

Education for Climate Neutrality and Sustainability:

Guidance for ACUPCC Institutions

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Cover photo

Solar panels at Lane Community College, installed by students in the Renewable Energy Technician program, provide 3 kW of energy to the college's science building. Photo taken by Jeremy Aasum, a student in Lane Community College's graphic design program.

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Executive Summary

The Importance of Education for Sustainability

Higher education is facing its greatest challenge ever in meeting its responsibility to provide the knowledge and educated citizenry that will lead to a thriving civil society. Humanity is at an unprecedented crossroads. Because of the extraordinary and exponential growth in population and of the technological/economic system since the mid 20th century and despite all the work on environmental protection, all living systems are in long-term decline and are declining at an increasing rate. We are severely disrupting the stability of the climate that made human progress to date possible, and there are huge social, economic, security and public health challenges worldwide. This is happening with 25% of the world's population consuming 70-80% of the world's resources. The overarching question for humanity is: *How will we ensure that current and future humans will be healthy, and we will have strong, secure, thriving communities and economic opportunity for all in a world by 2050 that will have 9 billion people and economic output that is increased 4-5 times?* Many believe that this is the greatest intellectual, moral and social challenge human civilization has ever faced.

Higher education plays a unique and critical role, one often overlooked, in making a healthy, just and sustainable society and a stable climate a reality. It prepares most of the professionals who develop, lead, manage, teach, work in, and influence society's institutions, including the most basic foundation of K-12 education. It is largely responsible for developing the conceptual models of society's leaders and professionals that have, unwittingly, led to the unsustainable situation in which society finds itself. Today's and tomorrow's businesses, governments and professionals – architects, engineers, attorneys, business leaders, scientists, urban planners, policy analysts, cultural and spiritual leaders, teachers, journalists, advocates, activists, and politicians – will need new knowledge and skills that only higher education can provide on a broad scale.

The new knowledge and skills are needed to redesign the human economy to emulate nature, which has sustained itself for hundreds of millions of years. Three key components will be essential to building a sustainable future: (1) operating on renewable energy; (2) creating a circular production economy in which the concept of 'waste' is eliminated because all waste products are raw materials or nutrients for the industrial economy; and (3) living off of nature's income, not its capital (i.e., managing human activities in a way that uses natural resources only at the rate that they can self-regenerate – the ideas embodied in sustainable forestry, fishing and agriculture).

Education for Sustainability Principles

What if higher education were to take a leadership role in preparing students and providing the information, knowledge, and skills to achieve a healthy, just and sustainable society? What would higher education look like? A college or university would operate as a fully integrated community that models social and biological sustainability itself and recognizes its interdependence with the local, regional and global community. The education of all professionals would reflect a new approach to learning and practice. Often teaching, research, operations and relations with local communities are thought to be separate activities; however, because students learn from everything around them, these activities form a complex web of experience and learning. All parts of the college or university system are critical to achieving profound individual, institutional, and societal change that can only occur by connecting head, heart and hand. Profound change cannot not be merely intellectual; it must be rooted in a place that is personally relevant and connected with an ability to take action. The educational experience of graduates would reflect an intimate connection among (1) curriculum; (2) research; (3) understanding and reducing any negative ecological and social footprint of the institution; and (4)

working to improve local, regional, and global communities so that they are healthier, more socially vibrant and stable, economically secure and environmentally sustainable.

The context of learning would make human/environmental interdependence, values and ethics a seamless and central part of teaching of all the disciplines, rather than isolated as a special course or module in programs for specialists. Colleges and universities would operate as fully integrated communities that “practice what they preach” by modeling economic, social and ecological sustainability in their own operations. They would partner with the local, regional and global communities to co-learn and contribute to helping society become socially vibrant, economically secure and environmentally sustainable.

The content of learning would reflect interdisciplinary systems thinking, dynamics and analysis for all majors and disciplines with the same lateral rigor across the disciplines as there is vertical rigor within them.

The process of education would “teach what it practices,” by complementing formal curriculum with active, experiential, inquiry-based learning and real-world problem solving on the campus and in the larger community. Creativity and innovation in students would be fostered to meet global challenges.

Unique Role of President or Chancellor

For a host of structural and historic reasons, the direction and content of educational curricula of colleges and universities has largely been faculty-driven, especially for bachelor level degree granting colleges and research universities. The decentralized organization of colleges and universities is considered a strength internally and externally, and academic freedom is seen as important for the success of higher education and for society as a whole. As a consequence, many presidents, chancellors and academic officers are wary of getting overly involved in curricular issues.

On the other hand, senior administrators are often able to see external trends and challenges facing society for which higher education can provide solutions and turn into great opportunities through education, research and demonstration. Problems such as preventing catastrophic climate disruption and creating a sustainable world for billions of people often cut across traditional disciplinary learning and require institution-wide discussions on how best to orient its education, research and practice. Successful senior administrators help their institutions understand and embrace these big ideas through a variety of ways that engage the entire institution, determine priorities, assemble the necessary resources and organize for implementation.

As with any other innovation, a critical step is to engage all the relevant members inside and outside the institution in a conversation about the meaning of the educational component of the Commitment and to seek their input on the best ways to address it. Great leaders are mentors, coaches and stewards that use support and inquiry to foster a learning-oriented community of team members that are comfortable with asking questions that do not have easy answers. In addition, administrators may want to engage with future employers, alumni and community leaders to understand the needs and experience they have in addressing climate disruption and sustainability challenges to ensure that the strategies developed will be most effective. This could involve a number of strategic questions such as:

- What knowledge and skills do we want our graduates to have to be able to have a climate neutral and sustainable society and to contribute to adaptation to climate change?
- What are we currently doing to help students develop this knowledge and skills?

- What are the best curricular and co-curricular strategies for providing this educational experience?
- How do we connect learning with action by the institution and individuals to demonstrate climate neutrality and sustainability?
- How do we connect learning with service to local and global communities to work together to achieve these goals and learn from each other's experiences?
- How do we best organize, sequence and implement the strategies over time in a way that is consistent with our overall strategic direction?

This document contains several examples of how colleges and universities and their presidents, chancellors and senior academic administrators are providing desired educational experiences that will lead to fulfilling the educational component. For more information on leading profound change processes such as movement toward higher education institutional sustainability, please see [*Enhancing Your Institution's Capacity to Fulfill the ACUPCC: A resource for ACUPCC signatory presidents and chancellors.*](#)

Introduction

What is the purpose of this guidance document?

This document, *Education for Climate Neutrality and Sustainability: Academic Guidance for ACUPCC Institutions*, has been created to assist signatory schools in implementing the educational component of the American College & University Presidents' Climate Commitment (ACUPCC). ACUPCC signatories recognize that providing sustainability education to the leaders of tomorrow, so that they can develop ongoing solutions to the threat of significant climate disruption, is as important as, and a necessary component of, eliminating their school's contribution to global warming pollution. This is reflected in the Commitment document, which states that signatories commit to taking "*actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.*" This guidance is designed to clarify the intent of the Commitment, identify some of the best practices across higher education, and to provide resources to assist signatories in creating their own strategies. It is intended to help higher education leaders, including presidents, provosts, deans, faculty, ACUPCC Implementation Liaisons and others that are working on the implementation of the ACUPCC.

Unlike the measurable goal of achieving climate neutrality in campus operations and activities, there is no commonly agreed to measures of what it means to "make climate neutrality and sustainability a part of the curriculum and other educational experience for all students," especially given the breadth and scope of the concept of sustainability. For this reason, *each school will make its own determination of how to fulfill this part of the Commitment.* Participating institutions will (1) find their own creative and unique means of doing so; (2) develop a means of reviewing progress and expanding their reach over time; and (3) share their efforts with other signatories so that all of the institutions will be able to meet the ultimate goal to have graduates that can help all of society restore the earth's climate to a safe level and achieve sustainability over several generations.

This guidance document is not intended to be comprehensive treatise on why, what and how higher education should be teaching in order to produce the educated citizens that will create a sustainable world. Rather, the document provides a snapshot of some best practices to help signatories in their efforts.

How is it relevant to my institution?

Because each institution has a unique culture and approach to learning, there is not a "one-size-fits-all" strategy for how all colleges and universities can achieve this goal. This guidance document was developed with the recognition that not all higher education institutions are alike. A variety of strategies are offered in order to provide a choice of options for different institutions, and examples demonstrate a range of practices at institutions of differing enrollments, charters, resources, and student demographics. A significant list of resources is also included for those signatories who would like more information.

How was it developed?

A large and diverse group of faculty, college administrators, and others participated in the development of this document, lending their many perspectives. A twelve-member working group assembled in November 2008 by Second Nature determined the content framework and reviewed three drafts of the document. The working group was comprised of representatives from a variety of colleges and

universities. A diverse advisory group of 29 individuals – college and university faculty, administrators, climate change and sustainability in higher education experts – provided their expertise by reviewing drafts of the document and offering suggestions and edits. A full list of committee members and an outline of the process is available on-line at http://www.presidentsclimatecommitment.org/html/solutions_academics.php.

Fulfilling the Educational Component of the Commitment

What is the scope of the Commitment?

Because there are no easy or commonly agreed-upon measures of what it means to “*make climate neutrality and sustainability a part of the curriculum and other educational experience for all students,*” each school will make its own determination of how to fulfill this commitment. Participating institutions will develop their own creative and unique approaches, in a manner that fits their own context and teachable perspective. They will create a means of reviewing progress and expanding their reach over time, and through the public reporting process and other networking avenues, they will share their strategies with other signatories so that all of the institutions will be able to meet the ultimate goal of producing graduates with the knowledge and skills to help all of society re-stabilize the earth’s climate and achieve sustainability over several generations.

What does “for all students” mean?

The phrase “for all students” signifies the importance the ACUPCC places on the unique role of higher education in training future professionals, leaders, and citizens in all disciplines.

Introducing some students to the concepts and practices of sustainability through an elective course in the topic or by offering a major/minor in sustainability can be useful and provide an important educational experience for those students. However, because addressing society’s great sustainability challenges will require skills represented by a wide variety of professions, as well as sustainable behaviors by individual citizens, sustainability specialists are necessary but they will not be sufficient. The ACUPCC signatories have committed to finding creative ways to introduce all students to these concepts and practices, through traditional and non-traditional education offerings, and by creating implicit and explicit learning opportunities. While participation in the ACUPCC does not require a major re-orientation of a school’s academic programs, some institutions are choosing to take this path because they believe it to be necessary to create a better society.

The pace and scope of this work will be different among institutions. No particular sequence of steps is the right progression, and there are many possible entry points. For example, a college or university that is in the early stages of integrating sustainability and climate neutrality into educational experiences may choose to follow the path outlined in Figure 1 *while continuously assessing progress and building the capacity* to move along the continuum:



Figure 1. One of the many possible progressions over time toward full-integrated education for sustainability.

How should this section of the climate action plan be organized and submitted?

The Curriculum and Other Educational Experiences section of the climate action plan will be highly institution-specific and should take into account the institution's particular strengths. It should start by describing the institution's current educational offerings (both curricular and co-curricular) related to climate change and sustainability. It should then set out planned actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.

This section of the plan should also explain how the implementation of the ACUPCC will be integrated into the institution's educational efforts (e.g., by having students or classes perform the campus GHG inventory), as well as how the entire campus community including alumni will be made aware of the institution's participation in and progress toward implementing the ACUPCC.

The Importance of Education for Sustainability

Higher education is facing its greatest challenge ever in meeting its responsibility to provide the knowledge and educated citizenry that will lead to a thriving civil society. Humanity is at an unprecedented crossroads. Despite all the work we have done to protect the environment, all living systems are in long-term decline and are declining at an increasing rate. We are severely disrupting the stability of the climate that has made human progress to date possible, and there are huge social, economic, security and public health challenges worldwide. This is happening with 25% of the world's population is consuming 70-80% of the world's resources. The overarching question for humanity is: *How will we ensure that current and future humans will be healthy, and we will have strong, secure, thriving communities and economic opportunity for all in a world by 2050 that will have 9 billion people and economic output that is increased 4-5 times?* Many believe that this is the greatest moral and social challenge human civilization has ever faced.

To paraphrase Einstein, we can't solve today's problems with the same level of thinking at which they were created. We need an unprecedented shift in the way we think and act. We currently view health, social, economic, political, security, population, environmental, and other major societal issues as separate, competing, and hierarchical when they are really systemic and interdependent. The current educational system is largely reinforcing the current unhealthy, inequitable and unsustainable path that society is pursuing. This is not intentional – it is because of disciplinary predominance and an implicit assumption that the earth will be the gift that keeps on giving, providing the resources, assimilating our wastes and mitigating negative impacts, ad infinitum. Twenty-first century challenges must be addressed in a systemic, integrated, and holistic fashion.

Higher education plays a unique and critical role, one often overlooked, in making a healthy, just and sustainable society and a stable climate a reality. Higher education has been granted tax-free status, the ability to receive public and private funds, and academic freedom in exchange for educating students and producing the knowledge that will result in a thriving and civil society. It prepares most of the professionals who develop, lead, manage, teach, work in, and influence society's institutions, including the most basic foundation of K-12 education. As Michael Crow, President of Arizona State University and Co-chair of the ACUPCC Steering Committee, said at the 2007 ACUPCC Climate Leadership Summit, "Higher education has 100% of the educational footprint." Today's and tomorrow's businesses, governments and professionals – architects, engineers, attorneys, business leaders, scientists, urban planners, policy analysts, cultural and spiritual leaders, teachers, journalists, advocates, activists, voting citizens, and politicians – will need new knowledge and skills that only higher education can provide on a broad scale.

There has been exponential growth in distinct programs related to the environmental dimension of sustainability in higher education in the last decade. Environmental studies and graduate programs in every major scientific, engineering and social science discipline are abundant and growing. Progress on modeling sustainability in campus operations has grown at an even faster rate. Higher education has embraced programs for energy and water conservation, renewable energy, waste minimization and recycling, green buildings and purchasing, alternative transportation, organic food growing and local purchasing. The rate of increase is unmatched by any other sector. The student environmental movement is the most well organized, largest and most sophisticated student movement since the anti-war movement of the 1960's. These efforts have largely been distinct programs that are helping to begin the cultural shift to making deep and comprehensive sustainability the goal of higher education;

however, despite these efforts, the overwhelming majority of graduates know little about the importance of climate action and sustainability or how to have their personal, professional and civic lives aligned with sustainability principles. As institutions, most colleges and universities still view modeling sustainability as an option that they will pursue if they can afford it.

Benefits of Education for Sustainability

Broad societal concerns about climate disruption and other unsustainable consequences of modern civilization and the growth of interest in sustainability in and through higher education has resulted in higher education executives becoming more involved in sustainability initiatives to provide more comprehensive and visible leadership by higher education. Moreover, there is growing consensus of business, government, labor and other leaders that a clean, green economy is the only way to restore American economic leadership, create millions of jobs and help solve global health and environmental problems.

In a recent article in *Sustainability: The Journal of Record*, Daniel J. Sherman, Professor of Environmental Policy & Decision Making at the University of Puget Sound, states, “Sustainability is a concept with tremendous opportunity for the kind of pedagogical applications that usher in broad and enduring social changes. For sustainability to assume its full transformative potential in higher education, the concept must become a big idea, an avenue of inquiry that critically examines our role in the world. Big ideas are the generative material of all academic disciplines - the building blocks of the university and its curriculum. Sustainability is a rich concept that can offer big ideas complementary to and overlapping with most, if not all, traditional disciplines.”

Frank Rhodes, former president of Cornell University, suggests that the concept of sustainability offers “a new foundation for the liberal arts and sciences.” It provides a new focus, sense of urgency, and curricular coherence at a time of drift, fragmentation, and insularity in higher education, and what he calls “a new kind of global map.” Sustainability provides a vital source of hope and opportunity for facilitating institutional renewal and revitalizing higher education’s sense of purpose.

ACUPCC signatory schools that embrace the expanded form of learning, operation and service envisioned by the Commitment will better fulfill their mission and better prepare students for character and citizenship as well as commerce and career. They will attract new and better students and faculty, attract new funding for teaching and research, expand alumni support, improve town-gown relationships and have a more dynamic and involved campus.

Education for Sustainability Principles

What if higher education were to take a leadership role in preparing students and providing the information, knowledge, and skills to achieve a healthy, just and sustainable society? What would higher education look like?

Often teaching, research, operations and relations with local communities are thought to be separate activities; however, because students learn from everything around them, these activities form a complex web of experience and learning. All parts of the college or university system are critical to achieving profound individual, institutional, and societal change that can only occur by connecting head, heart and hand. Profound change cannot be merely intellectual; it must be rooted in a place that is personally relevant and connected with an ability to take action. The educational experience of graduates would reflect an intimate connection among (1) curriculum; (2) research; (3) understanding and reducing any negative ecological and social footprint of the institution; and (4) working to improve local, regional, and global communities so that they are healthier, more socially vibrant and stable, economically secure and environmentally sustainable.

The education of all professionals would reflect a new approach to learning and practice. In preparing students to meet the challenges of an era of rapidly accelerating climate change, the current curricular emphasis on the physical science of climate directed towards a small set of students would shift to a broader educational enterprise that includes mitigation and adaptation. Academia would adapt existing courses and create new courses, collaborations and expansion, on both broad sustainability and specific climate solutions.

The context of learning would make human/environment interdependence, values and ethics a seamless and central part of teaching of all the disciplines, rather than isolated as a special course or module in programs for specialists. Colleges and universities would operate as fully integrated communities that “practice what they preach” by modeling economic, social and ecological sustainability in their own operations. They would partner with the local, regional and global communities to co-learn and contribute to helping society become socially vibrant, economically secure and environmentally sustainable.

The content of learning would reflect interdisciplinary systems thinking, dynamics and analysis for all majors and disciplines with the same lateral rigor across the disciplines as there is vertical rigor within them.

The process of education would “teach what it practices,” by complementing formal curriculum with active, experiential, inquiry-based learning and real-world problem solving on the campus and in the larger community. Creativity and innovation in students would be fostered to meet global challenges.

Education for Sustainability Strategies

Following are descriptions and examples of some of the strategies for sustainability education that have proven successful. This is not an exhaustive list; these suggestions are intended to share interesting approaches, stimulate creative thinking and enhance connections between higher education institutions.

The Context of Learning

What are the avenues available to academics for educating students about sustainability?

Although integrating climate neutrality and sustainability into the curriculum and other education experiences “for all students” may sound daunting, many of the systems and structures that can make this a possibility already exist within most colleges and universities. By leveraging these existing avenues for transformation, ACUPCC signatories can find ways to fulfill this commitment without having to re-invent their university or college.

The context of learning would make human/environment interdependence, values and ethics a seamless and central part of teaching of all the disciplines, rather than isolated as a special course or module in programs for specialists.

The experience of colleges and universities currently educating their students about climate change and sustainability demonstrates that the following curricular and co-curricular structures can be effective avenues for meeting the ACUPCC:

Freshmen orientation, common readings, entry courses, and other activities required of all freshmen can introduce all students to these concepts.

At the *University of New Hampshire*, the Discovery Program exposes all freshman to year-long and campus-wide conversations on topics that include energy and the environment.

<http://www.unh.edu/academic-affairs/discovery/>

At the *University of Pennsylvania*, the Penn Green pre-orientation program gives incoming freshman a green introduction to the university and Philadelphia.

<http://media.www.dailypennsylvanian.com/media/storage/paper882/news/2008/02/19/News/A.New.PreOrientation.Program-3218727.shtml>

At *St. Olaf College*, a sustainability-themed academic year was used as a springboard to introduce the concept of sustainability across the curriculum and was the impetus for activities for Week One, guest lectures, and the incorporation of the sustainability theme into syllabi across disciplines.

<http://fusion.stolaf.edu/news/index.cfm?fuseaction=NewsDetails&id=2877>

At *Prescott College*, the orientation program includes an activity discussing environmental issues through multiple perspectives as well as a service-learning component so students can apply and practice new knowledge.

<http://www.prescott.edu/highlights/orientation.html>

Required courses, including general education requirements and capstone courses required for graduation, can be a quick way to infuse sustainability throughout multiple courses (Rowe, 2002).

At *Unity College*, students have a general education requirement of five interdisciplinary core courses that all focus on “ecoliteracy,” plus a capstone environmental stewardship course.
<http://www.unity.edu/uploadedFiles/wwwunityedu/Academic/SupportServices/Registrar/FA09ThemeBasedCourseDescriptions.pdf>

The *College of the Menominee Nation* offers the course “Introduction to Sustainable Development” as a general education requirement that all students must take to graduate, and asks students to sign a sustainable living pledge during new student orientation.
<http://www.menominee.edu/01/CommunityServices/SDIEducation.html>

At *Oakland Community College*, the components of sustainability have been part of the General Education core outcomes for all degrees for over ten years.
<http://www.oaklandcc.edu/Catalog/DegreeRequirements/GenEdRequirements.htm>

At *Furman University*, all students are required to take a general education course designated as “Humans and the Natural Environment,” which explores nature-society dynamics.
http://www.furman.edu/catalog/2008-2009_catalog.pdf

At the *University of Minnesota*, undergraduate students are required to take one course in four themes, which include “Environment” and “Citizenship and Public Ethics.”
http://onestop.umn.edu/degree_planning/lib_edu

At the *University of California-Davis*, a course in Global Climate Change provides general education credit in all categories and explores the geophysical factors that influence climate while assessing the biological, technical, economic, legal, and sociological consequences of climate change and various mitigation strategies.
<http://www.plantsciences.ucdavis.edu/courses/sas025/>

Elective courses for all students, regardless of major, provide exposure to important concepts, but unlike required courses, these electives may not reach all students.

At *Dalhousie University*, the course “Campus as a Living Laboratory” teaches the skills and tools of interdisciplinary research and problem-solving and applies these to real-life problems involved in running the university and progressing towards sustainability.
http://www.aashe.org/resources/campus_sustainability_courses.php

At *Northern Arizona University*, the Interdisciplinary Climate Change Mitigation course is open to all majors who register for it as an independent study within their major department.
<http://www.mpcer.nau.edu/carbonproject/>

Existing courses in which climate change and sustainability can be integrated can be avenues for taking the first steps towards creating a diverse curriculum that teaches about these topics. Many colleges that have found it politically difficult to add additional courses for degree requirements have solved this dilemma by integrating sustainability course materials into

existing liberal arts courses, which are often the domain of individual faculty members who can choose to bring in these topics at their discretion (Rowe, 2002).

At the *University of Maryland* and the *University of South Carolina*, student sustainability advisors give presentations on sustainable living to hundreds of students enrolled in the freshman course “University 101.”

http://www.sustainability.umd.edu/index.php?p=academics_sustainability_advisors
<http://www.sc.edu/sustainableu/SustainableLivingPres.htm>

At the *University of British Columbia*, sustainability has been infused into more than three hundred undergraduate courses across all disciplines.

<http://www.sustain.ubc.ca/>

The *Medical University of South Carolina* is reforming its curriculum to integrate environmental health issues into pediatrics.

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1253669>

At *Vermont Law School*, despite the fact that a permanent body of law governing society’s long-term responses to climate change does not yet exist, climate change issues are being addressed in the context of the Clean Air Act.

http://www.vermontlaw.edu/Academics/Environmental_Law_Center/Courses.htm

North Lake College is revising its construction education curriculum to prepare project managers to identify LEED certification points, introduce energy management in building construction, and maximize sustainability in building construction practices.

<http://www.northlakecollege.edu/academics/construction/construcmngmt.html>

California State University-Chico provides a special “green course” designation for courses with a sustainability emphasis in the course catalogue.

http://cypress.csuchico.edu/APO/Course_net1/GreenCourses.aspx

Offering existing courses in sustainability topics to more students regardless of major is another way to expose “all students” to these topics.

At *Guilford College*, students are required to take three critical perspective courses, with one being social justice/environmental responsibility.

<http://www.guilford.edu/academics/catalog/overview.html>

Creating new multidisciplinary and interdisciplinary courses that are cross-referenced across departments and possibly team-taught can bring a holistic understanding of these topics to many students. The co-teaching process can be a learning opportunity for some faculty who may be hesitant to teach about sustainability because they do not have background in the topic.

At *Alverno College* the “Globally Effective Citizen” course, required of all students, teaches sustainability perspectives and change agent skills.

http://www.nerche.org/cluster_project/alverno/alverno.html

Lane Community College offers cross-disciplinary courses in global ecology, environmental

politics, and natural resource economics as well as continuing-education courses ranging from sustainable landscaping to voluntary simplicity.

<http://www.lanec.edu/sustainability/vision.html>

Madison Area Technical College has a certificate in renewable energies and also provides professional development to faculty at other institutions in energy management, renewable energies and other sustainability topics via their Consortium for Education in Renewable Energy Technology.

<http://www.ceret.us>

Los Angeles Trade-Technical College offers sustainable construction courses and a solar panel installation course, and the automotive department provides classes on maintaining hybrid cars.

<http://www.lattc.edu/dept/lattc/WED/GCIPrograms.html>

At *Loyola University-Chicago*, the student-led Solutions to Environmental Problems (STEP) courses explore environmental issues from a variety of perspectives and give students from across the disciplines opportunities to address these issues.

http://www.luc.edu/biodiesel/about_us.shtml

At *Warren Wilson College*, in a new, three-year pilot for multidisciplinary sustainability curriculum, nine disciplines team-taught three courses about regional land use issues. For 2009/10, the focus is energy/climate change.

http://www.warren-wilson.edu/~ELC/sustainability/Arthur_Vining.php

Allegheny College offers seven courses on climate change in the disciplines of art, religious studies, and environmental studies through the Allegheny College Climate Change Initiative.

<http://webpub.allegheny.edu/group/accci/courses.htm>

The *North Carolina Community College System* has begun "Code Green," an initiative to expand green job training courses throughout the state. The program is currently working to identify the needs of colleges and of companies to decide exactly which types of courses will be most beneficial.

<http://raleigh.mync.com/site/raleigh/news/story/27736/green-is-future-for-nc-community-colleges>

New programs, institutes, and colleges focusing on sustainability education have been developed at a number of colleges and universities.

At *Arizona State University*, a new Global Institute for Sustainability that contains the School of Sustainability was formed for interdisciplinary, collaborative efforts to address real-world issues with participation of every other school of the university.

<http://schoolofsustainability.asu.edu/about/school/>

At *Stony Brook University*, an interdisciplinary college was created on its Southampton campus to focus exclusively on sustainability studies.

<http://www.stonybrook.edu/sb/southampton/about.shtml>

At *Furman University*, a new Center for Sustainability has been formed to provide guidance and

collaboration across the curriculum for sustainability efforts. The Center encourages community-based sustainability research.

www.furman.edu/sustain

At *Colorado State University*, the School of Global Environmental Sustainability is an umbrella organization that encompasses all environmental education and research at the university.

<http://soges.colostate.edu/About/about-soges.html>

At *Cuyahoga Community College*, the Green Academy and Center for Sustainability trains individuals in the principles of sustainability, green construction and interior design, green business development, certified photovoltaic installation, energy auditing, and sustainable facilities management.

<http://www.corporatecollege.com/cc/GreenAcademyInformation.pdf>

At *Montclair State University*, the environmental management program was designed to bridge the gap between public policy and environment science, and is expanding courses to focus on climate change.

<http://csam.montclair.edu/environ/>

Northeast Wisconsin Technical College developed a Center for Renewable Energy and Sustainable Practices that includes technical studies degrees, certificates, continuing education, seminars, technology campus, and career academies.

<http://www.nwtc.edu/RenewableEnergy/Default.htm>

Middlebury College offers new programs providing a greener study abroad experience to students that include grants for student study abroad research on sustainability issues and the “Green Passport” program which helps students to keep track of their actions while abroad and offers guidelines for responsible travel.

<http://www.middlebury.edu/academics/ump/sap/sustainable/>

Integration across the curriculum, with a reorientation of all majors towards sustainability, has been possible at a few schools where visionary leadership has facilitated “education as sustainability.”

At the *College of the Atlantic*, all departments have been eliminated to offer undergraduate and graduate students only one degree in human ecology.

<http://www.coa.edu/html/academics.htm>

Green Mountain College offers “environmental liberal arts” by taking the traditional general education core program and converting it into liberal arts courses that focus on the environment. Students must take each of the four core courses: “Images of Nature,” “Voices of Community,” “Dimensions of Nature,” and “A Delicate Balance.”

<http://www.greenmtn.edu/academics/ela.aspx>

The *Los Angeles Community College District* is aligning academic programs and courses with the emerging green technology industries that have the highest potential for job growth in the Los Angeles area and is creating state-certified sustainable development curricula.

<http://www.californiagreensolutions.com/cgi-bin/gt/tpl.h,content=1304>

The Content of Learning

What do we want students to learn?

The traditional system of higher education generally educates through academic disciplines. By working to connect and integrate the disciplines in structured ways, students are given opportunities to better integrate what they learn and to learn to think systematically to develop an understanding of deep cause and effect relationships, strengthen their critical thinking skills, and better integrate what they learn.

The content of learning would reflect interdisciplinary systems thinking, dynamics and analysis for all majors and disciplines with the same lateral rigor across the disciplines as there is vertical rigor within them.

For example, Richard Norgaard describes how the Energy and Resources Group (ERG), an interdisciplinary graduate program at the University of California at Berkeley, was able to develop lateral rigor within vertical academic structures: “We have tended to emphasize how each discipline helps us see the whole. We have avoided espousing one ERG approach, a single methodology for synthetic understanding, that disciplinary academics might find questionable and an easy target.”¹

Examples of institutions encouraging multidisciplinary and interdisciplinary learning approaches include:

- *Bard College*, where the President is asking the college to rethink new iterations of introductory courses organized around problems rather than disciplines.
- *Massachusetts Institute of Technology*, where since the early 1960s the Systems Dynamics Group has educated students from many disciplines in the use of feedback loops to study complex non-linear systems.
<http://scripts.mit.edu/~sdg/>
- *The University of Florida*, where the Common Reading Program provides all new first year students with a common intellectual experience and where students are now reading “When the Rivers Run Dry: Water – The Defining Crisis of the Twenty-First Century.”
<http://www.dso.ufl.edu/nsp/firstyearexperience/commonread/>
- *The University of Georgia*, where an environmental literacy requirement ensures that all undergraduate students learn the basic scientific principles that govern natural systems and the consequences of human activity for global, regional, and local systems.
http://bulletin.uga.edu/Bulletin_Files/ELR_Req.html
- *Lansing Community College*, where alternative energy has been integrated into existing courses and the college’s instructors are helping other schools to create their own alternative energy curricula. For example, the automotive technology students work on hybrid vehicles and fuel cell technology, and the building construction students learn energy management and alternative heating and cooling methods.
<http://www.lcc.edu/energy/>

¹ Barlett, Peggy and Geoffrey Chase (eds.). 2004. *Sustainability on Campus: Stories and Strategies for Change*. Cambridge, MA: Massachusetts Institute of Technology, p.116.

Defining Success in Student Learning

Sustainability Literacy

What knowledge and skills would students need to be sustainably literate? A number of scholars have addressed this question over the last fifteen years. For example, in the 1995 Essex Report to President Clinton's Council on Sustainable Development, education leaders provided these outcomes for student understanding:

- how the natural world works;
- the interdependence of humans and the environment;
- how to assess the effects on humans and on the biosphere of human population dynamics; energy extraction, production and use; and other human activities such as agriculture, manufacturing, transportation, building and recreation;
- the relationship of population, consumption, culture, social equity and the environment;
- how to apply principles of sustainable development in the context of their professional activities;
- technical, design, scientific and institutional strategies and techniques that foster sustainable development, promote energy and natural resource efficiency and conservation, prevent and control the generation of pollution and waste, remediate environmental problems, and preserve biological diversity;
- social, cultural, legal and governmental frameworks for guiding environmental management and sustainable development; and
- strategies to motivate environmentally just and sustainable behavior by individuals and institutions.

These are some of the knowledge and skills needed to redesign the human economy to emulate nature – operating on renewable energy, creating a circular production economy in which the concept of 'waste' is eliminated because all waste products are raw materials or nutrients for the industrial economy, and managing human activities in a way that uses natural resources only at the rate that they can self-regenerate – the ideas embodied in sustainable forestry, fishing and agriculture.

In addition to gaining knowledge about ecosystems and the human condition, the learning outcomes for education for sustainable development, when compared across multiple countries, all share systemic thinking, interpersonal and intrapersonal skills development, and a strong emphasis on change agent skills (Svanström et al., 2008).

Climate Literacy

Climate literacy provides education to students about the importance of a stable climate for human civilization, the ways and consequences of disrupting the earth's climate and the various pathways towards reducing and eventually reversing anthropogenic climate change. A cooperative interdisciplinary approach is needed to develop curriculum and pedagogy on climate solutions to better educate faculty and equip students to deal effectively with this pressing global concern.

As Mark McCaffrey, Associate Scientist at the Cooperative Institute for Research in Environmental Sciences at the University of Colorado-Boulder, says, "While clearly not everyone needs to be an expert in climatology and alternative energy in order to make informed choices, our nation's current climate

and energy awareness has room for substantial improvement. Every high school and certainly every college graduate should know the essentials of climate science and have an understanding of why it is imperative to reduce carbon emissions for the sake of future generations. That is not the case today. In addition, high school and college graduates should have skills and understandings needed to engage in the kinds of citizen decision-making that will enable local, state and federal agencies to reverse current trends regarding energy choices and climate change.”²

Andy Jorgensen and David Blockstein at the National Council for Science and the Environment (NCSE) suggest that climate literacy involves:

1. understanding the *scientific basis of climate change* (both the workings of the climate system, and the anthropogenic disturbances to the system);
2. understanding the *environmental, economic and social consequences* of rapid global climatic disruption;
3. understanding the various *means by which the anthropogenic influence can be limited*, the *complications* inherent in utilizing these means, the *uncertainty* about various solutions; and
4. preparing to be an *active participant in climate solutions*, whether as a climate solutions professional or simply as an engaged citizen.

Jorgensen and Blockstein’s assessment of current curriculum at American colleges and universities is that only outcome #1 is being addressed in a systemic way (largely through science courses for majors); outcomes #2 and #3 are being addressed in an uneven fashion and not reaching a majority of students; and very few are addressing outcome #4 other than in disciplinary professional programs (mostly at the graduate level).

This view is based on NCSE’s informal 2008 survey of climate curriculum at 150 major academic institutions, which indicates that most colleges and universities have no general education course on the topic (unpublished). About two-thirds of the colleges and universities surveyed provide some type of introductory course on climate change directed towards environmental and science majors. About one fourth of the colleges and universities surveyed offer an introductory course on climate change for non-majors, which serves as an option to fulfill a general education science requirement. More commonly, non-majors are offered a basic environmental science course, which covers climate change as well as several other environmental issues.

Most of the in-depth climate change courses, which focus on one specific aspect of climate change in detail (such as impacts, causes, or mitigation), are taught at the graduate level or are exclusively for upperclassmen majoring in environmental science or studies. Thus the vast majority of the hundreds of thousands of students who graduate from college each year have no formal education about the rapidly changing global climate, the causes and consequences of these changes, and the possible solutions to minimize rapid climate change or to allow people and ecosystems to adapt. Although many faculty members are teaching about climate change, most do so from the perspective of their own discipline, and in isolation. There is little opportunity to learn from what others are teaching and to incorporate resources and experiences from different institutions.

Courses and curricula are needed for at least three general categories of students:

² McCaffrey, Mark. 2009. Personal communication to the Climate Literacy Network. McCaffrey is co-author of NOAA’s “Climate Literacy: The essential principles of climate science,” published in March 2009 to provide a set of essential principles for the field to facilitate informed decision-making. <http://www.climatescience.gov/Library/Literacy/default.php>

1. “Citizens”– the typical student who will not become an environmental professional, but needs to understand climate change, its causes, consequences and solutions as part of becoming an informed and active citizen. These needs can be served by curricular modules in other courses ranging from science to the humanities, or by courses targeted to non-majors.
2. “Environmental Experts” – students majoring in an environmental field who need to understand climate change as the context that they will be operating in regardless of their environmental career – these students will need at least a full one or two-semester dedicated course.
3. “Climate Solutions Professionals” – students whose career pathway will center on developing and implementing solutions for mitigation and adaptation. These students need to take a program of many courses over one or two years. There is a need for a new Masters Degree in Climate Solutions. A committee of the NCSE’s Council of Environmental Deans and Directors (CEDD) is planning such a degree in the context of a Professional Science Masters Degree.

In considering the educational challenges raised by the global climate challenge, participants at a summit meeting of thirty-one Texas colleges and universities, convened by NCSE, identified eight broad themes which creative administrators, deans, professors and instructors would have to address:

- Developing better *curriculum* content (disciplinary and inter-disciplinary);
- Improving the *core learning competency* of students;
- Improving *K-12* education to better prepare students for college-level work;
- Creating more *experiential education* opportunities to supplement classwork;
- Developing better ways for educators to *work together across disciplines*;
- Adding *informal education* vehicles to the educational process;
- Overcoming *institutional barriers* that currently inhibit creativity and change.
- Improving *assessment and evaluation* methods.

They noted that universities and colleges also have a role in addressing the climate change challenge through career preparation, including:

- Providing good *information* about the workforce to help students explore career options
- Connecting academic learning to both “soft” and “hard” *career skills*
- Expanding the quality and quantity of *internships and fellowships*
- Increasing the participation of *alumni* and working professionals
- Promoting and using *study abroad* options to prepare students for a global economy

Andy Jorgensen and David Blockstein suggest that colleges and universities should collaborate to build educational resources about climate solutions through processes in which educators, researchers, and decision-makers contribute teaching materials to an online repository. These items should be evaluated in classroom settings, and continually modified and improved. There is a need to engage focused communities to create curricular resources relevant to key regions that are being affected by climatic disruption. These regional models can be used for active learning and service learning to provide

greater immediacy for local students. The Council of Environmental Deans and Directors is developing a learning community of educators to develop and share approaches for climate solutions education.

The Process of Education

What are the pedagogical methods for teaching systems thinking and the interdisciplinary concepts of climate change and sustainability?

Multidisciplinary thinking and action can be taught through creative teaching techniques applied within the disciplines – including applying problem solving on campus and in the local community through cases and hands-on experiences – and by encouraging students to undertake interdisciplinary research projects.

The process of education would “teach what it practices” by complementing formal curriculum with active, experiential, inquiry-based learning and real-world problem solving on the campus and in the larger community.

Bill Timpson et al. (2006) encourages the use of these strategies for teaching about the interdisciplinary concepts of sustainability:

- *Cooperative and collaborative learning* are important for emphasizing principles of interconnectedness.
- *Discovery learning* can equip people to address complex and challenging problems.
- *Experiential learning* can get students out into communities and the natural world.
- *Putting lessons into practice* can deepen learning.

According to Timpson, real world issues – especially those involving environmental, economic, and social dimensions – are inherently interdisciplinary or transdisciplinary.

Inquiry-based and Experiential Learning

Inquiry-based and experiential learning, in which students learn through the process of discovering knowledge themselves and/or through direct experience, can take place inside or outside the classroom, on the campus and in the larger community. This approach is a good fit for education for sustainability because it provides the opportunity for students to develop problem solving and systems thinking skills that can be applied to interdisciplinary issues. In addition, researching problems not yet solved challenges students to use information they learn in new and meaningful ways, and can lead to new innovations and other benefits to the institution and/or society.

According to Timpson et al. (2006), an excellent way to appreciate the “triple bottom line” of environmental, economic, and social concerns is to connect course content to unmet needs in the community. When inquiry-based learning is applied to problems of the local community, students gain hands-on experience working with professionals and community members, and the community benefits from the students’ help solving complex issues and assisting in sustainable community development. The college or university also benefits from improved community relations.

These educational techniques are currently being utilized to teach about climate change and sustainability at many schools, including:

- *Tufts University*, where an experiential education course at Hummingbird Cay Tropical Field Station in the Bahamas engages students in research on the international aspects of climate change, ecology, and natural resource management.
http://global.tufts.edu/1194617619045/IER-Page-IER_Highlight_1194617619070.html
- *Wake Technical Community College*, where the construction management program uses the Northern Wake Campus as a lab setting where students learn both conventional building methods and those elements of sustainable construction that have led to LEED certification at Wake Tech.
<http://appliedtechnologies.waketech.edu/constrmgmt/index.php>
- *Western Washington University*, where student research teams were involved in the university's first campus sustainability assessment through a class called the "Campus Planning Studio."
<http://www.ac.wvu.edu/~sustwwu/sustain/sustain.html>
- At *Furman University*, students learn about environmental policy theory and practice through applied research projects connecting climate action and conservation cases on campus to community sustainability efforts in the region.
www.furman.edu/sustain
- *The School for Field Studies*, which engages students from many colleges and universities, provides semester-long programs using place-based and problem-based learning that integrate an interdisciplinary curriculum involving environmental, economic, and development coursework with ongoing field research on local issues. <http://www.fieldstudies.org>
- At *Los Angeles Valley College*, the Wings program enhances the education and participation of Hispanics in environmental science and natural resource management through "hands-on" experience and training at the Los Angeles Community College District Gold Creek Ecological Reserve.
<http://wingslvc.weebly.com>

Case-based learning often takes place in the classroom with discussions of real-world examples. Students read cases of specific situations drawn from events that have happened, and the teacher facilitates dialogue between students to examine the case. These techniques teach through real experience and collaboration.

- At *Evergreen State College*, a collection of case studies on Native American environmental issues provides teaching tools for Environmental Studies classes.
<http://www.evergreen.edu/tribal/cases/collection/environmentalstudies.htm>
- *Colorado State University* offers graduate students opportunities to write case studies on sustainability through two courses, EDUC619 Curriculum Development and EDUC 629 Classroom and Communication, which can be used for either M.Ed. or Ph.D. programs with an elective option in "Educating for Sustainability." These cases are then compiled and made available to the entire campus as curriculum materials.
<http://soe.cahs.colostate.edu/Graduate/PhD/EL/Default.aspx>

Co-curricular student campus projects and experiences are opportunities for education on climate

change and sustainability outside the classroom. Many students are engaged in assisting with sustainability practices on their campuses – such greenhouse gas emissions inventories and feasibility studies for environmental improvements – through internships, student organizations, and for-credit independent projects under the guidance of faculty or staff.

- At *Warren Wilson College*, with staff and faculty mentors, students conduct all the campus energy monitoring, perform energy audits on campus buildings, and produce the annual greenhouse gas inventory.
<http://www.warren-wilson.edu/~elc/sustainability/energy.php>
- A group of *Calvin College* students, under the direction of an Engineering Department faculty member, conducted an energy savings analysis project for the college.
http://www.calvin.edu/academic/engineering/about/Energy_Analysis_2004.pdf
- *Duke University's* Greening Initiative is a graduate student organization that works on projects they believe will contribute to the institutionalization of an ethic of sustainability at Duke. Their projects includes a Recycling Committee, an Energy Committee, a Bike Advocacy Committee, a Distinguished Speaker Series, an Education Committee, a Green Grant Fund that grants \$50,000 annually for the purpose of “greening” Duke, and more.
<http://web.duke.edu/greening/index.html>
- *Eco-Olympics* is a sustainability competition between residence halls on campus, which evaluates recycling, energy and waste consumption, and environmental education. The Association for the Advancement of Sustainability in Higher Education (AASHE) and Duke Environmental Alliance have launched a website on “Dorm vs. Dorm Sustainability Competitions” to encourage other colleges and universities to host competitions like Eco-Olympics.
<http://www2.aashe.org/competitions/>
- *National Teach-in's* annual day of national engagement on climate change issues involves students in collaborations with faculty and business leaders to connect their campuses with members of Congress and hundreds of state and city officials.
<http://www.nationalteachin.org/>
- *Recyclemania* is an annual ten-week recycling competition between colleges and universities across the United States. The friendly competition uses weekly reporting to promote awareness of each institution’s strengths and encourages improvements in individual waste management practices.
<http://www.recyclemania.org/>
- Energy Action Coalition’s *Power Shift* conference is a national youth summit in Washington D.C. to solve the climate crisis that is coordinated with student organizers at campuses across the country.
<http://www.powershift09.org/>

Student internships and practicum experiences offer opportunities for engaging students in real-time systems analysis and critical thinking about sustainability. Many schools offer have a service-learning infrastructure that can be utilized for these purposes.

- At *Ithaca College*, there is a strong emphasis on experiential learning and civic engagement through collaboration with EcoVillage at Ithaca and a program of participation in the larger community around issues of climate change. <http://www.ithaca.edu/news/release.php?id=1088>
- *Iowa Lakes Community College* offers a program on the operation and maintenance of wind turbines that includes a summer internship with the wind industry, and the college's own wind turbines are used as educational tools. http://www.iowalakes.edu/programs_study/industrial/wind_energy_turbine/index.htm
- *Warren Wilson College* offers students paid summer internships, through the Sustainability Internships Program, from land conservation work to data collection at the National Climatic Data Center. <http://www.warren-wilson.edu/~elc/sustainability/literacy.php>
- At the *University of Southern Maine*, the School of Social Work sends students to work on organic farms and to connect local food sources to low-income families in Portland, Maine.
- At *Corning Community College*, faculty can offer an additional credit hour to students who utilize the college's service learning infrastructure to connect to real-world sustainability projects.

Outreach partnerships with local nonprofits and the community are helpful in developing opportunities for students to find internships, class projects, community-based research and other learning opportunities that provide benefit to the local community.

- At *Colorado State University*, established relationships with local nonprofits like Village Earth enable students to work with the Lakota people on the Pine Ridge Reservation in South Dakota. http://www.cm.cahs.colostate.edu/CM/Newsletters/Newsletter05/cultural_development.html
- At *Middlebury College* a senior capstone course teams students with community partners to do research and develop implementation plans to address the particular sustainability issues that these partners are grappling with.
- At *Warren Wilson College*, students have developed INSULATE! and created a national model to weatherize homes and measure sustainability benefits for low-income homeowners. http://www.warren-wilson.edu/~ELC/New_ELC_Website_/insulate/index.php
- At *Ball State University*, students enrolled in an MBA course work with undergraduates in an introduction to sustainable development course to serve as consultants to local clients, such as a bus service, libraries, and city hall, and conduct sustainability assessments.
- At the *College of the Menominee Nation*, students in hands-on permaculture design courses work with the Oneida Nation organic farm, and the Sustainable Development Institute at the college provides opportunities for students to visit other indigenous communities implementing sustainability practices. <http://www.sustainabledevelopmentinstitute.org/AdvancedPermaculture2009/index.asp>

- At *Arizona State University*, student research within the School of Sustainability focuses on urban development using Phoenix as a sustainability laboratory.
] <http://design.asu.edu/purl/PURLconf.shtml>
- At *Calvin College*, through the Electrical Power and Energy Systems Management Systems course, students learn the analytical basis of power and energy systems and the consequential environmental impact, and use these skills on real-world projects in the Grand Rapids area, including a feasibility study for wind power generation in partnership with a co-housing community.
<http://www.calvin.edu/academic/engineering/about/sustainability.html>

New Teaching Tools

Linda Vanasupa, a faculty member at California Polytechnic State University, finds new cyber-based educational tools like distance learning to be useful to when educating students about sustainability and climate change: “These kinds of tools leverage the resources developed by others and enable the students to more effectively learn and act on their knowledge. They also resonate with the intrinsic motivations of the students and can catalyze their ascent to become citizen change agents for a just and sustainable world.”

Not only are these new cyber-based learning opportunities appropriate to a younger audience, but they also may be the best route to providing education to adult students in hard economic times. An article in the *Chronicle of Higher Education* states that the recession and the subsequent unemployment may drive more adult students to take the online courses offered by two-year institutions.³ On-line courses offer adult learners more flexibility and convenience. In fact, the article states that schools are seeing students choose another college for its online program.

Several colleges and universities are exploring ways to use new teaching tools to integrate sustainability and climate change into the disciplines:

- *California Polytechnic State University, Yale University, and the University of South Florida* are developing a cyber-based learning tool to enable engineering students to self-regulate their development in key areas that underlie the ability to design for sustainability. The tool educates students in not only the scientific concepts, but enables them to see how they, in their chosen profession, can contribute to the solution.
- *The Massachusetts Institute of Technology*, in partnership with the Sustainability Institute and Ventata Systems, has developed a decision-maker-oriented simulation game called “C-Roads” that helps students understand the long-term climate impacts of various futures for fossil fuel emissions. This climate model can be used by non-modelers.
<http://climateinteractive.org/simulations/C-ROADS>
- *Arizona State University* developed the Decision Theater to facilitate policymaking and create a more sustainable future. Tackling complex issues such as urban growth, education and the environment, the Decision Theater uses interactive visualization that draws on modeling and simulation techniques.

³ Kolowich, Steve. Recession May Drive More Adult Students to Take Online Courses. *The Chronicle of Higher Education*. January 9, 2009. <http://chronicle.com/free/2009/01/9375n.htm>

<http://community.asu.edu/exchange/2007/01/asu%E2%80%99s-decision-theater-uses-virtual-reality-to-plan-a-better-future-for-arizona/>

- *The Consortium for Education in Renewable Energies Technology* and *Madison Area Technical College* make online courses in energy management and renewable energies available to remote students or to colleges who do not have their own capacity but want to offer pass-through courses
<http://www.ceret.us>

Building Institutional Capacity

Most profound change initiatives fail for lack of two key institutional capacities – insufficient institutional learning capabilities and insufficient attention to limiting processes in the organization (Senge et al, 1999). A survey of the information and ideas presented in conferences, workshops, books, reports, articles, and institutional literature indicates the following key capacities are crucial to a successful education for sustainability initiative:

- *Demonstrated Support of Senior Administrators/Leaders* – Individuals in positional leadership understand the importance of sustainability, believe it to be a key institutional success factor, and provide support for sustainability efforts through value statements, resources, or new administrative structures.
- *Collaborative/Shared Leadership* – Stakeholders throughout the campus, particularly students and faculty across all disciplines, are supportive of and involved in the initiative from conception to implementation.
- *Shared, Compelling, and Clear Vision and Strategy* – Shared vision and implementation strategy is created with input from people across campus, not in isolation among a few leaders. All stakeholders understand the strategy and their role in its implementation.
- *Enabled Stakeholders* – All stakeholders are enabled with the knowledge, skills, and authority to take actions to implement the strategy. In particular, a set of programmatic efforts is in place to offer opportunities for faculty and staff to learn relevant skills and/or gain knowledge.
- *Progress Assessment Mechanisms* – Processes are in place to continually monitor and assess progress, with mechanisms to inform and refine the strategy over time.
- *Informed Stakeholders* – Channels to all stakeholders exist to communicate the vision, the strategy, actions taken, success stories, and progress.

This document focuses on capacities and examples specifically related to the education aspect of climate action planning and sustainability, at a relatively high level, in the areas of 1) demonstrated support of senior administrators; 2) enabled stakeholders (with a focus on faculty and staff); and 3) progress assessment measures (with a focus on evaluating educational aspects). For more details and for strategies for leading profound change toward higher education institutional sustainability, please refer to *Enhancing Your Institution's Capacity to Fulfill the ACUPCC: A resource for ACUPCC signatory presidents and chancellors*.

Demonstrated Support of Senior Administrators/Leaders

When discussing activities devised to transform Emory University's culture, Peggy Barlett explains, "one component of the success we achieved was the signals of support from the provost, the president, and several vice presidents and deans, who at several pivotal points helped reassure some who feared high-level disapproval of our efforts... Several administrators provided funding at crucial junctures, which reinforced the viability of initiatives." (Barlett and Chase, 2004)

One visible way to demonstrate support for education for sustainability is by making institutional commitments. For example, by signing the ACUPCC, college and university presidents are saying that modeling and educating for climate neutrality is an institutional priority. Administrators can also demonstrate broad support in a number of other ways, including: building sustainability education into

the institution's mission statement; identifying and rewarding faculty who are champions for sustainability education through fellowships and other means of public recognition and monetary support; and creating institutional structures of responsibility such as new positions, committees, and task forces.

By **making institutional commitments** and **building education for sustainability into mission statements**, college and university senior leaders state that modeling and educating for climate neutrality and/or sustainability is an institutional priority to be taken seriously by all stakeholders, and not just another program for staff and faculty to take or ignore as it suits their perspective.

- *The American College & University Presidents' Climate Commitment* - The ACUPCC is a high-visibility effort to address global warming by garnering institutional commitments to neutralize greenhouse gas emissions, and to accelerate the research and educational efforts of higher education to equip society to re-stabilize the earth's climate.
<http://www.presidentsclimatecommitment.org>
- *The Talloires Declaration* – The Talloires Declaration is a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations, and outreach. Composed in 1990, it is the first official statement made by university administrators of a commitment to environmental sustainability in higher education, and has been signed by over 350 presidents and chancellors in over 40 countries.
http://www.ulsf.org/programs_talloires.html
- At *Antioch New England*, a stated mission “to provide transformative education for a just and sustainable society” guides teaching in the four academic disciplines of education, environmental studies, organization and management, and psychology.
<http://www.antiochne.edu/academics/default.cfm?ref=nav>
- At *Middlebury College*, the President named interdisciplinary environmental studies and awareness as a “Peak of Excellence” that, along with five other peaks, defines a vision for the future of the College.
http://www.middlebury.edu/administration/enviro/about/environmental_peak.htm
- Northland College's mission states that it “integrates liberal arts studies with an environmental emphasis, enabling those it serves to address the challenges of the future,” and the college is guided by a vision to become the nation's leading environmental liberal arts college.
<http://www.northland.edu/about-northland-mission-vision.htm>

Incentives, rewards, and recognition of faculty sustainability champions can encourage people to step outside of their comfort zones and into the education for sustainability realm. For profound change initiatives such as these, incentives systems must be aligned with the long-term, trans-disciplinary nature of sustainability initiatives, and can be detrimental if they focus only on short-term performance and/or leave little time, money, or space for learning (Senge et al, 1999).

- At *Elon University* a sustainability faculty scholars program offers \$1000 stipends to integrate sustainability into disciplines.
<http://org.elon.edu/sustainability/ac-susScholars.html>

- At *The University of Pennsylvania* the Global Initiatives Fund, funded by the Provost and President's office, sponsors faculty research and teaching for interdisciplinary solutions to environmental problems with attention to business and policy.
<http://environment.wharton.upenn.edu/>
- At *The University of New Hampshire* the Outreach Scholars program recognizes faculty champions and supports a new research paradigm that brings potential users of the results of faculty research in at beginning.
<http://www.unh.edu/outreach/champions.html>
- At *Cornell University* the Cornell Center for a Sustainable Future is providing Academic Venture Fund awards, funded by alumni gifts, to stimulate original and cross-disciplinary research in sustainability science.
<http://www.sustainablefuture.cornell.edu/grants/rfptab.php>

Creating **institutional structures of responsibility and accountability**. A designed person or group of people tasked with authority and accountability for education for sustainability initiatives has been demonstrated to effect the most progress toward integrating sustainability and climate neutrality into the curriculum and other educational experiences. Administration support is essential for providing these individuals or coordinating committees with the clout necessary to work with faculty across the disciplines. These offices, individuals and groups are often charged with some or all of the following responsibilities:

- Lead the creation of the strategic plan
- Build awareness and support among stakeholders
- Catalogue the various efforts across campus for integration
- Assess progress
- Build connections and be a liaison between faculty across the disciplines, and between faculty, staff and students
- Lead the development of learning outcomes for sustainability for all disciplines
- Provide professional development opportunities for staff and faculty
- Look for opportunities to fund and institutionalize these efforts

Several colleges and universities have understood the importance of identifying a group or an individual who is responsible for doing this work, including:

- *Texas Christian University*, where a committee comprised of faculty, administrators, and students has been assembled by the Provost to design the curriculum to incorporate sustainability into every student's educational experience.
- *Middlebury College*, where the Dean of Environmental Affairs reports directly to the Provost and oversees the Sustainability Integration Office as well as academic and administrative environmental and sustainability programs.
<http://www.middlebury.edu/administration/doenv/>

- The *University of New Hampshire*, where the Director of the University Office of Sustainability is also the University's Chief Sustainability Officer, reporting directly to the Provost. The Office is charged with advancing the university as a nationally recognized sustainable learning community that integrates sustainability across its curriculum.
<http://unh.edu/news/campusjournal/2007/Jul/25sustain.cfm>

Enabled stakeholders – faculty

The faculty is instrumental in the design of coursework, student research, campus activities, and outreach. Programs to engage faculty in dialogue on sustainability are necessary to result in knowledge and values about climate change and sustainability becoming an integral part of the normal teaching within all academic disciplines.

Faculty Development Programs

There is high demand for faculty development programs that help professors, deans, and provosts think through ways to adopt and implement education for sustainability best practices, which can have some different content and instructional aspects that may be different from what most faculty have used in the past. Since being pioneered in 1990 by Tufts University through its Environmental Literacy Institute, summer workshops and other intensive programs expanding faculty knowledge and teaching from a wide range of disciplines on sustainability in higher education have become a popular tool for engaging faculty in this topic.

Tufts University's Environmental Literacy Institute is a multi-day faculty development summer workshop with a goal of enhancing faculty literacy on climate change and climate justice, and inspiring participants to incorporate these themes into existing courses or to create new courses. Ultimately, the purpose is to increase the ability of all Tufts students to engage with the issues that will shape their generation. Emphasis is placed on recruiting faculty participants from a wide range of disciplines. The workshop includes interactions with experts, access to a range of resources, and a field-based learning experience.
<http://environment.tufts.edu/?pid=14>

Emory University's Piedmont Project emerged as a grassroots effort on the part of a group of concerned faculty to strengthen Emory's engagement with sustainability and environmental issues. It is a curriculum development project that seeks to foster an invigorated intellectual community to address global issues and local environmental awareness. The project has grown from a focus on course development to include a broader group of experiences, both in and outside the classroom.
<http://sustainability.emory.edu/page/1021/Piedmont-Project>

For more than 7 years, *Northern Arizona University's* Ponderosa Project has served as a model for other faculty development projects across the country. A discussion of the challenges and rewards of this pioneering program are detailed by Geoffrey Chase and Paul Rowland (2004) on pages 91-105 in "Sustainability on Campus." Included in the discussion are the underlying assumptions that drive the Ponderosa Project's workshops: 1) faculty benefit most from being presented with a broad range of approaches, ideas, and resources; 2) content and pedagogy are both critical to education for sustainability, i.e. how faculty teach is as important as what they teach; 3) faculty themselves know best how to revise the courses they teach; and 4) providing opportunities for faculty to step outside the boundaries of their disciplines and departments is a useful way to help faculty move toward sustainability.

<http://www2.nau.edu/~ponder-p/>

Other examples of schools that are now providing faculty development include:

- *Auburn College*, where the Fall-line project provides faculty development and where a minor in sustainability, based on new courses from the workshop, has been approved.
<http://www.auburn.edu/projects/sustainability/>
- *Calvin College*, where the Calvin Environmental Assessment Program offers summer faculty workshops and aims to build a network for more systematic curriculum programs.
<http://www.calvin.edu/admin/provost/ceap/>
- *Evergreen State College*, where summer institutes have been offered for several years around issues of sustainability and curriculum. Also, the Curriculum for the Bioregion Initiative out of Evergreen serves 32 institutions and is engaging disciplinary groups of faculty in sustainability curriculum development for use in introductory or general education classes.
<http://www.evergreen.edu/sustainability/home.htm>,
<http://www.evergreen.edu/washcenter/project.asp?pid=62>
- *University of Maryland*, where the Chesapeake Project is a two-day workshop designed to help faculty integrate sustainability across all disciplines, in which faculty are encouraged to use examples from the Chesapeake Bay region to ground students in place-based problem solving.
<http://www.chesapeakeproject.umd.edu>
- *Scranton University*, where the Workshop on Sustainability involves one fifth of all faculty and has resulted in an MBA program with sustainability in the curriculum.
<http://matrix.scranton.edu/sustainability/workshop.shtml>
- *University of Alaska-Anchorage*, where a three-day faculty intensive entitled “Cool Classes, Cool Climate: Integrating Climate Change into the Curriculum” affects about 40 courses.
http://www.uaa.alaska.edu/sustainability/upload/SOF_Proposal_Integrating_Climate_Change_in_Curriculum.pdf
- *University of Southern Maine*, where the Maine Watersheds Project provides faculty development workshops that have resulted in an edited volume of curriculum innovations for infusing sustainability.
<http://usm.maine.edu/teachsustain/>

Geoff Chase and Peggy Barlett took their experiences from the success of the programs at Northern Arizona University and Emory University and developed *Sustainability Across the Curriculum Leadership Workshops*. These workshops, offered by the Association for the Advancement of Sustainability in Higher Education (AASHE), have now trained more than 250 faculty to take steps towards curriculum innovation at their own colleges and universities.

<http://www.aashe.org/profdev/curriculum.php>

The *Disciplinary Associations Network for Sustainability (DANS)* is another resource for faculty development. DANS provides faculty and staff development workshops to catalyze sustainability focused curriculum and integration on campus. The DANS web site is hosted by AASHE.

<http://www2.aashe.org/dans/>

A study conducted by Peggy Barlett and Ann Rappaport (2007) on the impacts of these programs reveals long-term changes in teaching, research, interdisciplinary collaboration, and engaged action. Participants from several cohorts of the Tufts Environmental Literacy Institute and the Piedmont Project reported substantial numbers of new and renovated courses and multiple innovations in teaching methods.

The administration can provide a receptive audience to these efforts by supporting new faculty hires that serve more than one program and will be working at an interdisciplinary level. These hires will naturally be more receptive to the kind of interdisciplinary work that is needed for education about sustainability and climate change.

Learning By Teaching

Established academic traditions have maintained the quality and integrity of higher education teaching in part by requiring college and university faculty members to be experts in their fields. This can be an impediment to broad teaching of sustainability because faculty may not feel sufficiently well-versed in relatively new concepts like climate change, particularly in comparison to their depth of knowledge in their discipline. By leading courses that by pedagogical and/or content design do not require deep expertise on the part of the professor or instructor, faculty members can learn with the students and develop their own understanding over time. Team-taught courses can be an excellent way to for faculty to learn from each other and through the process of teaching together.

- At *Northern Arizona University* the team-taught course “Climate Change Mitigation” has engaged students in conducting a greenhouse gas emissions inventory for campus, in analyzing the feasibility of a biomass energy facility, and in organizing an energy conservation contest.
<http://www.mpcer.nau.edu/carbonproject/files/bio497b.pdf>
- *Green Mountain College* offers “block courses” that have been designed as both models of integrated bioregional education and as faculty development tools. Faculty learn about regional sustainability with their co-teachers and the students, and they conduct research that contributes to the surrounding communities.
<http://www.greenmtn.edu/block-courses.aspx>
- At the *University of New Mexico*, the director of the Sustainability Studies Program and his Sustainability 434 students, with input from the Physical Plant department and others, are learning together by writing the University’s carbon action plan as the class project.
<http://www4.unm.edu/sust/index.php?page=students>
- At *Duke University*, an undergraduate course on the climate footprint of food, cross-listed in environmental studies and sociology, provides co-learning for faculty and students. The class is divided into project teams, each of which conducts research to answer a question posed by an on-campus dining client.
<http://www.aas.duke.edu/reg/synopsis/view.cgi?term=1270&s=01&subj=ENVIRON&course=171>
- *California State Polytechnic University* offers a laboratory course titled “Regenerative Responses to Climate Change,” which in its first year involved students in conducting a greenhouse gas

emissions inventory and faculty from planning disciplines who were new to this methodology. The class is now exploring Scope 3 emissions on campus.

<http://www.csupomona.edu/~kdbrown/RS599/>

- *Ithaca College* offers “Sustaining Our World,” a team-taught first year seminar with faculty from business, social sciences, and natural resources. The class was recognized in 2006 by National Wildlife Federation’s Campus Ecology program for innovative curriculum development.
http://www.ithaca.edu/ithacan/articles/0611/30/news/4college_r.htm
- At *Oakland Community College*, the faculty developed a flexible instructional and curricular project model that is simple to implement in a variety of disciplines. For both teachers and students, the model instills attitudes and skills required to become positive change agents while not requiring sustainability expertise. Small groups of students envision a positive scenario for the future of society using two themes, creating a more humane society and environmentally sustainable society. Students then use discipline concepts from the course to create a story describing how society changed from today to their positive future scenario.
<http://www.ncseonline.org/EFS/DebraRowe.pdf>

Enabled stakeholders - staff

William Throop, Vice President of Academic Affairs for Green Mountain College, states in an interview by the journal *Sustainability*, “the other thing institutions need to do is to ensure that offices across the campus are supportive of students and faculty who are using the campus as a laboratory for sustainability. So from the residence life office to the business office and various areas of facilities, they have to be ready to provide knowledge, to be transparent, and to enable students to engage in helping make these areas more sustainable.”⁴

Nan Jenks-Jay, Dean of Environmental Affairs at Middlebury College, finds this to be true in Middlebury’s experience, “If students are to truly learn what sustainability is and what it looks like, it’s essential that colleges and universities demonstrate it in how they operate, what they build, and in all the other physical manifestations of a campus. Staff have an important role to play in making sustainability visible by understanding where they are currently in their job with respect to sustainability, and what practices and changes could be made to move further down that path.”

To this end, colleges and universities are training staff in sustainable operations and office practices, and encouraging them to think of themselves and the campus as teachers. Some examples include:

- *The University of Connecticut* provides an online resource entitled “Sustainable Office Guidelines: A Guide to Working Green at the University of Connecticut” to help teach staff and faculty about sustainability. Representatives from each department discuss the topic with staff and evaluate the knowledge of employees.
<http://advance.uconn.edu/2008/080929/08092905.htm>
- *Harvard University* encourages members of the staff to set up workshops that teach tips on how to implement various sustainable work methods and create a green workplace.
<http://www.greencampus.harvard.edu/greenoffice/>

⁴ Roundtable: Integrating Sustainability into the Higher Education Curriculum. *Sustainability: The Journal of Record*. Vol.1 No.6, p.368.

- At *The University of Washington and Lee*, the dining services team has been undergoing sustainable cooking training, which includes a visit to a local farm.
<http://www.hobartcorp.com/sustainabledesign/doc/hcfs/WashingtonUniversity.pdf>
- *Antioch New England* hired a sustainability specialist to provide one-on-one workplace efficiency audits for university employees.
<http://www.antiochne.edu/ssj/greenguru.cfm>
- At *Middlebury College*, the Director of the Sustainability Integration Office has a standing slot on the agenda of new employee orientation meetings, and the office partners with Human Resources, Staff Council, and Facilities to organize training sessions and expos for staff on specific topics such as green cleaning.
<http://www.middlebury.edu/administration/enviro/>

Enabled stakeholders - students

According to Peter Bardaglio, Second Nature Senior Fellow, the role that students have played in actively advocating for administrators and faculty to include sustainability in their teaching and learning has been very powerful, but is sometimes overlooked. In addition, student based initiatives provide important learning opportunities for students outside the classroom.

Student sustainability initiatives are gathering momentum across the country, and at some institutions the administration is supporting these initiatives through policy changes, funding, and other means of support:

- *Northeastern University's* Husky Energy Action Team (HEAT) is a student group aimed at bringing students, faculty, and staff together to promote and implement sustainability initiatives across campus.
<http://www.heat.neu.edu/>
- At the *University of Illinois Urbana-Champaign*, the Student Sustainability Committee received approval from the administration to include small fees in tuition for the sustainable campus environment and cleaner energy technology.
<https://netfiles.uiuc.edu/ro/www/StudentSustainabilityCommittee/links/projects.shtml>
- At *Ithaca College*, students help organize and run the Finger Lakes Environmental Film Festival each year, attended by over 8,000 people.
<http://ithaca.edu/fleff>
- At *Ball State University*, honors students took it upon themselves to address the campus watershed issues, which resulted in markers on storm drains throughout campus.
<http://www.bsu.edu/web/ceres/stormwater/stormwaterweb.pdf>

Enabled stakeholders – learning communities

A learning community is a group of people who engage in order to learn together from one another. A learning community with sustainability as a shared value can help members of the community recognize and deepen their understanding of the importance of issues such as climate change and the need for leadership in addressing it.

On-campus Learning Communities

Middlebury College uses a practice of “deep learning” to engage staff, students and faculty in developing policies and practices related to climate change and sustainability. It usually starts with a task force or a standing body like the Environmental Council taking on a sustainability challenge. They explore the topic and define the information and knowledge gaps needed to make a sound decision. Faculty take these needs into the classroom where students apply their learning in economics, biology, social sciences, or other disciplines to fill in the gaps. Their insights and recommendations are fed back to the task force, which then recommends policies and strategies for institutional change to College administration and Trustees such as what kind of carbon reduction goal should be set and the key strategies for achieving it. This kind of deep learning leads to substantive change that keeps the College on the leading edge of sustainability. It also reinforces the importance of learning together as a whole community to address the challenges of sustainability.

Green residential learning communities, such as the Biosphere at the *University of Pennsylvania* and Ecovillage at *Berea College*, and green buildings on campus, such as the Cliffs Cottage at *Furman University* and other “Living Learning Laboratories”, can provide experiential learning opportunities on a daily basis.

<http://ees.furman.edu/greenguide/Cliffs.html>

<http://kcech.house.upenn.edu/biosphere/index.html>

<http://www.berea.edu/sens/ecovillage/>

Learning communities may start from small acts. For example, at *Pratt Institute*, a group of faculty members who call themselves “Sustainable Pratt” get together for monthly lunches, and a process of institutionalization has begun.

<http://www.sustainablepratt.org/index.php>

Multi-institution Learning Communities

The ACUPCC signatories realize that getting to climate neutrality in order to achieve social, economic and environmental sustainability may be the hardest thing that modern society will ever attempt. It means shifting from a fossil fuel dependent, automobile centric and take-make-waste society to a low carbon, less auto-dependent and circular production economy. Achieving these goals fits squarely into the educational, research, and public service missions of higher education. Society will need new and better design, technologies, economic instruments, public and private decision-making and a whole host of individual and collective strategies for which the research capability of higher education is crucial. This includes dealing with population, consumption and social equity.

The urgency and scale of the challenge may be larger than the Marshall Plan, the Apollo project, the Manhattan project and the attempt to eradicate cancer because it is really about remaking the human presence on the planet in a manner that will sustain human society for many generations. Like these other challenges it will take concerted focus and action over time to achieve these goals, especially by higher education. Collaborative action toward the common goal is necessary because no one school or small subset of schools can lead this change.

For these reasons, one of the most important benefits of working on fulfilling the Commitment is the ability of the ACUPCC network to help each other and to help advance the whole cohort of schools as well as other higher education institutions. The ACUPCC network is a learning community.

The *Washington Center for Improving the Quality of Undergraduate Education*, with support from The Russell Family Foundation and the U.S. Environmental Protection Agency, is developing “faculty learning communities” among thirty-two member campuses in the Puget Sound bioregion by offering professional development experiences that involve collaborative learning, curriculum development, and a publishing opportunity. Each group of teachers works to create a faculty learning community that develops, shares, and publishes curricular ideas related to sustainability and place-based learning for use in introductory and general education courses in their disciplines.

<http://www.evergreen.edu/washcenter/home.asp#>

There are many associations and groups working to build learning communities for sustainability and climate change education across institutions.

- *The Association for the Advancement of Sustainability in Higher Education (AASHE)* aims to advance the efforts of the entire campus sustainability community by uniting diverse initiatives and connecting practitioners to resources and professional development opportunities. Membership in AASHE provides entry to an on-line resource center with a database on sustainability-focused academic programs and a network of more than 900 members working to advance sustainability in their institutions
<http://www.aashe.org/>
- *The Disciplinary Associations Network for Sustainability (DANS)* is a network of over two dozen academic disciplinary associations including the natural sciences, social sciences and the humanities. The network works collaboratively on sustainability curricula, interdisciplinary approaches, and engages faculty from multiple disciplines across all higher education institutions.
<http://www.aashe.org/dans>
- *The Higher Education Associations Sustainability Consortium (HEASC)* is a network of higher education associations with a commitment to advancing sustainability within their constituencies – including business officers, facilities officers, campus activities staff, and others – and within the system of higher education itself.
<http://www2.aashe.org/heasc/>
- *The World Federation of Colleges and Polytechnics* is an international network of colleges and associations of colleges providing leadership in the delivery of workforce education and lifelong learning that benefits society and the global economy.
<http://www.wfcp.org/>
- Consortia of institutions within particular regions or states are providing leadership on sustainability within operations and academics, including the *New Jersey Higher Education Partnership for Sustainability*, *The Associated Colleges of the South*, and *The Green Campus Consortium of Maine*.
<http://www.njheps.org/>
<http://www.colleges.org/>
<http://www.megreencampus.com/>
- Electronic discussion lists connect schools informally for information sharing, and include the Green Schools List-serv, which is managed by Brown University, and the Community Colleges for

Sustainability List-serv, which is managed by Lane Community College, and the Education for Sustainability for Academics List-serv, managed by Arizona State University.

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<http://lists.asu.edu/cgi-bin/wa?SUBED1=efs-acad&A=1>

Assessing Sustainability Content in Teaching and Curricula

It is important for colleges and universities to have active programs to monitor and periodically assess the results and efficacy of educational strategies and modify them to achieve desired results. The criteria used will vary by institution, based on size, mission, and organizational capacity, among other things. Assessment is particularly crucial for a concept as encompassing and open to broad interpretation as education for sustainability.

Currently several national assessment frameworks have been developed to evaluate academic quality with regard to sustainability content. The AASHE *Sustainability Tracking, Assessment and Rating System (STARS)* is scheduled for launch in 2009, and offers a thorough system for evaluating teaching and research.

Kim Tanzer, Professor of Architecture at the University of Florida, suggests the following *monitoring, assessment and refinement process*:

1. *Identify existing sustainability content in a form meaningful to a university's mission.* This content might be identified by course or by degree program, be reported by faculty members or students, or identified by a staff member reviewing content based on course titles or program descriptions.
2. *Evaluate the content.* Engage a cross-disciplinary group of faculty members, experts in sustainability subject matter and experienced with teaching students at the level being considered. Charge them to: a) define sustainability, for this purpose, for the institution, b) prioritize a review of the content based on the institution's needs, and c) develop a fair and rigorous process to review the content based on parameters previously set.

Professor Tanzer suggests setting up mechanisms to answer the following questions as a basis for the creation of evaluation criteria:

- How will the concept of sustainability be defined, and by whom?
- How will an effective education in sustainability be measured—by its impact on individual students, by the total number or percentage of students exposed to the concept of sustainability, and/or by students' professional accomplishments?
- Can an institution's existing assessment tools be utilized to evaluate sustainability-based teaching, or should new ones be developed?
- In what form(s) do students learn principles of sustainability and their application – in courses, through majors or other programs, at the undergraduate and/or graduate level?
- How deeply do students learn principles and applications of sustainability? Is it the focus of their studies, or is it related to their studies?

- How will an institution improve its sustainability coursework, and make it available to, or even required of, more students?
3. *Communicate the results.* Coordinate the group's assessment with the institution's data collection system, allowing for internal and external analysis and reporting as appropriate, and for certification of students' transcripts, etc. Communicate to a spectrum of decision-makers, including students, faculty, administrators, and alumni.
 4. *Improve the institution's sustainability offerings.* Request that the faculty group recommend a means of institutional improvement of sustainability offerings, and create and implement a process for conducting reviews.

Selected Resources

Expertise

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Timpson, W. 2001. *Stepping up: College learning and community for a sustainable future*. Madison, WI: Atwood and Cincinnati, OH: Thomson Learning.

Timpson, W. and Broadbent, F., Eds. 1995. *Action learning: Experience and promise*, Brisbane, Australia: University of Queensland/The Tertiary Education Institute.

Timpson, William, Brian Dunbar, Gailmarie Kimmel, Brett Bruyere, Peter Newman, and Hillary Mizia. 2006. *147 Practical Tips for Teaching Sustainability: Connecting the Environment, the Economy, and Society*. Madison, WI: Atwood Publishing.

Professional and Peer-reviewed Journals

Consilience: The Journal of Sustainable Development.
<http://consiliencejournal.readux.org/>

The E-Journal of Solidarity, Sustainability and Nonviolence.
<http://pelicanweb.org/solisust.html>

The Electronic Journal of Sustainable Development.
<http://www.ejsd.org/>

The International Journal of Environmental, Cultural, Economic and Social Sustainability.
<http://ijs.cgpublisher.com/>

International Journal of Sustainability In Higher Education.
<http://info.emeraldinsight.com/products/journals/journals.htm?id=ijshe>

The Journal of Climatic Change
<http://www.springer.com/earth+sciences/meteorology/journal/10584>

Sustainability Science, Practice and Policy.
<http://ejournal.nbii.org/>

Sustainability: The Journal of Record.

<http://www.liebertpub.com/products/product.aspx?pid=252>

System Dynamics Review

<http://www3.interscience.wiley.com/journal/11215/home>

On-line Resources

AASHE Resource Center

http://www.aashe.org/resources/resource_center.php

Disciplinary Associations Network for Sustainability curricular resources

<http://www2.aashe.org/dans/resources.php>

American College Personnel Association learning outcomes

http://www.myacpa.org/taskforce/sustainability/docs/Learning_Outcomes_Sustainability_Map.pdf

American Association of Community Colleges Sustainability Resources

<http://www.aacc.nche.edu/sustainable>

Curriculum for the Bioregion Learning Outcomes and related articles

<http://www.evergreen.edu/washcenter/project.asp?pid=62>

Play A Greater Part (connecting students to community projects)

www.playagreaterpart.org

Second Nature Sustainability Curriculum Framework

<http://www.secondnature.org/Resources.html#FactSheets>

Education for Sustainability West Course Syllabi Resource Center

http://efswest.madwolftech.com/Resource_Center/Second_Nature/second_nature.nsf/resource_center_courses.html

National Education for Sustainability K-12 Student Learning Standards

http://www.uspartnership.org/resources/0000/0062/USPEfSStandards_V2.09.08.pdf

NOAA's Guide on "Climate Literacy: The Essential Principles of Climate Science"

<http://www.climatescience.gov/Library/Literacy/default.php>

UNESCO Teaching and Learning for a Sustainable Future Multimedia Teacher Education Program

<http://www.unesco.org/education/tlsf/>

National Wildlife Federation's Campus Report Card

<http://www.nwf.org/campusEcology/campusreportcard.cfm>

Beyond Grey Pinstripes

<http://www.beyondgreypinstripes.org>

World Watch Magazine

<http://www.worldwatch.org/taxonomy/term/41>

jdiamond@worldwatch.org (for free on-line access for professors and students)

The Tahoe Center for A Sustainable Future's Sustainability Education Guide:

<http://ceres.ca.gov/tcsf/seg/index.html>

Campus Based-Learning in the Geosciences

<http://serc.carleton.edu/introgeo/campusbased/index.html>

Environmental Liberal Arts Goals and Learning Outcomes (Green Mountain College)

http://www.greenmtn.edu/media/93895/ela_goals.pdf

http://www.greenmtn.edu/media/93898/learning_outcomes.pdf

Advanced Technology Environmental and Energy Center Energy Education Resource Center

<http://ateec.org/store/catalog/Energy-17-1.html>

Consortium for Education in Renewable Energy Technology

<http://www.ceret.us>

Interstate Renewable Energy Council listing of renewable energy education programs

<http://www.irecusa.org/trainingCatalog/>

Organizations

Alliance for Climate Protection

www.wecansolveit.org

Association for the Advancement of Sustainability in Higher Education (AASHE)

www.aashe.org

Campus Climate Challenge

www.climatechallenge.org

The Center for a Sustainable Future

<http://csf.concord.org>

Clean Air-Cool Planet

www.cleanair-coolplanet.org

Disciplinary Associations Network for Sustainability (DANS)

www.aashe.org/dans/

Energy Action Coalition

www.energyactioncoalition.org

Higher Education Associations Sustainability Consortium (HEASC)

www.heasc.net

National Campus Compact

<http://www.compact.org>

National Council for Science and the Environment (NCSE) and Council of Environmental Deans and Directors (CEDD)

www.NCSEonline.org/CEDD

National Wildlife Federation Campus Ecology Program

www.nwf.org/campusecology

Power Vote

www.powervote.org

Second Nature

www.secondnature.org

University Leaders for a Sustainable Future

<http://www.ulsf.org>

U.S. Partnership for Education for Sustainable Development

<http://www.uspartnership.org>

Other Resources on Climate Change and Sustainability

Design Principles

The Natural Step – www.naturalstep.org

Natural Capitalism – www.natcap.org

Biomimicry – www.biomimicry.net

Sustainability Institute – www.sustainer.org

Cradle-to-Cradle Design – www.greenblue.org

Ecological Footprint – www.footprintnetwork.org

US Green Building Council – www.usgbc.org

Architecture 2030 – www.architecture2030.org

Precautionary Principle: Science & Environmental Health Network - www.sehn.org

Energy Justice Network – www.energyjustice.net/about

Center for a New American Dream – www.newdream.org

Global Sustainability Policy

Earth Policy Institute – www.earth-policy.org

World Resources Institute – www.wri.org

Worldwatch Institute – www.worldwatch.org

Sustainability and the Economy

The Apollo Alliance – www.apolloalliance.org

Green For All – www.greenforall.org

US Climate Action Partnership – www.us-cap.org

GreenBiz.com – www.greenbiz.com

World Business Council for Sustainable Development – www.wbcsd.org

International Society of Ecological Economics – www.ecoeco.org

Creation Care

Au Sable Institute of Environmental Studies – www.ausable.org

National Association of Evangelicals – www.nae.net

Evangelical Environmental Network – www.creationcare.org

Creation Care for Pastors – www.creationcareforpastors.com