount of civic interest and capacity to join with others to promote the common good. In *Bowling Alone*, Robert Putnam paints a comprehensive and compelling picture of declining citizen involvement and diminishing social capital in the United States[56]; voting rates are among the many measures of citizen involvement that are at historic lows. Thus, sustainability educators must seek to contribute to developing effective citizen participation as we strive to demonstrate why we must alter our social and economic practices to promote sustainable development.

Yet, in spite of this bleak broad picture, the recent history of education in America reveals some spotty improvement in our ability to educate our citizens for sustainable development. Recent school reform efforts, many of which involve an increased emphasis on student skills, capacities, and dispositions, increasingly contribute to this improvement.[57] Education for sustainability requires the development of new skills, attitudes, and "habits of the heart" in addition to new content knowledge. As we do not yet fully know how to live sustainably, students must be able to create new knowledge, must be able to analyze and synthesize knowledge from various fields, must be able to think and act "outside the box" to create new understandings and new behaviors, and must be able to work with others and learn from their perspectives. Thus, pedagogies that develop these student attributes—pedagogies that are becoming more common practice in our educational system through consistent and widespread pedagogical reform efforts—also have contributed to the capacity of our population to achieve sustainable development. Student-centered, constructivist education methodologies, creative problem-solving techniques, critical thinking and analysis, cooperative learning and inquiry-based learning all are pedagogies that contribute to education for sustainability. These new pedagogies are being adopted because educational leaders increasingly are coming to value the outcomes they produce: students better prepared to operate successfully in a complex, information-rich, inherently interdisciplinary "real world."[58] Changing teaching practice, however, is never easy; although many school districts have policies and professional development strategies that promote these new practices and that help teachers to implement them in their classrooms, success on the ground is patchy and partial.[59]

The current trend of implementing standards-based education has necessarily shaped the effort to implement education for sustainability in the United States. While only one state, Vermont, has adopted the explicit goal of fostering an understanding of sustainability amongst its students, many current content-area and performance standards support the skills and understandings detailed in Chapter 36 of Agenda 21. Social studies, geography, and science standards all mandate that students understand the interconnections between people, place, the planet, and technology; social studies standards also dictate the ability to view issues from multiple perspectives. Sustainability educators have been able to design units that address these standards—units that therefore have a justifiable place in U.S. K-12 classrooms. Those who wish to educate for sustainability thus find ample support in state and content-area standards.[60] There is no mandate, however, to explore these connections within a framework that fosters sustainability: neoclassical economics, for example, describes a relationship between people, place, the planet, and technology, but most sustainability educators find the neoclassical understanding of this relationship to be limited and outdated. Moreover, the standards that are tested in school systems tend to become the dominant focus of educational efforts; the increasingly important and increasingly implemented state tests often required for promotion and graduation—and sometimes sealing the fate and setting the salaries of principals and teachers—usually focus more specifically on math and literacy skills and upon simpler, "multiple-choice" content knowledge. The interdisciplinary and complex skills and understandings that are crucial components of education for sustainability tend to get slighted in such an educational climate; "fuzzier," less predictable, and time-consuming off-site projects (which are often opportunities for civic action and real-world explorations) seem tangential and a poor risk in an increasingly time-conscious and test-focused educational program.

Some components identified as central in successful education for sustainability involve capacity-building skills such as systems thinking and the ability to participate effectively in civic life; there is broad consensus that these skills are desirable, and thus these components, piecemeal, have increasingly been implemented in U.S. classrooms.[61]

There has even been the encouraging implementation of a more systemic understanding of sustainability in a few educational programs. Education for a Sustainable Future, for example, has been able to use education for sustainable development as a goal and an overarching theme in the technology education developed for a large network of Georgia public schools.[62] The Sustainability Education, moreover, is developing a full-year course on entrepreneurship for the New York City Board of Education that will teach entrepre-

56. Robert Putnam, Bowling Alone (Simon & Schuster 2000).

57. *See supra* note 48.

58. *See supra* note 52. *See also* Personal Communication with Giselle Martin-Kniep, *supra* note 50; Personal Communications with Directors of Instruction, New York City High School Superintendents (Feb. 27, 2002).

59. For some enlightening case studies of dedicated teachers working to change their practice, see Patricia A. Wasley, Stirring the Chalkdust: Tales of Teachers Changing Classroom Practice (Teachers College Press 1994).

60. Global Learning has done substantial work in correlating sustainability curricula to New Jersey state standards. Global Learning, *Teaching to the Test: A Guide to Teachers' Resources for New Jersey's Social Studies Standard 6.6*, *at* http://www.globallearningnj.org/SSNb.htm (last visited Mar. 27, 2002).

61. There is, for example, a thriving network of educators who teach system dynamics organized through the Creative Learning Exchange, http://www.clexchange.org, which offers curricula, a newsletter, conferences, student exhibitions, etc. Details on advances in civics skills will follow.

62. Education for a Sustainable Future, *About ESF-Project Abstract*, *at* http://csf.concord.org/esf/AboutESF_Abstract.cfm, (last modified Mar. 16, 1999).

neurship through the lens of sustainability, infusing all teaching—about business practices and the relationship between businesses, society, and the ecosystem—with the knowledge and skills necessary for the understanding and practice of sustainability.[63] Such major commitments to the integrated, overarching framework of sustainability, however, remain rare.

In 2002, education for sustainability still has only a toe-hold in the dialogue and literature of the mainstream K-12 educational community in the United States. It is unclear whether we parallel our national vision of sustainability as it develops and matures or whether we are trailing behind the times. What is certain is that the earlier we lay the foundations of sustainability education for K-12 students, the sooner our higher education colleagues will be able to advance the requisite knowledge, skills, and habits of mind in our young people and the better equipped our communities will be to move toward a sustainable future. Our schools do not currently lead the movement toward sustainability in the United States; however, in spite of the absence of a clear national mandate and explicit national agenda, some work has been done to implement the goals of Agenda 21, Chapter 36, in U.S. classrooms. There has been progress in developing curricula, knowledge, skills, and literacies in the key understandings identified as central to being educated for sustainability.

Ecological Literacy

Many excellent environmental education programs exist that help students understand natural systems and the ways that humans affect these systems. Recycling curricula and programs are popular in American schools, as are programs to understand and preserve local forests, watersheds, and natural resources.[64] Many American students learn about the value and beauty of rainforests and biodiversity and learn about specific actions to take in order to minimize damage to essential ecosystems and endangered species through standards-supported curriculum, textbooks,[65] and even semester and full-year courses.[66] Teachers can gather in conferences, join associations, and implement frameworks that guide and support their environmental education efforts.[67] From the vantage point of sustainability education, environmental education seems quite developed, successful, and mainstream. In a recent report to the U.S. Congress, however, environmental educators, while citing overwhelming support for environmental education among U.S. citizens, feel there is "inadequate coordination and financial support for the effort" and state that efforts at environmental education in the United States are "diffuse and fragmented and therefore fail to reach a 'critical mass' capable of achieving overall direction or consistent, definitive accomplishment."[68]

However, there are ecological literacy goals important to sustainability education that still are usually absent in mainstream environmental education. The profound impact of everyday human life on our planet's operations and the inescapable reliance of humans on irreplaceable ecosystem services remain unknown to most students, or at best are abstruse facts that students "know" but don't connect with their lives and actions. Life-cycle analysis has recently appeared as a popular middle- and high-school science activity, which may help in bringing ecological truths "home."[69] The "ecological footprint"[70] also shows promise as a pedagogically useful way of helping young people understand the relationship between their behavior and the planet's resources.[71]

System Dynamics and Systems Thinking

School districts are increasingly adopting system dynamics and systems thinking as explicit educational goals.[72] *STELLA* modeling software provides the K-12 community with an age-appropriate systems modeling tool. Creative

63. Sustainability Education Center, *Projects*, *at* http://www.sustainabilityed.org/projects.htm, (last modified Jan. 18, 2002).

64. *See, e.g.*, Project WET (http://www.projectwet.org); Project WILD (http://www.projectwild.org/); and Project Learning Tree (http://www.plt.org). EPA and Adopt-A-Watershed have been very successful in connecting students with efforts to study and preserve their watershed (for more information, visit the following websites: http://www.adopt-a-watershed.org/ and http://www.epa.gov/OWOW/watershed/).

65. Particularly to be recommended is G. Tyler Miller Jr., Living in the Environment (11th ed. Brooks/Cole 2000).

66. World Wildlife Fund offers, for example, *Windows on the Wild* (*see* http://www.worldwildlife.org/wildworld/educators.html for more information), a very successful and popular collection of materials. The California Institute of Biodiversity offers *Exploring Biodiversity*, immensely popular in California (visit its website at http://www.calalive.org).

67. We note in particular the North American Association of Environmental Educators, which distributes the *EE Toolbox* (National Consortium for Environmental Education and Training, EE Toolbox (Kendall/Hunt Publishing 1994)), and a guideline series, *Excellence in Environmental Education* (published by the National Project for Excellence in Environmental Education). For more information, visit http://www.naaee.org.

68. The National Environmental Education Advisory Council, Report Assessing Environmental Education in the United States and the Implementation of the National Environmental Education Act of 1990—Report to Congress II (2000), *available at* http://www.epa.gov/enviroed/pdf/Rept2Congress.pdf (last visited Mar. 27, 2002).

69. Northwest Environment Watch publishes two relevant books, John C. Ryan & Alan Thein Durning, Stuff: The Secret Lives of Everyday Things (1997), and John C. Ryan, Seven Wonders (1999), and are at work on a curriculum to accompany *Stuff: The Secret Lives of Everyday Things*. The National Science Teachers Association also publishes a curriculum: Mike Reeske & Shirley Watt Ireton, The Life Cycle of Everyday Things (2000).

70. Developed and elaborated at Redefining Progress, whose website is http://www.rprogress.org. The Sustainability Education Center lists a teacher-resource clearinghouse on ecological footprint materials and curricula at http://www.sustainabilityed.org/efresources.htm.

71. Ecovoyageurs (http://www.ecovoyageurs.com) produces an effective middle school curriculum; Best Foot Forward (http://www.bestfootforward.com) offers educational tools to measure and understand ecological footprints. Mark DiMaggio, a California teacher, has developed footprint curriculum that involves system dynamics and systems modeling, found on the Second Nature Curriculum database (http://www.secondnature.org/resource_center/resource_center_courses.html). DiMaggio's efforts to implement ecological literacy are detailed in Education for a Sustainable Future, *supra* note 39, at 73-90.

72. It is a central element, for example, in the goals and practices of the Berkeley School District, and is implemented, in part, with interdisciplinary garden-based education. Carmela M. Federico, *Teaching About Food Systems*, Green Teacher, Summer 2001, at 6-19. It also is a central goal of the Education for a Sustainable Future project. *See* Education for a Sustainable Future, *About ESF*, *supra* note 53.

Learning Exchange[73] offers a website with an amazing array of curricula and system models applicable to a broad range of school subjects and facilitates a network of schools and school districts implementing systems thinking and system dynamics in their educational programs. Students have the opportunity to work with an extensive collection of dynamic models of change and to study the systemic implications of variables that change over time and behave differently under different conditions. They can develop "simulation literacy," learning from models and learning about the limitations of these models, and they can create their own models for our future and ask themselves: "What if?"[74] Yet, the nature of discreet subjects and separate tests in each subject continue to provide some barriers to true interdisciplinary thinking and learning. Pioneering school districts are working to implement systems thinking, to link their math and science departments, and to connect their literature and history departments, but few schools offer consistent opportunities to see the interconnectedness of academic subjects and the world, and even fewer assess student outcomes in this area. American schools are still too focused on the acquisition of individual factoids of knowledge and insufficiently concerned with helping students understand complex systems and their behavior.

Multiple Perspectives

Many curricula and programs exist to help students develop an ability to view issues from multiple perspectives and to foster a deeper understanding and respect for other cultures and other views. The ethnic diversity of the United States provides a rich, internal resource for the development of this skill and also provides a crucial, local need for students to be able to live in peace with those who are different. Multicultural education was extremely popular throughout the 1990s and remains an important part of the educational goals and offerings of many American schools. Technology allows students to directly communicate with a world of different cultures, experiences, values, and views, e.g., the International Education and Research Network.[75] Districts vary in their success in creating profound "aha!" insights into the lives, views, and values of others, but many American schools make efforts to help their students develop tolerance and the ability to learn about and appreciate different perspectives and values.[76]

Place

Many curricular and programmatic efforts are underway to help American students value and heal their place. Watershed explorations abound, and many local environmental and historical groups are producing interdisciplinary curricula that celebrate and inform about local ecology, heritage, and culture.[77] The Rural School and Community Trust[78] is a major, multistate effort to help schoolchildren value their places and to help schools contribute to local development efforts. The Orion Society[79] fosters the ability of teachers to know about and teach local culture through their "Stories in the Land" program. Yet attitudes toward local knowledge and commitment to working to develop home places for the most part remain unchanged. American history was founded on our ability to "go West" in search of better opportunities, and it will take a profound reworking of our national psychology to turn us into a people that stays put and repairs instead of moving on to greener pastures when a place no longer appeals.

The ability to understand the relationships between people, places, and the environment is a common social studies standard,[80] and the subject is increasingly covered in history courses—notably, the newly developed Advanced Placement American History course.[81] However, the complex, interdisciplinary understanding of a people's relationship with a particular place and dependence upon its resources continues to be absent from most American educational programs.

Sustainable Economics

An evolved understanding of economics is crucial to sustainable development, yet the teaching of economics in K-12 education has not substantially changed over the last 30 years. Neoclassical models of the relationship between the ecosystem, society, and the economy dominate the landscape. Teachings about the market do not include externalities, the "tragedy of the commons," the special needs and requirements of renewable resources, the reliance of the economy upon social and natural capital, or any contribution of ecological economics to our understanding of how an economy does, and should, function. If students understand anything about economics when they leave our K-12 educational system, they "know" that land, labor, and capital are

73. Further information about this organization can be found at its website, http://www.clexchange.org.

74. The Sustainability Education Center and Kurt Kreith, professor of mathematics emeritus of University of California, Irvine, incorporate systems modeling and system dynamics in training developed for math teachers. *See* Sustainability Education Center, *The Mathematics of Global Change*, *at* http://www.sustainabilityed.org/mgc.htm (last visited Mar. 27, 2000), and G.D. Chakerian & Kurt Kreith, *Iterative Algebra and Dynamic Modeling*, *at* http://www.math.ucdavis.edu/~kkreith/IADM.html (last visited Mar. 27, 2002).

75. The International Education and Research Network (iEARN) is growing in its U.S. membership. Personal Communication with Ed Gragert, Director, iEARN (Mar. 16, 2002). Learn more on its website at http://www.iearn.org.

76. The Anti-Defamation League produces the popular *A World of Difference* and other materials to promote appreciation of diversity and multicultural understanding (visit its website at http://www.adl.org). The American Forum for Global Education produces many materials for teachers to enhance students' understanding of, and appreciation of, other cultures (its website is at http://www.globaled.org). The National Association for Multicultural Education is growing, as is the number of schools that offer multicultural training to faculty and students. National Association for Multicultural Education, *About Name*, *at* http://www.nameorg.org/about.html (last visited Mar. 26, 2002).

77. *See, e.g.*, The Catskills: A Sense of Place (Aaron Bennett & Nathan Chronister eds., Catskill Center for Conservation and Development 2000) (a five-volume interdisciplinary exploration of the natural history and human heritage of the Catskill region of New York).

78. Visit the Rural School and Community Trust's website at http://www.ruralchallengepolicy.org. This organization is descended from the Annenberg Rural Challenge.

79. Further information about this organization is available at http://www.orionsociety.org.

80. *See supra* note 39.

81. Personal Communication with Linda Arkin, American Forum for Global Education (June 2001) (Ms. Arkin prepares history teachers to teach Advanced Placement World and U.S. history in U.S. high schools).

infinitely interchangeable; they "know" that markets always result in the most efficient combination of land, labor, and capital in the production of goods; and they "know" that technology and innovation will solve all our problems and substitute for all depletions—provided the market is allowed to work unfettered from "outside" constraints such as regulations. The role of natural and social systems in supporting and maintaining our economy remains a largely unexplored and unexamined concept in most K-12 economics education; most entrepreneurship textbooks have an isolated chapter on responsibility to society, usually at the end of the book and rarely covered because the teacher did not have enough time to "get to it."[82] Some excellent curriculum units have been developed to teach sustainability economics to youth and communities: *The Paper Trail* and *Ecological Economics for Life* (Sustainability Education Center); *The Shape of Change* (Creative Change Educational Solutions), and Education for a Sustainable Future's several online ecological economics units for students.[83] However, these units currently are used by only a small vanguard.

In the real world, the movement toward sustainability is a significant business trend that will continue to have profound implications for competitive strategy, business governance, and the products and services that businesses deliver. Businesses are adopting sustainability-fostering business practices to protect their brand, minimize risk, protect their "right to operate," build customer loyalty, experience cost savings from resource efficiency, and get a jump start on emerging markets. A growing number of businesses also produce a yearly "triple bottom line" report, which details their social and ecological impacts as well as their financial success.[84] Unfortunately, most of the growing number of business and entrepreneurship education programs in the United States are not teaching our future business leaders about these increasingly common business and entrepreneurship practices. The Sustainability Education Center is developing *Business and Entrepreneurship Education for the 21st Century* as a full year high school entrepreneurship course for the New York City Board of Education; this course teaches about these emerging business trends. For the sake of business competitiveness, as well as for the sake of the ecological and social systems impacted by business practices, our business and entrepreneurship education programs need to reflect the changes occurring in our increasingly sustainability-conscious world.

Citizenship

A sustainable community is a place where the vision for the future is created not by pitting conflicting interests against one another, but by building a consensus around each individual's and organization's shared stake in the long-term sustainability of the community. A study of successful American sustainable community initiatives and the correlated qualities of leadership and participation embedded in them revealed the following common characteristics:

> ecological/natural systems are protected and/or enhanced;
> ecological economic security;
> just and equitable social systems develop;
> cultural integrity is honored and evolves;
> documentation of historical and current assets and liabilities;
> development of catalytic, servant, participatory leadership solutions, plans, and designs draw on citizens' intuition, memory, and wisdom;
> systems approach to planning and decisionmaking;
> local/regional indicators of sustainability are developed and linked to macro indicators of sustainability;
> community consensus building/dialogue;
> fosters community education, i.e., skills, knowledge, ecological literacy, etc.;
> upstream thinking: ecological design of systems, energy flows, and material;
> thinking and planning with material cycles in mind;
> efficient energy use;
> future based vision (seventh generation);
> moving from reactive to pro-active;
> creative, holistic solution-oriented, not problem driven (solutions solve more than one problem at a time); and
> inclusive participation in planning and decisionmaking.[85]

While these skills will be crucial to the creation of sustainable communities, the majority of civics textbooks teach that policy is a battle of charisma, wills, and opposing constituencies. The vast majority of K-12 civics programs do not model or describe civic engagement but instead diagram the branches of the federal government. Some well-developed curricula exist, but they are only slowly being implemented in U.S. classrooms.[86]

On a more positive note, during the 1990s, many schools began to implement conflict resolution programs and to train students to be mediators in peer conflicts,[87] thereby

82. *E.g.*, Cynthia L. Greene, Entrepreneurship: Ideas in Action (South-Western 2000); E. Meyer & Kathleen Allen, Entrepreneurship and Small Business Management (Glencoe 2000).

83. Sustainability Education Center, The Paper Trail: Connecting Economic and Natural Systems (1998); Sustainability Education Center, *Ecological Economics for Life*, *supra* note 26; Susan Santone, The Shape of Change (Creative Change Educational Solutions 2001); various Education for a Sustainable Future curriculum modules, *available at* http://csf.concord.org/esf/CurrViewByTopic.cfm (last visited Mar. 26, 2002).

84. *See supra* note 5.

85. Jaimie P. Cloud, A Survey of Leadership Qualities Distilled From Sustainable Community Initiatives (American Forum for Global Education 1997).

86. *See* Alliance for Community Education, This Place Called Home (New Society Publishers 1998) (educational curriculum on CD-ROM developed by the Sustainability Education Center); World Resources Institute, Exploring Sustainable Communities (Kendall-Hunt Publishing 1997). *See also* Education for a Sustainable Future's online curriculum and Community Planner software (available at http://csf.concord.org/esf/Software_CP.cfm). Full Circle Institute in Minnesota is about to release a sustainable communities curriculum as part of its EarthStar series (visit the website http://www.fullcircleinstitute.org/earth.html for further information).

87. Educators for Social Responsibility has an extensive and popular collection of conflict resolution materials for K-12. Visit http://www.esrnational.org for further information.

providing some training in "civics for sustainability." The Program for Young Negotiators, which is becoming increasingly popular, helps youth to resolve conflicts through understanding and finding ways to meet the underlying needs that give rise to conflicting issue positions.[88] Additionally, service learning, which offers students community service experiences that are integrated with educational objectives, creates promising opportunities to actually provide students with real-life experience of successful social change work and successful social change leadership. The state of Maryland has made service learning mandatory for K-12 students; service learning is offered in an increasing number (over 80%) of all U.S. high schools, and is mandated in an increasing number of districts.[89] At the same time, however, many service learning programs (particularly for younger grades) are being reduced or straight-jacketed as schools conform to new demands to focus education on tested reading and mathematical literacies.[90]

Creativity and Visioning

Creativity exercises are becoming increasingly common in schools (especially in entrepreneurship programs). The popular "Spaceship Earth" scenario, used in classrooms and corporate training around the world, helps people understand the interdependence of ecosystem services and human societies as well as the need for societies to involve the talents and meet the needs of all.[91] Education for a Sustainable Future has created many sustainability-focused, future-visioning curricula.[92] There has been little systemwide success, however, in helping students learn how to develop multi-stakeholder shared visions. Ideally, this could be accomplished through student participation in local sustainable community initiatives—a practice that would certainly foster the preparation of future sustainability visionaries. Visioning as a practice in planning is becoming increasingly common in America, so the possibility for this kind of collaboration between students and real-world visioning efforts is growing.[93]

Food Systems Education: A Promising Trend

Food systems education is an interdisciplinary and increasingly popular element in education for sustainability in the United States. Teaching about food touches upon most of the skills and understandings described above. New curricula exist to explore hunger in a systemic way that educates about sustainability.[94] Gardens and natural habitats are becoming increasingly common on U.S. American school grounds[95]; garden projects recreate history, display the specialness of a place through nurturing its unique plants and recreating its local ecosystems, and help children "taste" the deliciousness of other cultures.[96] Food systems education also offers multiple opportunities for students to take action to contribute to the sustainability of their own food system or the food systems of hungry people in the world.

In Summary

Overall, in spite of isolated and local progress in implementing specific components of sustainability education, substantial barriers exist to the full-scale development of education for sustainability in the United States. The infrastructure is woefully inadequate, and the will to commit to broad and deep implementation of sustainability education is lacking. This is largely because sustainability's emerging collection of ideas and understandings are still relatively unknown to the American public. If it is considered at all, sustainability often is viewed as a particular subject and as imparting a partisan and partial opinion about the relationship between humans and nature, instead of being viewed as the overarching framework that should shape all human actions and decisions. The American public does not yet acknowledge the urgency and comprehensiveness of the changes we must make, and thus the urgency to change our educational system is not yet commonly felt. Current educational goals and assessments also get in the way: sustainability educators frequently report that schools often perceive education for sustainability curriculum as additional programs, additional burdens they have not the time or resources to bear given their requirements to achieve impressive "high-stakes" test results. Teachers also are often leery of teaching through broad, interdisciplinary projects instead of smaller, discreet, "testable" facts; sometimes these interdisciplinary projects require collaboration with other teachers and departments, which, in turn, requires resources, skills, and time.

88. Further information is available at http://www.pyn.org and at http://www.sera.com. The U.S. Departments of Education and Justice named the Program for Young Negotiators a leading national model for violence prevention and conflict resolution.

89. Robert Shumer, *From Service to Service Learning*, The Center, Summer 2001, *available at* http://www.fourh.umn.edu/educators/research/center/PDF/C2K1-A9.pdf (last visited Mar. 21, 2002); Brian Kleiner & Chris Chapman, Service Learning and Community Service Among 6th Through 12th Grade Students in the United States: 1996 and 1999, *available at* http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2000028 (last visited Mar. 28, 2002).

90. Learning In Deed, *Service Learning Conference Participants Offer Input to National Commission* (Apr. 2001), *at* http://www.servicelearningcommission.org/forumsum.html (last visited Mar. 22, 2002). Federico's personal experience in working with a variety of Massachusetts service learning NGOs, educators, and schools through a course and an independent study at the Harvard Graduate School of Education, 1998, also supports this conclusion.

91. Developed originally in the 1980s at The American Forum for Global Education, but used and adapted widely since then.

92. These are collected at Education for a Sustainable Future, *Curriculum by ESF Topic*, *at* http://csf.concord.org/esf/CurrViewByTopic.cfm (last visited Apr. 19, 2002).

93. Personal Communication with Susan Boyd, Co-Director, Sustainable Communities (Mar. 19, 2002).

94. Federico, *supra* note 72. Recommended curricula are Stephanie Kempf, Finding Solutions to Hunger: Kids Can Make a Difference (1997, updated 2001); Sustainability Education Center, From Global Hunger to Sustainable Food Systems: Challenges and Choices (2001), *available at* http://www.sustainabilityed.org/food.htm (last visited Mar. 23, 2002); any food curriculum from Food First (visit their website at http://www.foodfirst.org).

95. Many programs and resources exist to guide this process: Kids Growing Food, for example, in New York state (for more information, see http://cerp.cornell.edu/kgf/); National Wildlife Federation manages the popular Schoolyard Habitats Program, which maintains garden space as native habitat for native species (*see* http://www.nwf.org/schoolyardhabitats/); and Green Teacher has produced Greening School Grounds (New Society Publishers 2001), to help schools naturalize their physical plants.

96. The Berkeley Unified School District's Food Systems Project is especially to be recommended. *See* http://www.ecoliteracy.org/pages/foodsystemsproject.html for further information.

Furthermore, very little substantial research has been undertaken to establish effective methodologies for attaining sustainability education goals, to monitor the implementation of education for sustainability in the United States, and to establish the overall utility of sustainability education or even environmental education in the attainment of K-12 educational goals.[97] This data would substantially increase the credibility of the efforts of sustainability educators.

Recommendations

Should the K-12 education community be able to progress in a few key areas, U.S. children should be able to make substantial gains in their ability to understand and advance sustainability. What follows are specific recommendations for action to create this progress.

Teacher Education, Pre-Service and Inservice

Schools of education need to embrace two goals in their teacher education programs:

> ensuring that teachers understand sustainability and are equipped with the content knowledge and skills that will help them contribute to a more sustainable world; and
>
> ensuring that teachers can apply this knowledge and these skills in the work they do with students.

Teachers must have the skills, insights, and desire to ensure that their students are able to contribute to the ways their communities are working to advance the transition to sustainability. A research agenda needs to be developed in concert with the development of this goal so that schools of education may develop effective means of educating teachers about sustainability and preparing them to be effective educators that enable their students to understand and foster sustainability. At this stage, research and reports are "generally descriptions of action at the level of the individual institution."[98] Some resources for the professional development of educators exist to inform this process:

> the Toolbox in-service education project conducted by the National Consortium for Environmental Education and Training in the United States (EPA-funded);
>
> the Environmental Education Initiative in Teacher Education in Europe;
>
> the United Nations Educational, Scientific, and Cultural Organization's Learning for a Sustainable Environment-Innovations in Teacher Education Project in the Asia-Pacific region;
>
> the Indian national in-service education program conducted on a "cluster-model" (and incorporating workshops delivered by satellite) by the Centre for Environmental Education in India; and
>
> the Environmental and Development Education Project for Teacher Education in Australia and the Teaching for a Sustainable World modules.[99]

Our teachers need training to ensure that they understand the need to educate their students for sustainability and understand the connection between the knowledge, practices, and goals of sustainability and their chosen disciplines. Teacher training and professional development for teachers need to be adapted to include these goals.

Standards and Assessment

While many of the content and performance standards used in U.S. schools develop skills and capacities that make possible education for sustainability, the knowledge and skills needed to foster sustainability are usually not explicit educational goals, and certainly are not usually among the knowledge and skills assessed in U.S. school systems. Sustainability educators must mobilize to persuade their state education organizations to approve standards for sustainability education, and must persuade content-area groups that create standards, e.g., the National Council for the Social Studies, the National Research Council, the National Council on Economic Education, to incorporate the skills and knowledge necessary for the attainment of sustainability into the standards they develop and promulgate. Of course, this can only happen if these content area groups, which usually contain prominent expert practitioners of the subject in question, themselves have been persuaded that a sustainability framework best explains the data analyzed in their field and best supports future work in their field. Sustainability educators must rely upon sustainability practitioners and theoreticians in these fields to advance the infusion of sustainability ideas and practices into these fields.[100]

A growing consensus is building that students need to be able to evaluate information, construct effective arguments from sources, participate effectively in public policy and democratic action, synthesize facts from various fields to construct valid models of the world informed by knowledge from several academic subjects, see patterns and deduce larger truths from smaller events, and continue to learn as they wind their way through a changing work world and society. The school experience must help students develop these skills. Developing these skills takes time; educational

97. *See supra* note 40 for the report published by SEER. This report offers evidence that "students learn more effectively within an environment-based context than within a traditional educational framework," (SEER, *Brief Overview: Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning*, *at* http://www.seer.org/pages/overview.htm (last modified Dec. 10, 2001), but many of the schools involved are small, charter schools that may contain especially motivated and talented teachers and students. This report has not emerged as definitive evidence that environmental education can help all schools produce better educational outcomes. Personal Communications with Members of New York City's Environmental Education Advisory Council and Teacher Environmental Education Preparation (Spring 2001). Education for a Sustainable Future reports successful attainment of technology-related, pedagogical, and sustainability-related educational goals in its three-year project. *See* Karen C. Cohen et al., *External Evaluation Report, Year III: Education for a Sustainable Future*, *at* http://csf.concord.org/esf/Eval00/index.htm (last visited Mar. 27, 2002).

98. Griffith University and the Department of the Environment, Sport & Territories, *Teaching for a Sustainable World, Rationale*, *at* http://www.ea.gov.au/education/publications/tsw/rationale.html (last modified Sept. 5, 2001).

99. *Id.*

100. For example, there is an International Society for Ecological Economics (http://www.ecologicaleconomics.org), which seeks to develop the field of ecological economics and influence the thinking and practice of economics. The Union of Concerned Scientists (http://www.ucsusa.org) does excellent work in advancing support for studying sustainability-related issues in science and for disseminating sustainability-related scientific conclusions to schools and the public.

priorities must change so that students spend sufficient time in school activities to develop these skills and the other capacity-building skills that a people must have if they are to move their society toward sustainability.

Statewide assessments of student learning must change to reflect the new high priority for these goals. Certain state assessments support the above educational goals: some elementary science assessments, for example, asks students to design and carry out a scientific experiment; the New York State History Regents examinations involve a document-based question in which students must analyze and use sources to answer a historical question. The current ascendancy of "high-stakes" testing of less complex skills often crowds out the opportunity to develop the skills future workers and citizens will need to tackle multifaceted problems and successfully negotiate the intertwined social and environmental situations that will arise in the lives of all 21st century citizens. Assessments in K-12 education often function as "the tail wagging the dog"; education for sustainability will be enhanced if that tail-wagging supports the understandings and skills needed to foster sustainability. There is a growing number of organizations and associations working to reform assessment[101]; sustainability educators need to find and support appropriate allies in this movement and to support right-minded efforts in this area.

A change in the skills and knowledge that colleges expect from entering students also could help forward K-12 education for sustainability in the United States. Independent schools often do not focus on or even offer standardized tests, yet many of these schools feel that college entrance requirements leave them as constrained as their public school counterparts in the education they can offer their students. As college entrance requirements align themselves more with the requirements of sustainability education, more K-12 schools will be able to focus on developing the skills and knowledge that foster sustainability in their students.

Community Education, School Partnerships, and Real-World Knowledge

Much work needs to be done to connect students with real-life, existing, on-the-ground work that is ongoing in their community to foster sustainability. How better to help students understand sustainability than to ask them to learn from people trying to create it? Students can critically analyze the physical plant of their schools and the state of their communities and work with others to make real improvements in these areas.[102] This would necessarily involve the work of community members and organizations—NGOs, architects, businesspeople, gardeners, farmers, etc. Outreach, support, and training must exist to help these people and groups effectively work with schools and students.

Community education is crucially important in that education is notoriously conservative, often reflecting status-quo values and understandings rather than serving its truer purpose of preparing students for the new, different world they will inhabit when they graduate. Communities educated about sustainability will support educating their children for sustainability; these education efforts can be part of overall efforts to revitalize American civic life and counter civic apathy. K-12 educators, therefore, have a vested interest in either doing community education themselves or supporting the efforts of community educators who develop the capacity of parents and citizens to understand and practice sustainability and to understand the need to educate children so that they can create a more sustainable world. The Center for Geography and Environmental Education has an excellent resource for community education, the ESD Toolkit[103]; the Sustainability Education Center has an online training in *Ecological Economics for Life*[104]; the Northwest Earth Institute[105] produces, in print, a series of community discussion courses on sustainability-related topics; *YES! Magazine* covers a broad array of sustainability-related issues for the general public.[106] Funding should be sought to bring this material to American communities.

Curriculum Development and Distribution

While many first-rate units exist that educate for sustainability, and some entire courses have been developed and are in development, many more need to be created. More importantly, resources and time must be dedicated to market, diffuse, and distribute these units and to help teachers use them effectively in their classrooms. Funding the creation of a curriculum unit is never easy, but funding its national distribution and dissemination is currently nearly impossible. Sustainability educators need to convince school districts and funders of the indispensability of funding to support the widespread and effective use of curriculum units that educate students for sustainability.

Funding

Sustainability educators in the United States are still in the position of establishing the need and utility of their approach and educational goals. We stand, therefore, in need of public and private funding to support this effort, which must include the production of policy reports, the lobbying of educational organizations, the gathering of research data to demonstrate the efficacy and outcomes of sustainability education curricula and programs, the involvement of teachers and students in the creation of sustainability, and the time- and labor-intensive networking efforts needed to work out effective strategic partnerships between sustainability educators and individual districts, schools, and teachers. Support for the further development and dissemination of sustainability education through journals, confer-

101. *See, e.g.*, ReThinking Schools, *at* http://www.rethinkingschools.org (last visited Apr. 19, 2002); National Center for Fair & Open Testing, *at* http://www.fairtest.org (last visited Apr. 19, 2002).

102. There is ongoing work in this area. In particular, the New Jersey Sustainable Schools Network, managed by Global Learning, works to implement sustainability, particularly greenhouse gas reductions, amongst its many members. *See* New Jersey Sustainable Schools Network *at* http://www.globallearningnj.org/SSN.htm (last visited Apr. 19, 2002).

103. Rosalyn McKeown, Ph.D, ESD Toolkit (University of Tennessee Center for Geography and Environmental Education 2000), *available at* http://www.esdtoolkit.org (last modified Feb. 14, 2002).

104. Sustainability Education Center, *Ecological Economics for Life*, *supra* note 26.

105. Further information on these discussion courses is available at the Northwest Earth Institute's website, http://www.nwei.org.

106. Further information about *YES! Magazine* can be found at the following websites: http://www.yesmagazine.org and http://www.futurenet.org.

ences, symposia with sustainability practitioners, and contact with developers of sustainability thought would also enhance the success of efforts to educate U.S. students for sustainability.

Conclusion

Groundwork has been laid in the 10 years since Rio for sustainability education in the United States. Some recent changes in educational practices help to prepare our youth to understand and implement sustainable development, e.g., service learning, a focus on literacies and skills, standards that support interdisciplinary understanding and complex thinking, and growing recognition of the importance of "systems thinking." Several organizations and a network for those organizations now exist that attempt explicitly and effectively to bring the diverse and emerging understandings of what sustainability looks like, in its multifaceted aspects, to our young people, and to define and develop skills and dispositions in youth that will enable them to create a more sustainable world as future workers and as active citizens. However, like our counterparts in business, design, architecture, and agriculture, our endeavor is still in the chrysalis stage. All of those interested in fostering sustainability still must work to convince the American people that our current practices are interfering with the ability of all people, now and into the future, to have fulfilling, secure lives and that the needed changes can produce more options, more fulfillment, and more fun.

When this understanding flowers, our entire society can be mobilized to fashion new ways of living and being that no longer hamper the awesome restorative and life-giving resources of this planet from abundantly supplying us with all we need. Daily, the evidence mounts that we are systematically undermining the supports all societies need to pursue their variously conceived destinies. When the pursuit of sustainability ceases to be a visionary crusade and becomes an obvious and inescapable goal of all our endeavors, educating for sustainability will necessarily become a primary goal of our school systems. Until then, we can work to share our truths about our species' interdependence with the planet; about the qualities and requirements of our planet's systems; about ways to work together that create consensus and that produce new knowledge for a new world; about creating real growth in all our capital—natural, human, and financial; about thinking upstream, systemically, and for the seventh generation; and about having the hope and courage to dream of a just, restored, and abundant world filled with treasured, special places.